# Beal Elementary School

214 Lake Street, Shrewsbury, MA 01545

# MSBA

# Schematic Design Binder

**September 12, 2018**

**MSBA**
Massachusetts School Building Authority
40 Broad Street, Suite 500, Boston, MA 02111

**OWNER**
Town of Shrewsbury, MA
100 Maple Avenue, Shrewsbury, MA 01545

**OPM**
PMA Consultants
35 Braintree Hill Office Park, Suite 300, Braintree, MA 02184

**DESIGNER**
Lamoureux Pagano & Associates, Inc.
108 Grove Street, Suite 300, Worcester, MA 01605

Prepared by:

LAMOUREUX · PAGANO
ARCHITECTS PROJECT MANAGERS

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# DESE Submittal

**SEPTEMBER 12, 2018**

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Massachusetts School Building Authority
40 Broad Street, Suite 500, Boston, MA 02111

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Town of Shrewsbury, MA
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# 4.1.1 DESE SUBMITTAL

A. Cover Letter

PMA Consultants
EST. 1971
35 Braintree Hill Office Park, Suite 300 ▪ Braintree, MA 02184
Tel: 781.794.1404 ▪ Fax: 781.794.1405

September 12, 2018

Ms. Mary Pichetti
Director of Capital Planning
Massachusetts School Building Authority
40 Broad Street, Suite 500
Boston, Massachusetts 02109

Dear Ms. Pichetti:

Shrewsbury Public Schools is pursuing execution of a Project Scope and Budget Agreement for the MSBA-approved preferred schematic for the Beal Elementary School Project, a new elementary school for 790 K-4 students that will replace the current Beal Early Childhood Center, a K-1 school for 318 students. The current school is located at 1 Maple Avenue in Shrewsbury. The new school will be constructed at 214 Lake Street in Shrewsbury. The District's 2018/2019 enrollment for the Beal Early Childhood Center is 318 students. The design enrollment for the proposed elementary school project is 790 K-4 students.

In accordance with G.L. c. 70 B, the required documents have been assembled for the review of the special education program at the Beal Elementary School. The following are attached per the 'Submittal Requirements':

1. A letter from Superintendent of Shrewsbury Public Schools, Dr. Joseph Sawyer, describing the district's special education program.
2. Proposed space summary that includes the existing facility, proposed spaces, and MSBA guidelines based on the agreed upon design enrollment. The first page of this summary indicates a total of 13,310 net square feet of space dedicated to the delivery of special education.
3. The floor plans for the proposed 141,600 (gross) square foot Beal Elementary School.
4. A completed Special Education Adjacency Table

PMA has reviewed the attached documents and we confirm that the Shrewsbury Beal School Building Committee officially approved the September 12, 2018 dated DESE submittal. Additionally, we verify that the space summary matches the floor plans and the submittal conforms to the MSBA requirements for a DESE submittal as outlined in Module 4 – Schematic Design Guidelines.

Sincerely,

Paul Queeney

Paul Queeney
PMA Consultants, LLC
Owner's Project Manager

Cc: File

B. Special Education Delivery Methodology

# SHREWSBURY PUBLIC SCHOOLS

100 Maple Avenue, Shrewsbury, MA 01545
Tel.: 508-841-8400 Fax: 508-841-8490
schools.shrewsburyma.gov

Joseph M. Sawyer, Ed.D. Superintendent of Schools | Amy B. Clouter Assistant Superintendent for Curriculum & Instruction | Patrick C. Collins Assistant Superintendent for Finance & Operations | Barbara A. Malone. Director of Human Resources | Margaret Belsito Assistant Superintendent for Student Services


Matthew Deninger, Designee of the Commissioner of Education
MSBA Board of Directors
40 Broad Street
5th Floor
Boston, MA 02109

August 27, 2018

Dear Mr. Deninger,

The privilege of building a new school is an opportunity. Crafting the educational plan for Beal Elementary School has helped capture the best qualities of existing programming in Shrewsbury. Developing the vision has also helped to suggest ways that smart design can further the aspirations we hold for students, staff and families. Although we reviewed a number of desirable features in an effort to fuel the design of our newest school, we can think of no more important goal than this: our newest school will serve as a vehicle to further inclusive education for students across the district.

Finnish architect Juhani Pallasmaa once said, "A profound design process eventually makes the patron, the architect and every occasional visitor in the building a slightly better human being." It's our hope that the submission of the Special Education Delivery Methodology information that follows this letter will depict the different ways in which we've planned for form to further function.

How will the addition of the new building impact the community? To begin with, Beal School will largely remain the same in name only. As noted previously in the Teaching Philosophy Statement (educational plan) the current Beal building functions as an Early Childhood center, serving approximately 310 students in Kindergarten and first grade. In contrast, the new Beal 2.0 will serve an estimated 790 students across a span of five grades in a K-4 configuration. The anticipated change in grade span is planned to alleviate overcrowding at the Elementary level across the district. Further, this decision was informed by a thorough review of the research on grade configuration as well as by current and future enrollment numbers for Shrewsbury.

Finally, the following information was carefully considered by the members of the Shrewsbury School Committee:

# SHREWSBURY PUBLIC SCHOOLS

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- The current District enrollment for Grades K-4 in Shrewsbury is 2,174 students.
- The projected District enrollment for Grades K-4 as presented in the MSBA letter is 2,320 students for the 2025-2026 school year.

Subsequent to the submission of the Special Education Delivery Methodology (attached) we look forward to Board approval of a Project Scope and Budget plan. We anticipate meeting to seek approval on October 31st of this year.

As you read through the attached submission, please don't hesitate to contact us, as we'd be happy to address any questions you may have. Thank you for your consideration of the details that matter most to the Shrewsbury Public Schools as we contemplate how to best meet the diverse needs of our growing community.

Sincerely,

Margaret Belsito

Margaret Belsito, Assistant Superintendent for Student Services

Joseph M. Sawyer, Ed. D., Superintendent

Christian Girardi, Principal Beal Early Childhood Center

# BEAL 2.0

## Special Education Delivery Methodology

*A description prepared for submission to the*

*Massachusetts School Building Authority*

*September 2018*

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# I. INTRODUCTION

As mentioned previously, the current Beal School currently serves as an Early Childhood Center. As of October 2017, there were 310 children enrolled at Beal. 254 children attend Kindergarten in a mix of half day and full-day programming, which is approximately 70% of the total Kindergarten student population in Shrewsbury. The combination of space limitations in Beal's aging building (built in 1922 as Shrewsbury's first Junior/Senior High School) and increases in student enrollment over time have limited programming inside and outside the structure.

Given the evolving needs of students and families in Shrewsbury, the new Beal facility will need to be far bigger than the existing structure in order to accommodate increased demand on our public schools across the district. Accordingly, "Beal 2.0" is slated to become an elementary school. More importantly, it's been designed with the needs of all our students in mind. It's our hope that the construction of a new building will reduce overcrowding in the other elementary schools throughout the district.

The Statement of Interest submitted to the Massachusetts School Building Authority (MSBA) in 2015 demonstrates that the current Beal building only allows for basic functionality. Going forward, the existing facility will be inadequate for delivery of the educational program. Some of these reasons are directly related to Special Education Delivery Methodology, notably:

- Space limitations force some special education and other student support services (such as English language education and small group Reading support) to be delivered in the lobby, gymnasium, hallways, and basement rooms.
- Space limitations constrain the ability of educators to collaborate with parents or other professionals. Some small group instruction must take place in offices, which means that parent and teacher meetings must take place in more public settings and/or after hours.
- The site consists of 3.5 acres bound on three sides by public ways. For this reason, dismissal routines must be tightly coordinated. The space is not conducive to today's dismissal routines, including Special Education transportation.

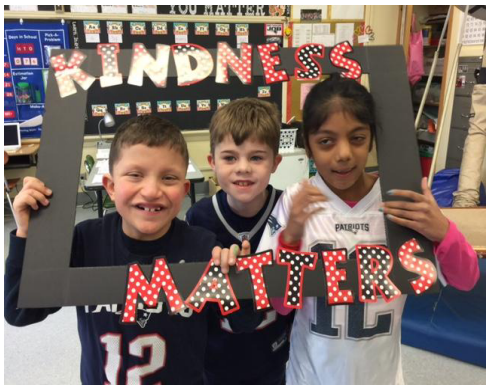
Accordingly, the School Committee elected to move away from an Early Childhood K-1 model and voted to approve a K-4 model for Beal 2.0 with an expected student population of 790.

# II. ADDITIONAL INFORMATION

Recently, the Shrewsbury Public Schools adopted a new set of strategic priorities for 2018-2022 (https://schools.shrewsburyma.gov/district/2018-2022-strategic-priorities-and-goals). The district's goals and objectives for all staff, students and families emphasize learning environments where all students' success matters. Our vision also centers on inclusive practices for students with and without disabilities. Importantly, our schools endorse "best practice", namely instructional strategies that engage students with disabilities participate in

the general education classroom alongside their non-disabled peers. Special education teachers, related service providers (Occupational Therapists, Speech Therapists, Clinical Coordinators, Physical Therapist, Psychologist, etc.) and paraprofessionals join classroom teachers in delivering instruction to meet the needs of diverse learners in each classroom. Student-specific accommodations and modifications are continually assessed to ensure that teaching and learning is effectively enhanced for all.

The Shrewsbury Public Schools have a strong history of complying with all federal and state regulations regarding students with disabilities. The District's 2016 DESE Coordinated Program Review (CPR) documented compliance in all areas of Special Education. We're proud to say that our district did not have a single corrective action under Special Education. Indeed, during the exit interview, the CPR Coordinator noted the exemplar status of Special Education in Shrewsbury. It should be noted in the areas of Civil Rights and English Language Learning the district had a high level of regulatory compliance as well.




In Shrewsbury, our core values guide our educational decisions. Specifically, the Shrewsbury Public School district continually strives to ensure that all students make meaningful progress within the least restrictive environment. Like many high performing districts across the Commonwealth, we embrace the conviction that all students can learn. The mission of the Special Education and Pupil Personnel Department is to identify students who meet the federal and state criteria for a disability requiring specialized instruction and/or accommodations through an Individualized Educational Plan or 504 Accommodation Plan, to empower children and families as learners, and to ensure equitable access to the educational program. In this way, we work to ensure that all our students become connected, contributing members of our community. As a district, we are committed to building skills from individual strengths and abilities, providing inclusive settings for teaching and learning, and engaging parents and community members in our schools as educational partners. Above all, we aspire to meet the academic, emotional and social needs of all our students in a respectful and positive environment.

## 4B.2.1 CURRENT PROGRAM: Beal Early Childhood Center

Presently, Beal School is organized by grade level and schedule. Primarily teachers are organized into three teams: Half Day Kindergarten, Full-Day Kindergarten and First Grade. Overall the Shrewsbury Public Schools presently enroll over 900 students with disabilities. As of October of 2017, 930 students are supported with Individualized Education Plans and 197 students are supported with 504 Accommodation Plans. Of these, there are 40 students with special needs at Beal. Each student's needs are considered individually as placement decisions are made. In Shrewsbury, special education methodology delivery allows for a balanced approach. Students can access supports in specialized settings as needed or remain in the regular education classroom and receive support from specialists that work alongside general educators.

Beal Elementary School is a wonderful example of customized special education programming; district staff meet the diverse and complex needs of its students in a variety of ways. Designed to serve students in Grades K and 1, most students learn in their classrooms in

a full inclusion model. In this model, student needs are met by a co-teaching team or children receive specialized supports via pull-out instruction.

Co-Teaching Teams

A service delivery option designed to address the needs of students in an inclusive classroom by having a general education teacher and a special service provider (e.g., special education teacher, speech/language pathologist) teach together in the same classroom to the meet the needs of individual students.

Learning Skills Model

In the Learning Skills model, special educators provide direct special service, typically in English Language Arts and/or Mathematics, in a small group setting. All students who receive learning skills services remain included in their grade-level general education classrooms for all subjects, but require remediation of certain basic skills and pre-teaching/re-teaching of grade-level material in small groups. The amount of small group support depends on the individual student's needs. A variety of instructional techniques are utilized including structured, multisensory reading and math programs.

Importantly, there are additional options for students that require more support.

The Early Childhood Center (ELC)

The Educational Learning Center, or ELC, is designed for students diagnosed with Autism Spectrum Disorders or similar developmental profiles who require more time in a specialized classroom in order to make effective progress in school. This program is led and supervised by special educators with intensive certification and specialized training. A variety of teaching methods, guided by the principles of Applied Behavior Analysis (ABA) are utilized. Data collection drives instructional methodology, and careful monitoring of student progress determine which supports are best suited for each student. Students require different levels of intervention, and may receive 20% to 60% of their educational services in the ELC. Integration into the general education setting is determined by the student's IEP.

Students who require clinical support may also receive services through the ELC, but are fully included in their general education classroom. These students may have support from a trained paraprofessional and behavior support supervised by the ELC Coordinator. ELC program coordinators supervise the direct teaching staff and coordinate all student services.

Intensive Learning Classroom

In an intensive learning classroom, a special education teacher works with students in a more restrictive, structured environment. In this type of educational program, greater emphasis is placed on the acquisition of basic reading, language and math skills. These supports are individualized and thus they vary based on the students enrolled in the program.

All of the educational programs described above are in place in each of our other schools. The plans for the new Beal reflect the need for space rather than a need to provide additional programming.

In addition to receiving academic instruction, students in Shrewsbury access a variety of related services. These supports include Nursing, Speech and Language, Occupational Therapy, Physical Therapy, and Mental and Behavioral Health services. Each service is described in detail below:

School Health Services/Nursing

School Health services and Nursing services are designed to enable a child with a disability to receive free appropriate public education (FAPE) as described in the child's IEP. While children without disabilities regularly access the nurse, there are times when our nursing staff are instrumental in enabling a child to access the educational program, and thus their needs must also be considered as specialized supports.

Speech and Language Services

Speech-language pathology services entail a number of things: identification of children with speech or language impairments; diagnosis and appraisal of specific speech or language impairments; referral for medical or other professional attention necessary for the habilitation of speech or language impairments; provision of speech and language services for the habilitation or prevention of communicative impairments; and counseling and guidance of parents, children, and teachers regarding speech and language impairments.

It's important to note that students with communication disabilities who are not enrolled in the Shrewsbury Public Schools can receive "walk-in" services if they are found eligible for services on an Individualized Education Program. As a result, therapists maintain and train students and educators in the use of amplification equipment, including hearing aids and personal FM auditory trainers. They consult with educational audiologist/teacher of the deaf/blind re: students' audiological needs. Finally, Speech and Language Therapists implement and train students and educators to use AAC to access the curriculum and communicate in the school and vocational environments.

On a regular basis, our therapists supervise, provide lessons, review data, observe and provide feedback to Speech/Language Pathology Assistant (SLPA). Under the supervision of a Speech and Language Pathologist, the SLPA provides direct services outlined in an IEP to students. The SLPA implements speech and language interventions developed by the SLP. They may either work directly with the student or within a classroom environment. They assist with preparing the educational materials needed for the various programs as well as for the classrooms.

Occupational Therapy

The role of the Occupational Therapist is to evaluate a child, which typically involves standardized testing in the areas of fine motor skills, perceptual motor skills and sensory processing. Rest results are considered alongside clinical observations of the student in the classroom and other school environments, as well as consultation with the child's teacher and parent(s). The goal is to ensure student access to educational curriculum and environments. In occupational therapy terms, ensuring access means helping students attain optimal occupational performance in their student roles. Under the supervision of the Occupational Therapist, a Certified COTA provides direct services outlined in an IEP to students. Areas they provide direct services in include fine motor development, postural stability, sensory processing skills, attention, motor planning, visual perceptual function, writing/drawing ability, or self-care skill. Of note, in Shrewsbury a three-credit graduate course developed and taught by an OT has been provided to help teachers, administrators and paraprofessionals understand how children with sensory processing difficulties learn, and what classroom accommodations they can make for successful inclusion of these students.

Physical Therapy

Physical therapy services generally address a child's posture, muscle strength, mobility, and organization of movement in educational environments. Physical therapy may be provided to prevent the onset or progression of impairment, functional limitation, disability, or changes in physical function or health resulting from injury, disease, or other causes. The purpose of physical therapy services in the public schools is to ensure that students can safely and effectively access their school curriculum. This includes participation in activities in and out of the classroom including recess and in PE (Physical Education) or APE (Adaptive Physical Education) classes. It is also designed to ensure that students are as functionally independent as possible within the school building. It is the role of the PT to evaluate a child for issues with gross motor development and activities that prevent or limit a student's ability to access their educational program and to develop a plan for appropriate intervention.

While Occupational Therapy / Physical Therapy services are provided by licensed therapists, ongoing space constraints mean that services are currently delivered in the basement at Beal. Ideally, OT/PT services should be conducted as close as possible to the general classroom settings so that all educators can support students. This is not often possible given the distance between service delivery areas at Beal.

Psychological and Counseling Services:

A collaborative approach is taken to working with students presenting with mental health, emotional, social, and/or behavioral challenges. School teams consisting of School Psychologist(s), School Counselor(s), Administrators, Special Educators, and consultation with Clinical Coordinators, Psychiatrist,

and/or Clinical Fellows work together to identify students with needs in this area. In that capacity they provide recommendations, interventions, and support, and closely monitor children with and without disabilities. Identification of students in this area is accomplished by a variety of means, which includes convening Early Intervening Teams, reviewing referrals by individual faculty members, and monitoring discipline logs. Once a student has been identified with special needs in these areas, teams of professionals are available to assist students, offer strategies and interventions, monitor progress, provide counseling as needed, and to communicate with both families and outside service providers. Evaluations can also be conducted within the district to answer questions related to a student's disability area, if any, as well as the student's ability to access curriculum, and any needs for outside supports. Finally, the district works with families to obtain outside services as appropriate, via individual insurance policies.

Psychologist:

At Beal, as in all our elementary schools, the School Psychologist is responsible for assessing students who are initially referred to special education and re-evaluating students who are receiving services a minimum of every three years. They also meet with individual and small groups of students to provide counseling services. Since there are no adjustment counselors at the high school, early childhood, or elementary schools, the school psychologists there provide both the evaluation and counseling services for all students who require these services.

All related service providers are responsible for duties other than direct or indirect services for students. Examples include, but are not limited to the following: Medicaid documentation, attending parent and team meetings, research of specific disabilities and best practices, data collection, collaboration and coordination with other related service providers, regular education teachers and special education teachers, implementing behavior support plans, modification to curriculum, and developing home programs for carry over. To perform these functions, the related service providers that work in our schools need office spaces sufficient to support students and their families.

Finally, students and families may require support of district staff, including the:

Assistive Technology Specialist

The Assistive Technology (AT) Specialist consults to educators, related service providers, and paraprofessionals on how to identify and use the best technological tools and methods for engaging students in the curriculum. The specialist evaluates Assistive Technology needs; help in acquiring AT devices; guidance in selecting, customizing, adapting, maintaining, repairing, or replacing AT devices; coordinating and using necessary interventions (for example, low vision services) with the use of AT devices; training or providing technical assistance to individuals with disabilities, family members or

significant others, professionals, and employers in the effective use and integration of AT devices.

Clinical Coordinator

The Clinical Coordinator is a full time Master's level Behavior Analyst who works with all students across the district. SPS has two Clinical Coordinators to meet the needs of our student body. The Clinical Coordinator's primary responsibility in general education is to support the classroom teacher(s) in the implementation of evidence-based behavioral strategies that help struggling students more successfully engage in learning. This support may be provided through any of the following: consultation, staff training, conducting behavioral observations or more formalized evaluations, and/or the development of Positive Behavior Support Plans. The primary responsibilities in special education are to develop instructional procedures, develop data collection and analysis procedures, supervise home support programs, consult to district-wide programs, and provide professional development. In addition, the Clinical Coordinator works closely with building administrators, school psychologists, adjustment counselors and other service providers, using a problem-solving model to support students.

The degree to which constrained space impacts service delivery cannot be overstated. Presently the lack of space at Beal Early Childhood Center means that up to four special educators share one small room. Some staff have set up desk areas in closets. Moreover, on days when traveling and/or part-time staff are scheduled, many specialists and tutors work in hallways, at shared desks or in larger public spaces like the Media Center. Most importantly, the lack of private space impacts students as and families in both specialized and general education. Many small-group lessons currently take place in hallways. For example, Beal's Instructional Coach and Curriculum Coordinator works at a desk in a back corner of the basement with several other educators, making it hard for staff to schedule or sustain private consultations.

Finally, the district staff members described above regularly consult with individual teachers, administrators and/or grade level teams. It's not surprising that the design for the new Beal School puts a premium on allocating ample space for collaboration amongst these groups.

## 4B.2.2 PROPOSED PROGRAM: Beal Elementary School

Presently, the implementation of special education services is compromised by inadequate space. For example, in most schools, specialists instruct small group classrooms in areas that serve double duty as office space. The district's plan for the new Beal Elementary School will support the special education needs of students enrolled in their school and establish parity among all the elementary schools in Shrewsbury.

It's important to note that there are no plans to move special programs from other schools in the district. The programming options available at Beal will be similar to student supports already in place in Shrewsbury's other elementary schools. Rather, this project demonstrates our desire to place children in school by geographic location rather than bussing children to buildings with lower caseloads and/or fewer space constrictions, as we do now. Adjusting our

approach in this way will help to balance student populations in both general education and special education across the district.

Above all, the proposed Beal Elementary School plan has been developed to ensure appropriate instructional and support spaces for special education programming. The proposed instructional spaces, distributed throughout the new facility in locations proximal to general education classrooms, will increase our capacity to implement inclusive, non-restrictive, special education services.

Simply stated, the new Beal Elementary School will house teaching teams in a similar structure but it will feature many more of them. With eight classrooms per grade, and five grade levels overall, teams at all levels K-4 will be comprised of 40 "regular education" teachers (classroom teachers and special classes such as Art, Music and P.E.) as well as 6-8 "specialists" (Special Education teachers and English Language Education teachers). All educators will subscribe to a varied teaching methodology. The focus, as a district, on inclusive, high expectations teaching and learning has placed a premium on flexible grouping and a variety of educational support spaces centered in each wing or "neighborhood" of the school. In this way, every child can spend most of their time with typical peers without foregoing the supports they need.

Based on the proposed scale of a 790, K-4 school, the district anticipates needing approximately one inclusion classroom per cluster. The overall design shows seven clusters, resulting in 12 inclusion classrooms. This ratio of space is consistent with the current demographics across the district.

DESE guidance suggests that for specialized instruction, instructional group sizes are best kept to 10-12 students. The required space to support students in the aforementioned learning skills ("pull out" model) would be approximately half the size of the normal classroom.

Finally, the proposed design plan ensures that special education teachers and related service providers will provide instruction next door to their general education colleagues. This proximity will enhance collaboration between colleagues, equitable access to all educators for students and families and increased opportunities to implement research-based methodologies. Should needs change in the future, the design plan allows for the flexible use of space over time.

Accordingly, the proposed spaces in the new Beal will include both substantially separate classrooms and inclusive classrooms.

<u>Substantially Separate Classrooms</u>

- Four self-contained classrooms to address the needs of each of the learning communities are anticipated in the new school. Shrewsbury currently serves many students on the Autism spectrum with a range of physical and cognitive needs. Going forward, the district has made a commitment to keeping students in their

neighborhood schools. Thus, space must be allocated to support the ABA programming these students require. These full-size classrooms spaces will be organized to provide smaller, padded cubicles to support students as they receive instruction in a 2:1 or 1:1 setting. It's estimated that a school of this size will need classrooms configured in this way to address the needs of students in both the Early Learning Center (ELC) and Intensive Learning Classrooms (ILC) currently housed at Beal. Finally, these classrooms will need to accommodate the toileting needs of students placed in the program, including space for a Hoya lift and a changing table.

Inclusion Classrooms

- Educators serving at the Beal School believe in fully including all students in general classroom settings for academic instruction whenever possible. Achieving this means providing students with direct special education services within the general classroom. When student academic needs dictate that students require additional academic skill support in a separate small group setting (such as in Reading and/or Mathematics) instruction will take place within a proximal space. Licensed, credentialed Special Educators will work in a flexible, small group service delivery model to meet students' needs as outlined in their IEPs with the goal of maximizing learning for all students.

  Ideally, small group instructional support should take place as close to a student's classroom as possible.

The Shrewsbury Public School district is committed to ensuring equity, access and achievement for students with and without disabilities. Among high needs students (defined as students that belong to either low income, English Language Learner (ELL), or Special Education subgroups), there is a gap in the growth scores of students with special needs as compared with their typical peers. Ensuring that students with and without disabilities at the new Beal will have access to timely intervention will minimize the achievement opportunity gap. Not surprisingly, the design for the new building seeks to maximize opportunities for timely intervention by providing spaces for tiered systems of support. In this way we hope to reduce the need for specialized programming for all but the neediest of Beal students.

Literacy Support Centers (Reading)

- Regular education support for students reading below benchmark in a K-4 building that's projected to serve 790 students will require three small spaces that can hold book storage and ample space for 4-6 students and an instructor. As part of our tiered system of support, all Elementary schools in Shrewsbury employ part-time tutors that assist children in developing literacy skills. This model varies by school, and buildings that qualify for Title 1 funds benefit from additional tutor support. It's likely that the new Beal will qualify as a Title 1 school and thus spaces should be apportioned accordingly. However, regardless of the staffing numbers or grant status, all literacy intervention tutors are overseen by the Title 1 Director. Consequently, collaboration between buildings is commonplace. Shared resources and lessons strengthen job-embedded professional development efforts inherent in the model and spaces should be configured with this value in mind.

Occupational Therapy / Physical Therapy

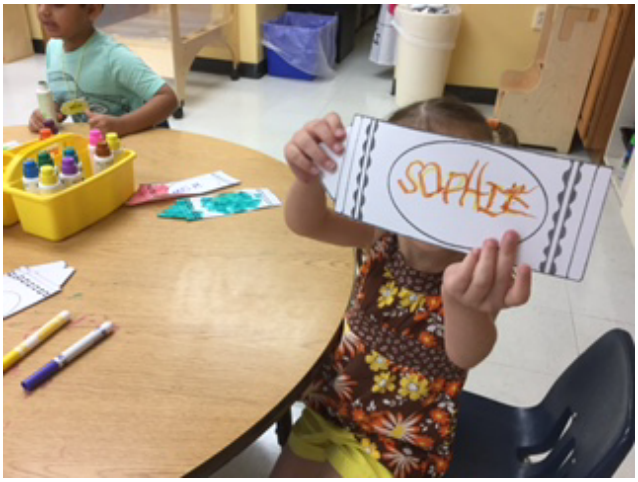
- In the new Beal, Occupational Therapy and Physical Therapy services that are not delivered in the general classroom setting, by IEP designation,

will be provided in two classroom spaces, one located near the Gym and Kindergarten wing and one located centrally on the ground floor. The space for these activities needs to be flexible, with the idea that most student needs should be accommodated as close as possible to nearby classroom spaces to avoid unnecessary disruption caused by lengthy travel time to service delivery areas. It's anticipated that two OT spaces will be required in the new building, with at least one space being large enough to accommodate a large beam and swing.

Speech and Language Classrooms

- As is the case now, Speech and Language services in the new Beal building will be provided by a licensed Speech Pathologist in both the general classroom and in a small group, "pull out" setting. When delivered in a small group, parallel setting, speech services are delivered in anything from a 1:2 or 1:5 ratio, and so space in the new facility should allow for varied group sizes. Students whose learning needs demand small group instruction and require a distraction-free environment will benefit from spaces designed explicitly for a speech pathologist. In the new school, there should be two spaces allocated for Speech large enough for 4-8 students. One of these two rooms should be located in the community near the Kindergarten classrooms.

While the preferred pedagogy of the Shrewsbury Public Schools is one of active, project- and inquiry-based learning that engages students and encourages critical thinking, collaboration, creativity, communication and problem solving, educators at the Beal Elementary School will continue to utilize differentiated teaching methodologies to personalize learning in response to student interests, skill gaps and learning styles. Additionally, Shrewsbury's commitment to helping students develop a "growth mindset" means that educators at all levels will encourage students to take a more active role in setting goals, monitoring their progress, reflecting on their needs and documenting their efforts over time. As a result, the new Beal has been designed to facilitate collaboration. For this reason, space has been allocated for consultation, coaching and meetings as well.




Leveled Book Storage / Office Space

- By law, students that receive Title 1 supports use resources above and beyond those provided by the school, including texts that are available for summer reading programs. It's important that plans for the new Beal allocate sufficient space for books, small white boards, letter tiles and other related materials. This space should also accommodate the Title 1 Director as needed. Our Director frequently works with our neediest students, assessing and supporting them individually and consulting with teachers and parents to coordinate support at school and home.

School Psychologist Office

- Given the scale and population that will be served by the new Beal School, there will be a need for two School Psychologists or one School Psychologist and one School Adjustment Counselor. Each of the educators in these positions will require an office with space for 2-4

students at a table and chair setting. These offices should be easily accessible off a corridor so that they can serve students, educators and families alike.

Special Education Office

- In a building with a projected enrollment of 790 students, special education staff will need to hold at least 100 meetings with parents and guardians. These meetings are facilitated by a Team Chair, and that person will need an office space sufficient to prepare for meeting the needs of our students and their families.

Special Education Conference Room

- The new Beal Elementary School will also require a conference room large enough for 12 people. This collaborative space will be used for daily meetings for initial, annual, re-evaluation and progress meetings with parents and district teams as well as data analysis meetings with both building based and district staff.

Ideally, teaching methodologies are matched to student need. Because every child is unique, instructional approaches are widely varied. At the same time, learning experiences should have some elements in common. The most effective lessons engage students in critical thinking practices. Accordingly, classroom design must be flexible enough to allow for frequent transitions from whole group instruction, to small group instruction, to peer-assisted interaction. At the Beal Elementary School, student learning will occur in flexible configurations. Students will sit at tables, then move to create smaller ad hoc "circles" on the rug or in their chairs to participate in discussions or engage in discovery. Classroom design should accommodate this flexibility with an intentional focus on mobility of space (walls that move to accommodate large groups of students, or which can be drawn to create smaller, more intimate learning spaces) to accommodate co-teaching models when indicated. In addition to small group instructional classroom spaces located in each learning community, it is important to have nooks where small groups of students can meet to research, discuss, and create within the learning process, thereby providing for more individualized and personalized instruction at all grade levels.

Lastly, given the importance of flexible grouping and co-teaching to supporting the diverse needs of today's learners, the design for the new Beal should facilitate the regular use of shared "neighborhood" spaces for differentiated instruction. Common spaces support multiple teaching delivery methods including small group inquiry, Socratic circles, reciprocal teaching, team instruction and tutorials. Communicating doors between learning spaces allow for easy communication and workflow for both students and staff.

To align district practices and to provide rigorous educational opportunities for all students with and without disabilities, we designed a facility for the new Beal Elementary School that will accommodate and maximize the school and district's programmatic needs. The most salient features incorporated into the design of the new Beal School building will help us to provide more students with equitable access to learning environments. They aim to provide:

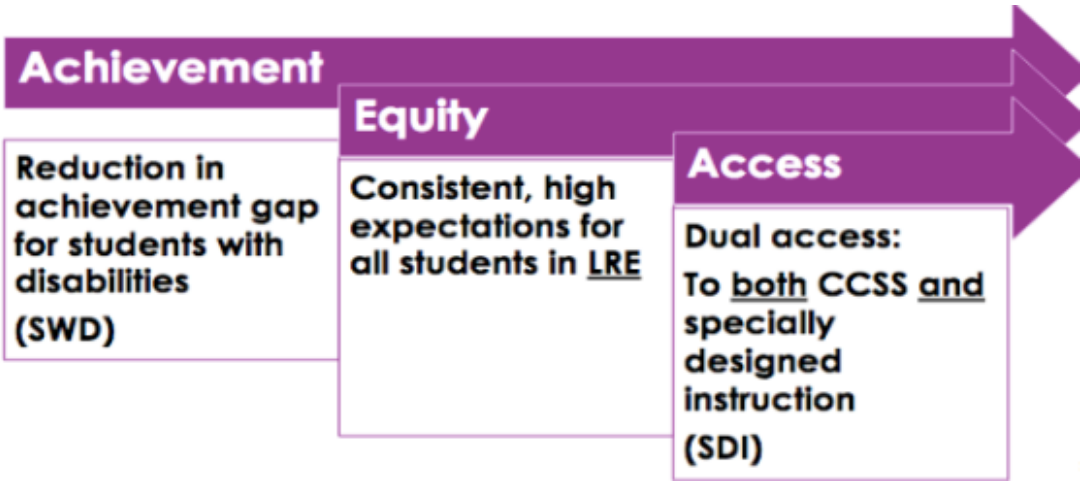
1. Increased space to facilitate service delivery of existing special education programming.

    a. At the new Beal, students with disabilities will receive special education services in a variety of modalities and settings. Students will learn in a full inclusion model, in co-taught classrooms, and in substantially separate classrooms. Students will also receive pull-out support services such as tutoring, therapy, and counseling.

b. Students diagnosed with Autism will receive educational and social-emotional supports through Applied Behavior Analysis techniques, Speech Therapy, OT, PT and clinical services.
c. Families will participate in regular clinical/therapeutic meetings with school personnel and home service providers to discuss how to best support their children in and outside their home.
d. The new building will provide added capacity for special education programs during the summer months.

2. Creation of "neighborhood" spaces to support all students with and without disabilities.

a. Smaller spaces within each wing accommodate flexible groupings of students to accommodate instructional delivery beyond the core classroom instruction.
b. Small group spaces will support differentiated instructional practices in a strategically defined multi-tiered system of supports.
c. Students will receive individualized or small group instruction – for the purpose of addressing their learning deficits, given specialized instruction and targeted interventions to accelerate their learning.




## 4B.2.3 SPECIALIZED PROGRAMS

In addition to the programming outlined above, students in the Shrewsbury Public Schools are eligible for placement in specialized programs located outside of the district. Placements decisions are made in consideration of the scope of a student's disability. Currently, several students with special needs access a variety of collaboratives within the state.

- The Assabet Valley Collaborative meets the needs of students with disabilities in Grades 6 through 12. Currently there are two Shrewsbury students enrolled in the AVC.
- Shrewsbury also contracts with the ACCEPT collaborative to meet the needs of our students. We currently have one student enrolled at ACCEPT.

- Two Shrewsbury students are presently enrolled at the Phoenix Academy in Marlborough through The Education Collaborative (TEC).

Shrewsbury provides Pre-Kindergarten programming for children with and without disabilities in three different locations. The Little Colonials Pre- K classroom is located at Shrewsbury High School. The Parker Road Preschool classrooms, located on Parker Road and Wesleyan Terrace, serve an integrated student group by offering programming in different configurations based on need.

Prior to turning three-years old, children with a disability or disabilities, or at-risk profiles may be referred to the school district for an initial special education evaluation to determine eligibility for special education services upon turning three-years old. Early Intervention programs are provided through the Massachusetts Department of Public Health for children from birth to age three. Parents, pediatricians, and private preschool teachers can also refer preschool aged children to the Shrewsbury Public Schools for an initial special education evaluation if there is a suspicion that a child may have a disability. Every referral is followed up with an evaluation in the suspected area of disability. If a student is found eligible for special education services, a preschool placement is determined. The least restrictive environment for most of our students in an integrated or inclusive preschool environment, which includes students with and without disabilities. A smaller percentage of preschool children require a substantially separate setting for the majority of their school day as a result of the severity of their disability. This group of students may also attend a full-day of preschool in order to receive an educational benefit. The District's preschool programs provide children with and without disabilities an engaging and challenging preschool experience. Children with identified disabilities are provided with an Individual Education Program developed for their unique and individual needs as described below:

<u>Pre-Kindergarten Educational Learning Center (Pre-K ELC):</u>

- Students with Autism Spectrum Disorders (ASD) or similar developmental profiles may receive some or all of their services as part of the ELC program per their IEP. The ELC program is designed to provide services along a continuum from consultation and/or to highly individual and intensive curriculum and instruction. This program is led and supervised by special educators with intensive certification and specialized training in working with children with Autism Spectrum Disorders (ASD) or similar developmental profiles. Instructional methodology is primarily based on, but not limited to, the principles of applied behavior analysis (ABA). Principles of ABA may include the use of positive behavior interventions, systematic instruction of skills across all domains of learning to foster increasing independence in the educational learning environment, instructional plans that break down skills across all domains into manageable increments and are taught from least to most complex, error-less instruction, task analysis, analysis of targeted intermittent collection of data and adjustment of instruction based on data, and planned and naturally occurring opportunities to acquire and practice skills and concepts.

<u>Integrated Classrooms:</u>

- Preschool aged students with and without disabilities are enrolled in integrated classrooms. Children with disabilities are enrolled based on their Individual Education Program (IEP). Children without disabilities are enrolled by their parents/guardians.

Early childhood special education teachers, certified to teach both children with and without disabilities, provide preschool curriculum and instruction for up to fifteen students with a ratio of seven students with disabilities to eight students without disabilities. Our curriculum is based on the Massachusetts Curriculum Frameworks, Early Childhood Program Standards, and Guidelines for Preschool Learning Experiences.

Walk-in/Itinerant Services:

- Students ages three to five and in need of therapies such as speech and language, occupational therapy, and physical therapy, receive walk-in services. Parents accompany their child during the one to two therapy sessions each week and are provided with consultation on how to best support their child at home.

Intensive Preschool Program:

- This program is designed for preschool children with intensive disabilities, which affect all areas of their development including cognition, communication, physical, social-emotional, and self-care skills. The morning portion of the program is integrated and the afternoon portion is substantially separate. An early childhood educator certified in intensive special needs leads this full-day program with related service providers to target all domains of development. Paraprofessionals, trained and supervised by the lead early childhood teacher provide carryover and direct instruction throughout the full-day program. The multidisciplinary team utilizes the afternoon instructional period to provide intensive therapy across all domains of development.

Finally, the Shrewsbury Public Schools provide space for the Assabet Valley Collaborative's *Evolution* program at Shrewsbury High School. This program is designed for students aged 18-22 and enrollment varies. There are no plans to allocate space for collaboratives in the new Beal, nor are there plans to house any alternative education or partnership programs with either private or public entities within the new Beal facility.

## 4B.3 EDUCATIONAL SPACE SUMMARY

Please refer to the submitted space summary spreadsheet that lists each proposed room type and related square footage for the new Beal Elementary School.

## 4B.4 FLOOR PLANS

Please refer to the submitted color-coded floor plans which indicate the locations of each special education space.

## 4B.5 SPECIAL EDUCATION ADJACENCY TABLE

Please refer to the Special Education Adjacency Table submitted to see the proposed space descriptions and reasoning for adjacencies.

# III. CONCLUSION

Michelangelo di Lodovico was well known as a sculptor and artist. He was also a contributing designer of St. Peter's Basilica and the Laurentian Library in Florence. In this capacity he had a profound influence on Western art and architecture. He said:

> "*The greatest danger for most of us is not that our aim is too high and we miss it, but that it is too low and we reach it. The greater danger for most of us lies not in setting our aim too high and falling short; but in setting our aim too low, and achieving our mark."*

For too long the bar for school buildings was set too low. With support from the state, guidance from the Massachusetts School Building Authority, and talent from skillful architects like those of Lamoureux Pagano & Associates, the Shrewsbury Public School district seeks approval for the design of a new Beal Elementary School that will stand the test of time. Most importantly, it's our shared hope that the combination of high expectations for teaching and learning in Shrewsbury and our efforts to match form with function in the design process will serve both as a source of support and inspiration for our students and families.

C. Signed Educational Space Summary

# *Proposed Space Summary- Elementary Schools*

Date: 9/12/2018 Schematic Design Submittal

| Beal K-4 Elementary | Existing Conditions | | | PROPOSED: Existing to Remain/Renovated | | | PROPOSED: New | | | PROPOSED: Total | | | MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ROOM TYPE | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | Comments |
| **CORE ACADEMIC SPACES** | | | **11,359** | | | **0** | | | **47,865** | | | **47,865** | | **34** | **33,800** | |
| *(List classrooms of different sizes separately)* | | | | | | | | | | | | | | | | |
| Pre-Kindergarten w/ toilet | | | | | | | | | 0 | | | 0 | 1,200 | | - | 1,100 SF min - 1,300 SF max |
| Kindergarten w/ toilet | | 10 | 7,185 | | | | 1,135 | 8 | 9,080 | | | 9,080 | 1,200 | 6 | 7,200 | 1,100 SF min - 1,300 SF max |
| General Classrooms - Grade 1-4 | | 3 | 2,087 | | | | 925 | 30 | 27,750 | | | 27,750 | 950 | 28 | 26,600 | 900 SF min - 1,000 SF max |
| General Classrooms - Grade 1-4 | | 3 | 2,087 | | | | 965 | 2 | 1,930 | | | 1,930 | | | | 4,240 NSF of Eligible Space is available from "Kindergarten & General/SPED Classrooms," based on MSBA maximum allowable size |
| Commons | | | | | | | 785 | 3 | 2,355 | | | 2,355 | | | | |
| Commons | | | | | | | 990 | 4 | 3,960 | | | 3,960 | | | | |
| ESL/ELL | | | | | | | 470 | 3 | 1,410 | | | 1,410 | | | | |
| Teacher Planning | | | | | | | 345 | 4 | 1,380 | | | 1,380 | | | | |
| **SPECIAL EDUCATION** | | | **2,753** | | | **0** | | | **13,310** | | | **13,310** | | | **9,060** | |
| *(List rooms of different sizes separately)* | | | | | | | | | | | | | | | | |
| Self-Contained SPED | | 2 | 2,248 | | | | 925 | 4 | 3,700 | | | 3,700 | 950 | 6 | 5,700 | 900-1,300 SF equal to surrounding classrooms |
| Self-Contained SPED - toilet | | | | | | | 80 | 4 | 320 | | | 320 | 60 | 6 | 360 | |
| Resource Room | | | | | | | 450 | 12 | 5,400 | | | 5,400 | 500 | 4 | 2,000 | 1/2 size Genl. Clrm. |
| Small Group Room / Reading | | | | | | | 250 | 3 | 750 | | | 750 | 500 | 2 | 1,000 | 1/2 size Genl. Clrm. |
| Reading Office | | | | | | | 120 | 1 | 120 | | | 120 | | | | |
| Reading Storage | | | | | | | 120 | 1 | 120 | | | 120 | | | | |
| Speech | | | | | | | 250 | 2 | 500 | | | 500 | | | | |
| OT/PT | | | | | | | 950 | 2 | 1,900 | | | 1,900 | | | | |
| Special Education Site Coordinator Office | | 1 | 285 | | | | 150 | 1 | 150 | | | 150 | | | | |
| Special Educaiton Conference Room | | 1 | 220 | | | | 350 | 1 | 350 | | | 350 | | | | |
| **ART & MUSIC** | | | **332** | | | **0** | | | **5,075** | | | **5,075** | | | **5,075** | |
| Art Classroom - 25 seats | | 1 | 332 | | | | 1,000 | 2 | 2,000 | | | 2,000 | 1,000 | 2 | 2,000 | assumed schedule 2 times / week / student |
| Art Workroom w/ Storage / Kiln | | | | | | | | 2 | 300 | | | 300 | 150 | 2 | 300 | |
| Music Classroom / Large Group - 25-50 seats | | | | | | | 1,500 | 1 | 1,500 | | | 1,500 | 1,200 | 2 | 2,400 | assumed schedule 2 times / week / student |
| Music Classroom | | | | | | | 1,000 | 1 | 1,000 | | | 1,000 | | | | |
| Music Practice / Ensemble | | | | | | | 0 | 0 | 0 | | | 0 | 75 | 5 | 375 | |
| Music Storage | | | | | | | | 2 | 275 | | | 275 | | | | |
| **HEALTH & PHYSICAL EDUCATION** | | | **3,269** | | | **0** | | | **7,650** | | | **7,650** | | | **6,300** | |
| Gymnasium | | 1 | 3,126 | | | | 7,000 | 1 | 7,000 | | | 7,000 | 6,000 | 1 | 6,000 | 6000 SF Min. Size |
| Gym Storeroom | | 3 | 143 | | | | | 4 | 500 | | | 500 | 150 | 1 | 150 | |
| Health Instructor's Office w/ Shower & Toilet | | | | | | | 150 | 1 | 150 | | | 150 | 150 | 1 | 150 | |
| **MEDIA CENTER** | | | **691** | | | **0** | | | **4,225** | | | **4,225** | | | **4,225** | |
| Media Center | | 1 | 691 | | | | 4,225 | 1 | 4,225 | | | 4,225 | 4,225 | 1 | 4,225 | |
| **DINING & FOOD SERVICE** | | | **2,175** | | | **0** | | | **10,236** | | | **10,236** | | | **9,776** | |
| Cafeteria / Dining | | 1 | 954 | | | | 5,000 | 1 | 5,000 | | | 5,000 | 5,925 | 1 | 5,925 | 2 seatings - 15SF per seat |
| Stage | | | | | | | 1,500 | 1 | 1,500 | | | 1,500 | 1,000 | 1 | 1,000 | |
| Chair / Table Storage | | | | | | | | 2 | 463 | | | 463 | 463 | 1 | 463 | |
| Kitchen | | 1 | 650 | | | | 2,975 | 1 | 2,975 | | | 2,975 | 2,090 | 1 | 2,090 | 1600 SF for first 300 + 1 SF/student Add'l |
| Staff Lunch Room | | 1 | 571 | | | | 298 | 1 | 298 | | | 298 | 298 | 1 | 298 | 20 SF/Occupant |

# *Proposed Space Summary- Elementary Schools*

Date: 9/12/2018 Schematic Design Submittal

| Beal K-4 Elementary | Existing Conditions | | | PROPOSED | | | | | | | | | MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Existing to Remain/Renovated | | | New | | | Total | | | | | | |
| ROOM TYPE | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | Comments |
| **MEDICAL** | | | **172** | | | **0** | | | **906** | | | **906** | | | **710** | |
| Medical Suite Toilet | | 1 | 54 | | | | 75 | 1 | 75 | | | 75 | 60 | 1 | 60 | |
| Nurses' Office / Waiting Room | | | | | | | 410 | 1 | 410 | | | 410 | 250 | 1 | 250 | |
| Resting | | 1 | 118 | | | | 72 | 3 | 216 | | | 216 | 100 | 4 | 400 | |
| Exam Room | | | | | | | 85 | 1 | 85 | | | 85 | | | - | |
| Exam Room | | | | | | | 120 | 1 | 120 | | | 120 | | | - | |
| **ADMINISTRATION & GUIDANCE** | | | **1,026** | | | **0** | | | **2,925** | | | **2,925** | | | **2,925** | |
| General Office / Waiting Room / Toilet | | 2 | 384 | | | | 590 | 1 | 590 | | | 590 | 545 | 1 | 545 | |
| Teachers' Mail and Time Room & Duplicating | | | | | | | 250 | 1 | 250 | | | 250 | 100 | 1 | 100 | |
| Duplicating Room | | | | | | | 0 | 0 | 0 | | | 0 | 150 | 1 | 150 | |
| Records Room | | | | | | | 110 | 1 | 110 | | | 110 | 110 | 1 | 110 | |
| Principal's Office w/ Conference Area | | 1 | 168 | | | | 175 | 1 | 175 | | | 175 | 375 | 1 | 375 | |
| Principal's Secretary / Waiting | | | | | | | | 0 | 0 | | | 0 | 125 | 1 | 125 | |
| Assistant Principal's Office | | | | | | | 175 | 1 | 175 | | | 175 | 120 | 1 | 120 | |
| Supervisory / Spare Office | | | | | | | 150 | 1 | 150 | | | 150 | 120 | 1 | 120 | |
| Conference Room | | | | | | | 400 | 1 | 400 | | | 400 | 250 | 1 | 250 | |
| Guidance Office | | | | | | | 150 | 3 | 450 | | | 450 | 150 | 3 | 450 | |
| Guidance Storeroom | | | | | | | 35 | 1 | 35 | | | 35 | 35 | 1 | 35 | |
| Teachers' Work Room | | 1 | 208 | | | | | 0 | 0 | | | 0 | 545 | 1 | 545 | |
| Instructional Coaches/Cirriculum Coordinator | | 1 | 133 | | | | 120 | 2 | 240 | | | 240 | | | | |
| Instructional/Cirriculum Conference Room | | 1 | 133 | | | | 350 | 1 | 350 | | | 350 | | | | |
| **CUSTODIAL & MAINTENANCE** | | | **531** | | | **0** | | | **2,390** | | | **2,390** | | | **2,390** | |
| Custodian's Office | | 1 | 445 | | | | 100 | 1 | 100 | | | 100 | 150 | 1 | 150 | |
| Custodian's Workshop | | | | | | | 425 | 1 | 425 | | | 425 | 375 | 1 | 375 | |
| Custodian's Storage/Trash/Recycling | | 2 | 38 | | | | 775 | 1 | 775 | | | 775 | 375 | 1 | 375 | |
| Recycling Room / Trash | | | | | | | | | 0 | | | 0 | 400 | 1 | 400 | |
| Receiving and General Supply | | | | | | | | 2 | 363 | | | 363 | 363 | 1 | 363 | |
| Storeroom | | | | | | | 527 | 1 | 527 | | | 527 | 527 | 1 | 527 | |
| Network / Telecom Room [IT Workroom] | | 1 | 48 | | | | 200 | 1 | 200 | | | 200 | 200 | 1 | 200 | |
| **OTHER** | | | **0** | | | **0** | | | **0** | | | **0** | | | **0** | |
| Other *(specify)* | | | | | | | | | 0 | | | | | | | |

# *Proposed Space Summary- Elementary Schools*

Date: 9/12/2018 Schematic Design Submittal

| Beal K-4 Elementary | Existing Conditions | | | PROPOSED: Existing to Remain/Renovated | | | PROPOSED: New | | | PROPOSED: Total | | | MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ROOM TYPE | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | Comments |
| Total Building Net Floor Area (NFA) | | | 22,308 | | | 0 | | | 94,582 | | | 94,582 | | | 74,261 | |
| Proposed Student Capacity / Enrollment | | | 310 | | | | | | 790 | | | | | | 790 | |
| **NON-PROGRAMMED SPACES** | | | | | % of GFA | 0 | | % of GFA | 47,018 | | % of GFA | -94,582 | | | | |
| Other Occupied Rooms (list separately) | | | | | #DIV/0! | | | 0% | | | #DIV/0! | | | | | Non-Programmed space areas are |
| | | | | | #DIV/0! | | | 0% | | | #DIV/0! | | | | | required to be included in the |
| | | | | | #DIV/0! | | | 0% | | | #DIV/0! | | | | | following submittals: |
| | | | | | #DIV/0! | | | 0% | | | #DIV/0! | | | | | Schematic Design Submittal |
| Unoccupied MEP/FP Spaces | | | | | #DIV/0! | | | 2% | 3,400 | | #DIV/0! | | | | | Design Development Submittal |
| Unoccupied Closets, Supply Rooms & Storage Rooms | | | | | #DIV/0! | | | 1% | 2,112 | | #DIV/0! | | | | | 60% Construction Documents |
| Toilet Rooms | | | | | #DIV/0! | | | 2% | 2,759 | | #DIV/0! | | | | | 90% Construction Documents |
| Circulation (corridors, stairs, ramps & elevators) | | | | | #DIV/0! | | | 18% | 25,086 | | #DIV/0! | | | | | Final Construction Documents |
| Remaining[3] | | | | | #DIV/0! | 0 | | 10% | 13,661 | | #DIV/0! | -94,582 | | | | |
| Total Building Gross Floor Area (GFA)[2] | | | 33,779 | | | | | | 141,600 | | | 0 | | | 114,550 | |
| Grossing factor (GFA/NFA) | | | 1.51 | | | #DIV/0! | | | 1.50 | | | 0.00 | | | 1.54 | |

[1] **Individual Room Net Floor Area (NFA)** Includes the net square footage measured from the inside face of the perimeter walls and includes all specific spaces assigned to a particular program area including such spaces as non-communal toilets and storage rooms.

[2] **Total Building Gross Floor Area (GFA)** Includes the entire building gross square footage measured from the outside face of exterior walls

[3] **Remaining** Includes exterior walls, interior partitions, chases, and other areas not listed above. Do not calculate this area, it is assumed to equal the difference between the Total Building Gross Floor Area and area not accounted for above.

**Architect Certification**

I hereby certify that all of the information provided in this "Proposed Space Summary" is true, complete and accurate and, except as agreed to in writing by the Massachusetts School Building Authority, in accordance with the guidelines, rules, regulations and policies of the Massachusetts School Building Authority to the best of my knowledge and belief. A true statement, made under the penalties of perjury.

**Name of Architect Firm:** Lamoureux Pagano Associates Architects

**Name of Principal Architect:** Kathryn Crockett

**Signature of Principal Architect:**

**Date:** 9/12/2018

D. Floor Plans

Scale: 1" = 50'-0"

LEGEND

- Self Contained SPED
- Self Contained SPED Toilet
- Resource Room
- Small Group Room / Reading
- Unique to District

# Beal Elementary School

214 Lake Street, Shrewsbury MA 01545

Scale: 1" = 50'-0"

LEGEND

- Self Contained SPED
- Self Contained SPED Toilet
- Resource Room
- Small Group Room / Reading
- Unique to District

# Beal Elementary School

214 Lake Street, Shrewsbury MA 01545

E. Special Education Adjacency Table

## Special Education Adjacency Table

Shrewsbury Public Schools 9/12/2018

| MSBA Guidelines Space | MSBA Guidelines SF | Proposed Room Name | Floor Plan Designation (A-Z) | Proposed SF | Proposed Space Description and Reasoning for Adjacencies |
|---|---|---|---|---|---|
| **Ground Floor** | | | | | |
| Self-Contained Sped | 950 | Substantially Separate | A.1 | 925 | Providing self-contained classrooms will address the needs of each of the learning communities anticipated in the proposed facility. Shrewsbury currently serves many students on the Autism spectrum with a range of physical and cognitive needs. Going forward, the district has made a commitment to keeping students in their neighborhood schools. Thus, space must be allocated to support ABA programming these students require. These full-size classroom spaces will be organized to provide smaller, padded cubicles to support students as they receive instruction in a 2:1 or 1:1 setting. It's estimated that a school of this size will need four classrooms configured in this way to address the needs of students in both the Early Learning Center (ELC) and Intensive Learning classrooms (ILC) currently housed at Beal. These self-contained classrooms will be distributed throughout the school in each academic wing to provide one in close proximity to each classroom. |
| Self-Contained Sped - Toilet | 60 | Substantially Separate - Toilet | B.1 | 80 | A number of students in our substantially separate programs require frequent access to facilities. Many of these students are learning the activities of daily living like toileting and feeding. Close proximity to bathroom is essential to the students' acquisition of these skills. Larger spaces accommodate the need for a Hoya lift and/or a changing table. |
| Resource Room | 500 | Inclusion | C.1 | 450 | Educators serving at the Beal School believe in fully including all students in general classroom settings for academic instruction whenever possible, and in providing students with direct special education services within this general classroom setting to maximize the education of all students. When student academic needs dictate that students require additional academic skill support in a separate small group setting in Reading and Mathematics, instruction takes place within a smaller proximal space. Licensed, credentialed Special Educators work in a flexible, small group service delivery model to meet students' needs as outlined in their IEPs. In most schools, specialists instruct small group classrooms in areas that serves double duty as office space. Ideally, small group instructional support should take place as close to a student's classroom as possible. |
| Resource Room | 500 | Inclusion | C.2 | 450 | Educators serving at the Beal School believe in fully including all students in general classroom settings for academic instruction whenever possible, and in providing students with direct special education services within this general classroom setting to maximize the education of all students. When student academic needs dictate that students require additional academic skill support in a separate small group setting in Reading and Mathematics, instruction takes place within a smaller proximal space. Licensed, credentialed Special Educators work in a flexible, small group service delivery model to meet students' needs as outlined in their IEPs. In most schools, specialists instruct small group classrooms in areas that serves double duty as office space. Ideally, small group instructional support should take place as close to a student's classroom as possible. |
| Resource Room | 500 | Inclusion | C.3 | 450 | Educators serving at the Beal School believe in fully including all students in general classroom settings for academic instruction whenever possible, and in providing students with direct special education services within this general classroom setting to maximize the education of all students. When student academic needs dictate that students require additional academic skill support in a separate small group setting in Reading and Mathematics, instruction takes place within a smaller proximal space. Licensed, credentialed Special Educators work in a flexible, small group service delivery model to meet students' needs as outlined in their IEPs. In most schools, specialists instruct small group classrooms in areas that serves double duty as office space. Ideally, small group instructional support should take place as close to a student's classroom as possible. |
| Resource Room | 500 | Inclusion | C.4 | 450 | Educators serving at the Beal School believe in fully including all students in general classroom settings for academic instruction whenever possible, and in providing students with direct special education services within this general classroom setting to maximize the education of all students. When student academic needs dictate that students require additional academic skill support in a separate small group setting in Reading and Mathematics, instruction takes place within a smaller proximal space. Licensed, credentialed Special Educators work in a flexible, small group service delivery model to meet students' needs as outlined in their IEPs. In most schools, specialists instruct small group classrooms in areas that serves double duty as office space. Ideally, small group instructional support should take place as close to a student's classroom as possible. |
| Small Group Room/ Reading | 500 | Reading | D.1 | 250 | Regular education Reading support requires three small spaces that can hold book storage and ample space for 4-6 students and an instructor. As part of our tiered system of support, all Elementary schools in Shrewsbury employ part-time tutors that assist children reading below grade level benchmarks with literacy skills. This model varies by school, and buildings that qualify for Title 1 funds benefit from additional tutor support. It's quite possible that the new Beal will qualify as a Title 1 school and so spaces should be apportioned accordingly. Regardless of the staffing numbers, all district tutors are overseen by the Title 1 Director. Consequently, collaboration between buildings is commonplace; shared resources and lessons strengthen job-embedded professional development efforts inherent in the model. These small group rooms will be distributed throughout the school to be easily accessible from each classroom cluster. |

| | | | | | |
|---|---|---|---|---|---|
| Self-Contained Sped | 950 | Substantially Separate | A.2 | 925 | Providing self-contained classrooms will address the needs of each of the learning communities anticipated in the proposed facility. Shrewsbury currently serves many students on the Autism spectrum with a range of physical and cognitive needs. Going forward, the district has made a commitment to keeping students in their neighborhood schools. Thus, space must be allocated to support ABA programming these students require. These full-size classroom spaces will be organized to provide smaller, padded cubicles to support students as they receive instruction in a 2:1 or 1:1 setting. It's estimated that a school of this size will need four classrooms configured in this way to address the needs of students in both the Early Learning Center (ELC) and Intensive Learning classrooms (ILC) currently housed at Beal. These self-contained classrooms will be distributed throughout the school to be easily and quickly accessible from all of the classroom clusters. |
| Self-Contained Sped - Toilet | 60 | Substantially Separate - Toilet | B.2 | 80 | A number of students in our substantially separate programs require frequent access to facilities. Many of these students are learning the activities of daily living like toileting and feeding. Close proximity to bathroom is essential to the students' acquisition of these skills. Larger spaces accommodate the need for a Hoya lift and/or a changing table. |
| Resource Room | 500 | Inclusion | C.5 | 450 | Educators serving at the Beal School believe in fully including all students in general classroom settings for academic instruction whenever possible, and in providing students with direct special education services within this general classroom setting to maximize the education of all students. When student academic needs dictate that students require additional academic skill support in a separate small group setting in Reading and Mathematics, instruction takes place within a smaller proximal space. Licensed, credentialed Special Educators work in a flexible, small group service delivery model to meet students' needs as outlined in their IEPs. In most schools, specialists instruct small group classrooms in areas that serves double duty as office space. Ideally, small group instructional support should take place as close to a student's classroom as possible. |
| Resource Room | 500 | Inclusion | C.6 | 450 | Educators serving at the Beal School believe in fully including all students in general classroom settings for academic instruction whenever possible, and in providing students with direct special education services within this general classroom setting to maximize the education of all students. When student academic needs dictate that students require additional academic skill support in a separate small group setting in Reading and Mathematics, instruction takes place within a smaller proximal space. Licensed, credentialed Special Educators work in a flexible, small group service delivery model to meet students' needs as outlined in their IEPs. In most schools, specialists instruct small group classrooms in areas that serves double duty as office space. Ideally, small group instructional support should take place as close to a student's classroom as possible. |
| Small Group Room/ Reading | 500 | Reading | D.2 | 250 | Regular education Reading support requires three small spaces that can hold book storage and ample space for 4-6 students and an instructor. As part of our tiered system of support, all Elementary schools in Shrewsbury employ part-time tutors that assist children reading below grade level benchmarks with literacy skills. This model varies by school, and buildings that qualify for Title 1 funds benefit from additional tutor support. It's quite possible that the new Beal will qualify as a Title 1 school and so spaces should be apportioned accordingly. Regardless of the staffing numbers, all district tutors are overseen by the Title 1 Director. Consequently, collaboration between buildings is commonplace; shared resources and lessons strengthen job-embedded professional development efforts inherent in the model. These small group rooms will be distributed throughout the school to be easily accessible from each classroom cluster. |
| Small Group Room/ Reading | | OT/PT | D.3 | 950 | One of two Occupational and Physical Therapy spaces is located on the ground floor of the proposed facility. Students will access materials in this space under the supervision of licensed therapists. They should have ready access to sensory materials, fine motor tools, and gross motor tools/activities designed to improve the students' individual physical/motor challenges. This room is centrally located to be easily accessible from each classroom wing on the ground floor, and the size of this room will allow for both larger equipment and smaller equipment to be housed and used. |

| Main Floor | | | | | |
|---|---|---|---|---|---|
| Self-Contained Sped | 950 | Substantially Separate | A.3 | 925 | Providing self-contained classrooms will address the needs of each of the learning communities anticipated in the proposed facility. Shrewsbury currently serves many students on the Autism spectrum with a range of physical and cognitive needs. Going forward, the district has made a commitment to keeping students in their neighborhood schools. Thus, space must be allocated to support ABA programming these students require. These full-size classroom spaces will be organized to provide smaller, padded cubicles to support students as they receive instruction in a 2:1 or 1:1 setting. It's estimated that a school of this size will need four classrooms configured in this way to address the needs of students in both the Early Learning Center (ELC) and Intensive Learning classrooms (ILC) currently housed at Beal. These self-contained classrooms will be distributed throughout the school to be easily and quickly accessible from all of the classroom clusters. |
| Self-Contained Sped - Toilet | 60 | Substantially Separate - Toilet | B.3 | 80 | A number of students in our substantially separate programs require frequent access to facilities. Many of these students are learning the activities of daily living like toileting and feeding. Close proximity to bathrooms is essential to the students' acquisition of these skills. Larger spaces accommodate the need for a Hoya lift and/or a changing table. |
| Resource Room | 500 | Inclusion | C.7 | 450 | Educators serving at the Beal School believe in fully including all students in general classroom settings for academic instruction whenever possible, and in providing students with direct special education services within this general classroom setting to maximize the education of all students. When student academic needs dictate that students require additional academic skill support in a separate small group setting in Reading and Mathematics, instruction takes place within a smaller proximal space. Licensed, credentialed Special Educators work in a flexible, small group service delivery model to meet students' needs as outlined in their IEPs. In most schools, specialists instruct small group classrooms in areas that serves double duty as office space. Ideally, small group instructional support should take place as close to a student's classroom as possible. |
| Resource Room | 500 | Inclusion | C.8 | 450 | Educators serving at the Beal School believe in fully including all students in general classroom settings for academic instruction whenever possible, and in providing students with direct special education services within this general classroom setting to maximize the education of all students. When student academic needs dictate that students require additional academic skill support in a separate small group setting in Reading and Mathematics, instruction takes place within a smaller proximal space. Licensed, credentialed Special Educators work in a flexible, small group service delivery model to meet students' needs as outlined in their IEPs. In most schools, specialists instruct small group classrooms in areas that serves double duty as office space. Ideally, small group instructional support should take place as close to a student's classroom as possible. |
| Small Group Room/ Reading | | Speech | D.4 | 250 | The Speech Pathologist maintains a space for small group instruction that doubles as an office space. Speech services, when delivered in a small group, parallel setting, are comprised by anything from a 1:2 or 1:5 ratio; students whose learning needs demand a small group setting benefit from the direct instruction provided by the speech pathologist. In the new school, there should be two spaces allocated for Speech large enough for 4-8 students. One of the two Speech rooms will be located in the typical classroom wing next to a common room on the main floor. |
| Resource Room | 500 | Inclusion | C.9 | 450 | Educators serving at the Beal School believe in fully including all students in general classroom settings for academic instruction whenever possible, and in providing students with direct special education services within this general classroom setting to maximize the education of all students. When student academic needs dictate that students require additional academic skill support in a separate small group setting in Reading and Mathematics, instruction takes place within a smaller proximal space. Licensed, credentialed Special Educators work in a flexible, small group service delivery model to meet students' needs as outlined in their IEPs. In most schools, specialists instruct small group classrooms in areas that serves double duty as office space. Ideally, small group instructional support should take place as close to a student's classroom as possible. |
| Resource Room | 500 | Inclusion | C.10 | 450 | Educators serving at the Beal School believe in fully including all students in general classroom settings for academic instruction whenever possible, and in providing students with direct special education services within this general classroom setting to maximize the education of all students. When student academic needs dictate that students require additional academic skill support in a separate small group setting in Reading and Mathematics, instruction takes place within a smaller proximal space. Licensed, credentialed Special Educators work in a flexible, small group service delivery model to meet students' needs as outlined in their IEPs. In most schools, specialists instruct small group classrooms in areas that serves double duty as office space. Ideally, small group instructional support should take place as close to a student's classroom as possible. |
| Small Group Room/ Reading | 500 | Reading | D.5 | 250 | Regular education Reading support requires three small spaces that can hold book storage and ample space for 4-6 students and an instructor. As part of our tiered system of support, all Elementary schools in Shrewsbury employ part-time tutors that assist children reading below grade level benchmarks with literacy skills. This model varies by school, and buildings that qualify for Title 1 funds benefit from additional tutor support. It's quite possible that the new Beal will qualify as a Title 1 school and so spaces should be apportioned accordingly. Regardless of the staffing numbers, all district tutors are overseen by the Title 1 Director. Consequently, collaboration between buildings is commonplace; shared resources and lessons strengthen job-embedded professional development efforts inherent in the model. These small group rooms will be distributed throughout the school to be easily accessible from each classroom cluster. |

| | | | | | |
|---|---|---|---|---|---|
| *Unique to District | | Reading Storage | E.1 | 120 | By law, students that receive Title 1 supports use resources above and beyond those provided by the school, including texts that are available for summer reading programs. It's important that plans for the new Beal allocate sufficient space for books, small white boards, letter tiles and other related materials. |
| *Unique to District | | Reading Office | E.2 | 120 | All literacy intervention tutors are overseen by the Title 1 Director. Consequently, collaboration between buildings is commonplace. Shared resources and lessons strengthen job-embedded professional development efforts inherent in the model and spaces should be configured with this value in mind. This space should accommodate the Title 1 Director as needed. Our Director frequently works with our neediest students, assessing and supporting them individually and consulting with teachers and parents to coordinate support at school and home. |
| Self-Contained Sped | 950 | Substantially Separate | A.4 | 925 | Providing self-contained classrooms will address the needs of each of the learning communities anticipated in the proposed facility. Shrewsbury currently serves many students on the Autism spectrum with a range of physical and cognitive needs. Going forward, the district has made a commitment to keeping students in their neighborhood schools. Thus, space must be allocated to support ABA programming these students require. These full-size classroom spaces will be organized to provide smaller, padded cubicles to support students as they receive instruction in a 2:1 or 1:1 setting. It's estimated that a school of this size will need four classrooms configured in this way to address the needs of students in both the Early Learning Center (ELC) and Intensive Learning classrooms (ILC) currently housed at Beal. These self-contained classrooms will be distributed throughout the school to be easily and quickly accessible from all of the classroom clusters. |
| Self-Contained Sped - Toilet | 60 | Substantially Separate - Toilet | B.4 | 80 | A number of students in our substantially separate programs require frequent access to facilities. Many of these students are learning the activities of daily living like toileting and feeding. Close proximity to bathrooms is essential to the students' acquisition of these skills. Larger spaces accommodate the need for a Hoya lift and/or a changing table. |
| Resource Room | 500 | Inclusion | C.11 | 450 | Educators serving at the Beal School believe in fully including all students in general classroom settings for academic instruction whenever possible, and in providing students with direct special education services within this general classroom setting to maximize the education of all students. When student academic needs dictate that students require additional academic skill support in a separate small group setting in Reading and Mathematics, instruction takes place within a smaller proximal space. Licensed, credentialed Special Educators work in a flexible, small group service delivery model to meet students' needs as outlined in their IEPs. In most schools, specialists instruct small group classrooms in areas that serves double duty as office space. Ideally, small group instructional support should take place as close to a student's classroom as possible. |
| Resource Room | 500 | Inclusion | C.12 | 450 | Educators serving at the Beal School believe in fully including all students in general classroom settings for academic instruction whenever possible, and in providing students with direct special education services within this general classroom setting to maximize the education of all students. When student academic needs dictate that students require additional academic skill support in a separate small group setting in Reading and Mathematics, instruction takes place within a smaller proximal space. Licensed, credentialed Special Educators work in a flexible, small group service delivery model to meet students' needs as outlined in their IEPs. In most schools, specialists instruct small group classrooms in areas that serves double duty as office space. Ideally, small group instructional support should take place as close to a student's classroom as possible. |
| Small Group Room/ Reading | | OT/PT | D.6 | 950 | In the new Beal, Occupational Therapy and Physical Therapy services that are not delivered in the general classroom setting, by IEP designation, will be provided in two different spaces. The space for OT/PT activities needs to be flexible, with the idea that most student needs should be accommodated as close as possible to nearby classroom spaces. This limits unnecessary disruption caused by lengthy travel time to service delivery areas and maximizes learning time. The main floor OT/PT space D.6 is located adjacent to the gym and near the Kindergarten wing, which will allow ease of access for both licensed therapists and adaptive physical education (APE) teachers. This space will also be large enough to accommodate a large beam and swing. |
| Small Group Room/ Reading | | Speech | D.7 | 250 | The Speech Pathologist maintains a space for small group instruction that doubles as an office space. Speech services, when delivered in a small group, parallel setting, are comprised by anything from a 1:2 or 1:5 ratio; students whose learning needs demand a small group setting benefit from the direct instruction provided by the speech pathologist. In the new school, there should be two spaces allocated for Speech large enough for 4-8 students. The second of two Speech rooms will be located in the Early Childhood community, near the Kindergarten classrooms. |
| *Unique to District | | Special Education Office | F.1 | 150 | In a building with a projected enrollment of 790 students, special education staff will need to hold at least 100 meetings with parents and guardians. These meetings are facilitated by a Team Chair, and that person will need an office space sufficient to prepare for meeting the needs of our students and their families. |
| *Unique to District | | Special Education Conference | F.2 | 350 | The new Beal Elementary School will also require a conference room large enough for 12 people. This collaborative space will be used for daily meetings for initial, annual, re-evaluation and progress meetings with parents and district teams as well as data analysis meetings with both building based and district staff. |
| | | | Total | 13,310 | |

**Square Footage Summary:**

**The proposed overall gross square footage of the new building is 141,600; Average square feet of General Classrooms is 925.**

**MSBA guidelines allows for 9,060 net square feet of dedicated special education space. The proposed program is 4,250 nsf in excess of the guidelines.**

***Indicates that space is unique to District's program and does not appear in MSBA space guidelines.**

F. MSBA Enrollment Letter

# Massachusetts School Building Authority

**Deborah B. Goldberg**
*Chairman, State Treasurer*

**Maureen G. Valente**
*Chief Executive Officer*

**John K. McCarthy**
*Executive Director / Deputy CEO*


RECEIVED
16 OCT 17 AM 9:57
TOWN MANAGER'S OFFICE

October 13, 2016

Mr. Daniel J. Morgado, Shrewsbury Town Manager
Town Managers Office
100 Maple Avenue
Shrewsbury, MA 01545

Re: Town of Shrewsbury, Beal Early Childhood Center

Dear Mr. Morgado:

I would like to thank you and other local officials for participating in a conference call with Massachusetts School Building Authority (the "MSBA") staff on July 21, 2016 during which enrollment projections and methodologies were reviewed for the Beal Early Childhood Center (the "proposed project") in the Town of Shrewsbury (the "District"), resulting in the additional information provided on September 1, 2016 and a follow-up conference call on September 16, 2016. As discussed, the next critical step is for the MSBA and the District to agree on a study enrollment for the Beal Early Childhood Center.

The Beal Early Childhood Center presently serves a portion of the District's grades K-1 enrollment, however, the MSBA understands that the District would like the feasibility study for this project to examine a K-4 grade configuration at the Beal Early Childhood Center to be more consistent with the grade configuration of the District's four other elementary schools. The MSBA also understands that one of the District's goals for this proposed project is to relieve current and future overcrowding at the District's other four elementary schools.

The table on page 2 illustrates the District's K-12 enrollment during the most recent ten year period, including enrollment for the previous school year (2015-2016) as reported by the Department of Elementary and Secondary Education ("DESE"). The total grades K-4 enrollment in the Town of Shrewsbury as reported by the District for the 2015-2016 school year is 2,139 students, which reflects a decrease of 104 students (-4.6%) from the grades K-4 enrollment reported in 2006-2007, which was the maximum grade K-4 enrollment reported in the preceding ten years. Additionally, the current year's grade K-4 enrollment reflects a decrease of approximately 51 students (-2.3%) from the average grades K-4 enrollment reported during the preceding ten year period.

| YEAR | K-4 | 5-6 | 7-8 | 9-12 |
|---|---|---|---|---|
| 2006 | 2,243 | 950 | 950 | 1,578 |
| 2007 | 2,205 | 946 | 934 | 1,629 |
| 2008 | 2,210 | 917 | 941 | 1,639 |
| 2009 | 2,191 | 908 | 906 | 1,624 |
| 2010 | 2,233 | 934 | 915 | 1,617 |
| 2011 | 2,207 | 961 | 905 | 1,631 |
| 2012 | 2,159 | 989 | 940 | 1,658 |
| 2013 | 2,173 | 980 | 961 | 1,646 |
| 2014 | 2,135 | 956 | 1,007 | 1,683 |
| 2015 | 2,139 | 972 | 1,027 | 1,668 |

The MSBA understands that the District is proposing a design enrollment to accommodate approximately 850 students in grades K-4 at the Beal Early Childhood Center. The enrollment in grades K-1 reported to DESE for the 2015-2016 school year at the Beal Early Childhood Center was 311 students.

With respect to future enrollments, the MSBA's base enrollment forecast indicates the District's grade K-4 enrollment will be stable over the next 4-5 years and then experience an increasing trend through 2025-2026. The average grade K-4 enrollment forecast for the projected period through the 2025-2026 school year is 2,225 students.

As a result of a sensitivity analysis performed by the MSBA on this base enrollment projection and further discussion with the District, the following adjustments have been made to the base enrollment projection:

- Out-of-District Enrollment
  - In order to adjust for fluctuations to the out-of-district enrollment patterns of the District's residents over time, the MBSA has made an additional adjustment to the base enrollment projection;
  - In order to make this adjustment, the MSBA adjusted the grade to grade survival ratios for grades K-4 by a total of 3.3% throughout a four year period in the projection; and
  - This adjustment added approximately 60 students to the average grades K-4 enrollment as compared to the projection without this adjustment.

- Development
  - Based on discussions between the District and the MSBA, and the anticipated development information provided by the District, the MSBA enrollment model has been adjusted to use the five-year 75th percentile cohort survival rate for 2016 and 2017 rather than the five-year average cohort survival rate, which is utilized throughout the base enrollment forecast; and
  - This adjustment added approximately 35 students to the average total grades K-4 enrollment as compared to the projection without this adjustment.

As a result of analysis on the base enrollment projection, the adjustment to the base projection described above, and based on the historical enrollment trends of the District, the average adjusted K-4 enrollment forecast for the projected period through the 2025-2026 school year is 2,320 students.

In order to recommend a design enrollment for an appropriately sized project for the Beal Early Childhood Center, the MSBA performed capacity analyses of the District's current elementary schools. The capacity analyses was based upon the MSBA's 2010 Needs Survey data, capacity information provided by the District, as well as the District's class size policies indicated in the Educational Profile Questionnaire, as follows:

- Kindergarten: 17-19 students per class
- Grades 1-2: 20-22 students per class
- Grades 3-4: 22-24 students per class

The District's four elementary schools, not including the Beal Early Childhood Center, currently contain (7) kindergarten classrooms, (33) grade 1-2 classrooms and (36) grade 3-4 classrooms, which accommodate 1,571 students based on the District's minimum student/classroom policies. Accordingly, if the Beal Early Childhood Center remains in a grade K-1 configuration, the MSBA recommends a design enrollment of 750 students for the Beal Early Childhood Center.

As previously stated, the District is considering a K-4 grade configuration at the Beal Early Childhood Center to be more consistent with the grade configuration of the District's four other elementary schools, as well as to relieve current and future overcrowding across the District. With reconfiguration, the District's four elementary schools, not including the Beal Early Childhood Center, would contain (16) kindergarten classrooms, (30) grade 1-2 classrooms and (30) grade 3-4 classrooms, which accommodate 1,532 students based on the District's minimum student/classroom policies. Accordingly, if the Beal Early Childhood Center reconfigures to become a grade K-4 configuration, the MSBA recommends a design enrollment of 790 students.

Please note School Committee approval of a detailed draft plan to redistrict students in accordance with a K-4 grade configuration for the District's five elementary schools is required prior to the approval of a Project Scope and Budget Agreement associated with this proposed project.

The MSBA believes that this study enrollment recommendation will position the District to efficiently meet space capacity needs throughout future enrollment variations. Please sign and return the attached certification within 21 calendar days to confirm agreement on this study enrollment. If the District feels that this study enrollment does not meet the needs of the District, please respond to this letter via e-mail to Katie DeCristofaro and propose three meeting/conference call times for which the District can be available to discuss enrollment.

If you have any questions regarding this matter, please do not hesitate to contact me or Katie DeCristofaro (Kathryn.DeCristofaro@MassSchoolBuildings.org) at 617-720-4466.

Sincerely,

Mary Pichetti
Director of Capital Planning

Cc: Legislative Delegation
Maurice M. DePalo, Chair, Shrewsbury Board of Selectmen
Sandra Fryc, Chair, Shrewsbury School Committee
Dr. Joseph Sawyer, Superintendent, Shrewsbury Public Schools
Patrick C. Collins, Assistant Superintendent, Shrewsbury Public Schools
File: 10.2 Letters (Region 2)

**MASSACHUSETTS SCHOOL BUILDING AUTHORITY**
**TOWN OF SHREWSBURY**
**BEAL EARLY CHILDHOOD CENTER**
**STUDY ENROLLMENT CERTIFICATION**

As a result of a collaborative analysis with the Massachusetts School Building Authority (the "MSBA") of enrollment projections and space capacity needs for the Beal Early Childhood Center (the "Proposed Project"), the Town of Shrewsbury hereby acknowledges and agrees that the design of alternatives, which may be evaluated as a part of the feasibility study for the Beal Early Childhood Center, shall be based in accordance with the following:

| Enrollment for Grades K-1 (Current Configuration) | Enrollment for Grades K-4 |
|---|---|
| 750 students | 790 students |

The Town of Shrewsbury further acknowledges and agrees that, pursuant to 963 CMR 2.00 *et seq.*, the MSBA shall determine the square feet per student space allowance and total square footage according to the enrollments noted above. The Town of Shrewsbury acknowledges and agrees that it has no right or entitlement to any particular design enrollment, square feet per student space allowance, or total square footage and that it has no right or entitlement to a design enrollment any greater than any of the enrollments noted above, and further acknowledges and agrees that it shall not bring any claim or action, legal or equitable, against the MSBA, or any of its officers or employees, for the purpose of obtaining an increase in the design enrollment for the Proposed Project that it has acknowledged and agreed to herein. The Town of Shrewsbury further acknowledges and agrees that, among other things, the design enrollment, square feet per student space allowance, and total square footage of the Proposed Project shall be subject to the approval of the MSBA's Board and that the final approval of a Proposed Project shall be within the sole discretion of the MSBA's Board.

The undersigned, for themselves and the Town of Shrewsbury, hereby certify that they have read and understand the contents of this study enrollment certification and that each of the above statements is true, complete and accurate. The undersigned hereby certify that they have been duly authorized by the appropriate governmental body to execute this Certification on behalf of Town of Shrewsbury and to bind the Town of Shrewsbury to its terms.

Chief Executive Officer

10/25/16
Date

Sandra M. Fryc
Duly Authorized Representative of School Committee

10-27-16
Date

Superintendent of Schools

10/27/16
Date

# 4.1.2 SCHEMATIC DESIGN BINDER

A. Introduction
B. Final Design Program
C. Traffic Analysis
D. Environmental Assessment
E. Geotechnical Analysis
F. Code Analysis
G. Utility Analysis
H. Massing Study
I. Building Systems Narratives
J. LEED-S
K. ADA-AAB Compliance
L. Room Data Sheets
M. Proposed Construction Methodology
N. Reimbursement Rate
O. Total Project Budget
P. Designer Cost Estimate
Q. Independent OPM Cost Estimate
R. Updated Project Work Plan
S. Local Actions & Approvals

# 4.1.2 SCHEMATIC DESIGN BINDER

## A. Introduction

1. Introduction
2. Updated Budget Statement
3. Visual Aids
4. Redistricting Plan
5. MSBA Approval to Proceed to SD
6. MSBA PSR Responses

The Beal Elementary School Preferred Solution, approved by the MSBA Board of Directors at the 27 June 2018 Board Meeting, features:

- New construction year round 142,700gsf 790 student K-4 facility
- 20 acre portion of the Glavin Center site located at 214 Lake Street, Shrewsbury
  Former residential facility currently owned by the Commonwealth
- Proposed realignment of Lake Street to improve sight lines and traffic flow priced separately in the SD estimate
- Well installation and irrigation for the multi-purpose athletic field priced separately in the SD estimate
- Demolition of existing campus buildings and site features
- Sustainable design to meet LEED v4 Silver certification
- Site features: min. 130 parking spaces with overflow capacity to 350 parking spaces, two playground areas, multi-purpose athletic field, separate parent pick-up/drop off for 120 cars and bus pick-up/drop off for 15 buses, service area
- The existing Beal School to be repurposed by the town under separate contract
- $75million construction budget and $95million project budget
- Chapter 149A Construction Manager and Risk delivery method

In addition to the ongoing efforts of the Town to educate the local community (via the Beal Elementary School website and Public Meetings), the project team has made several presentations to various Town Officials and Committees during the Schematic Design Phase in advance of the September 12, 2018m submission to MSBA. All public meetings noted are televised. Key meetings and votes include the following:

- June 6, 2018 MSBA Facilities Sub Committee Meeting
- June 12, 2018 Building Committee Public Meeting: Schematic Design Project Update
- June 12, 2018 Shrewsbury Department Heads Interdepartmental Review Meeting
- June 13, 2018 Sustainable Design Team Meeting
- July 10, 2018 Building Committee Public Meeting: Schematic Design Project Update
- August 28, 2018 Building Committee Public Meeting: Schematic Design Project Update
- August 28, 2018 Shrewsbury Board of Selectmen Public Meeting: Schematic Design Project Update
- August 29, 2018 Shrewsbury School Committee Public Meeting: Schematic Design Submission Approval Vote
- September 4, 2018 Building Committee Meeting: Schematic Design Submission Approval Vote

Minutes documenting the public meetings above may be found in section 4.1.2 S. Local Actions and Approvals.

Regarding the Glavin Center land acquisition process, the transfer of ownership to the Town of Shrewsbury was signed by the Legislature on July 25, 2018 and by the Governor on August 3, 2018. The purchase price for the school site portion of the acquisition has been set at $915,000.

To better determine existing conditions at the Glavin Center Site and existing Buildings, the following additional work has been conducted:

- Additional geotechnical borings and test pits at the site and Lake Street vicinity were conducted and are included in section 4.1.2.E Geotechnical and Geo-Environmental Analysis
- Additional soil testing and Comm 97 testing were conducted to better determine the regulatory issues including the levels of naturally occurring arsenic in the soil
- Hazardous Material testing at the existing Glavin Center buildings were conducted and included in Section 4.1.2.D Environmental and Existing Building Assessment
- Detailed site survey work was conducted by the Town of Shrewsbury Engineering Department
- Code review and egress capacity calculations and plans are submitted in section 4.1.2 F Code Analysis.

The following includes some key dates as the project advances:

- October 22, 2018 Town Meeting Vote
- October 31, 2018 MSBA Board Meeting to approve Schematic Design and Project Scope and Budget Meeting
- November 6, 2018 Town Ballot Vote

Further schedule related milestones can be viewed in Section 4.1.2.L.

Office of the
TOWN MANAGER

TELEPHONE: (508) 841-8508
FAX: (508) 842-0587
kmizikar@shrewsburyma.gov

# TOWN OF SHREWSBURY

**Richard D. Carney Municipal Office Building**
**100 Maple Avenue**
**Shrewsbury, Massachusetts 01545-5338**

September 4, 2018

Ms. Diane Sullivan
Senior Capital Program Manager
Massachusetts School Building Authority
40 Broad Street, 5th Floor
Boston, Massachusetts 02109

**Re: Budget Statement for Schematic Design-Beal Elementary School**

Dear Ms. Sullivan,

The Town of Shrewsbury is providing this letter in support of the Town's Schematic Design submission for the Beal Elementary School. Section O. of the Schematic Design submission contains the Total Project Budget, which was established through a reconciliation of separate cost estimates of the schematic design drawings commissioned by the Owner's Project Manager and Designer.

As of July 6, 2017, the date of the Town's last bond offering, the Town of Shrewsbury had $85,378,047 in total long-term debt obligations, which includes $13,869,796 in self-supported debt netting out to $71,508,251 in net direct debt.

The net direct debt equates to 1.23% of the November 1, 2017 equalized valuation of the Town. Approximately 50.0% of the principal debt shall be retired over the next five years. Additionally, the Town maintains an excess of $70,074,000 in unused levy capacity. The Town is in strong financial position and is poised financially to advance the funding requirements of the new Beal Elementary School.

With regards to future debt offerings, the Town is governed by its financial policies which dictate the amount of debt issued and investments are guided by a five-year Capital Improvement Program, which projects future need and identifies funding sources available. The Town shall allocate sufficient borrowing capacity to undertake new Beal Elementary School construction project within the parameters of our financial policies and Capital Improvement Plan.

The Town of Shrewsbury, and the Owner's Project Manager, PMA Consultants, LLC, have developed a Total Project Cost Budget Estimate for the Schematic Design in the amount of $92,831,833 to construct, furnish and equip a new elementary school.

Depending on the final project budget, MSBA reimbursement, and borrowing strategy, the cost of this project will add approximately $5,575,475 to the Town's debt service costs in the peak year of the borrowing impact, which is anticipated to be Fiscal Year 2021.

Every million-dollar increase in the Town's tax levy corresponds to an estimated $0.172 increase in the residential tax rate and $0.172 increase in the commercial, industrial, and personal property tax rate with the Town's current single tax rate. The Town of Shrewsbury has always utilized a single tax rate. However, the shift factor and resulting tax rates for Fiscal Year 2020 will be set by the Town of Shrewsbury in November 2018. Better projections will be available once the Town's total share of the project budget is calculated, and tax rates for Fiscal Year 2020 are approved.

At this point in the project and the completion of schematic design, the Town Manager's office is prepared to recommend Board of Selectmen approval of a loan authorization for this total project cost, authorizing the respective notes/bonds to fund this project. Special Town Meeting will be held on October 22, 2018 at 7pm to request an authorization to borrow the required funding for this project. Additionally, voters will be asked to exclude the debt service requirements from the provisions of Proposition 2 ½ through a ballot question on November 6, 2018.

If you have any questions or concerns, please contact myself or Treasurer Laurie Gaudet at 508-841-8509.

Yours Truly,

Kevin J. Mizikar
Town Manager

BIOSWALE
PLAYGROUND
PLAYFIELD
RAIN GARDEN
ENTRY SIGN
EXISTING BEECH TREE
OUTDOOR CLASSROOM
EXISTING KNOLL
76 PARALLEL PARKING SPOTS (OVERFLOW)
BUTTERFLY GROVE
MAIN FFE: 570'
ENTRY PLAZA
133 PARKING SPOTS
LAKE STREET REALIGNMENT
BUS CIRCULATION AND DROP OFF
LOWER FFE: 556'
SERVICE AREA
POTENTIAL SOFTBALL FIELD LOCATION
SENSORY GARDEN
72 PARKING SPOTS (OVERFLOW)
PLAYGROUND
LAKE STREET
ENTRY SIGN
52 PARKING SPOTS
0
100
200
400

# Beal Elementary School

214 Lake Street, Shrewsbury, MA 01545

## SCHEMATIC DESIGN

4.1.2 SCHEMATIC DESIGN BINDER

A.3 Visual Aids - Floor Plans

## LEGEND

- Core Academic
- Special Education
- Reading / Speech / E.L.E.
- Physical Education
- Dining & Food Service
- Administration & Guidance
- Medical
- Media Center
- Music
- Art
- Mechanical / Custodial / Other
- Circulation

## GROUND FLOOR PLAN

1" = 50'-0"

Shrewsbury Public Schools
Shrewsbury, MA

LAMOUREUX · PAGANO
ARCHITECTS PROJECT MANAGERS

# Beal Elementary School

214 Lake Street, Shrewsbury, MA 01545

## SCHEMATIC DESIGN

4.1.2 SCHEMATIC DESIGN BINDER

A.3 Visual Aids - Floor Plans

## LEGEND

- Core Academic
- Dining & Food Service
- Music
- Special Education
- Administration & Guidance
- Art
- Reading / Speech / E.L.E.
- Medical
- Mechanical / Custodial / Other
- Physical Education
- Media Center
- Circulation

MAIN FLOOR PLAN

1" = 50'-0"

Shrewsbury Public Schools
Shrewsbury, MA

LAMOUREUX • PAGANO
ARCHITECTS PROJECT MANAGERS

PROPOSED AERIAL VIEW FROM EAST

EXISTING AERIAL VIEW FROM EAST

Beal Elementary School

**SHREWSBURY PUBLIC SCHOOLS**
**Draft Redistricting Educational Space Planning Document For PK-4**
**September 2018**

Space limitations due to over crowding have prevented the district in providing full-day kindergarten to all students, whereas 95% of Massachusetts students are enrolled in a full-day program. In addition to the lack of educational spaces needed to meet the needs of the district's growing kindergarten population, the district has taken over previously dedicated music, art, special education, and ELL spaces just to meet the needs for regular educational spaces. Currently, of the 355 kindergarten students in the district, 218, or 61%, are in a full-day kindergarten program while 29% are in half-day kindergarten. Many other Shrewsbury kindergarten students are enrolled in full-day kindergarten in area private schools due to space not being available in the district. The "Existing Space Utilization" chart below shows the number of dedicated spaces available at each neighborhood school for each category of space. The "Current & Projected Needs" shows the reassignments of space needed to not only meet the pressures the district is currently experiencing but those being projected. These reassignments will not only allow the district to provide full-day kindergarten to its entire kindergarten population but also creates parity amongst the schools with respect to delivery of music, art, special education, and ELL education. The last chart show the net gain/loss of spaces in each education category.

## Existing Space Utilization

| School | Regular Education Classrooms | Media Center | Gymnasium | Music Rm | Art Rm | Special Educ. Spaces | ELL Spaces | Totals |
|---|---|---|---|---|---|---|---|---|
| Beal | 13 | 1 | 1 | 0.5 | 0.5 | 5 | 1 | 22 |
| Coolidge | 19 | 1 | 1 | 0 | 1 | 6 | 3 | 31 |
| Paton | 17 | 1 | 0.5 | 0.5 | 0.5 | 7 | 0 | 26.5 |
| Floral | 32 | 1 | 1 | 1 | 1 | 7 | 1 | 44 |
| Spring | 17 | 1 | 1 | 0 | 1 | 3 | 0 | 23 |
| | 98 | 5 | 4.5 | 2 | 4 | 28 | 5 | 146.5 |

## Current & Projected Needs

| School | Regular Education Classrooms | Media Center | Gymnasium | Music Rm | Art Rm | Special Educ. Spaces | ELL Spaces | Totals |
|---|---|---|---|---|---|---|---|---|
| Beal ** | 40 | 1 | 1 | 1 | 2 | 7 | 2 | 54 |
| Coolidge | 16 | 1 | 1 | 1 | 1 | 7 | 4 | 31 |
| Paton | 15 | 1 | 0.5 | 1 | 1 | 7 | 1 | 26.5 |
| Floral | 30 | 1 | 1 | 1 | 2 | 7 | 2 | 44 |
| Spring | 15 | 1 | 1 | 1 | 1 | 3 | 1 | 23 |
| | 116 | 5 | 4.5 | 5 | 7 | 31 | 10 | 178.5 |

** Assumes Universal Full-day Kindergarten

## Difference: Existing Space Utilization v. Current & Projected Needs

| School | Regular Education Classrooms | Media Center | Gymnasium | Music Rm | Art Rm | Special Educ. Spaces | ELL Spaces | Totals |
|---|---|---|---|---|---|---|---|---|
| Beal [New] | 27 | 0 | 0 | 0.5 | 1.5 | 2 | 1 | 32 |
| Coolidge | -3 | 0 | 0 | 1 | 0 | 1 | 1 | 0 |
| Paton | -2 | 0 | 0 | 0.5 | 0.5 | 0 | 1 | 0 |
| Floral | -2 | 0 | 0 | 0 | 1 | 0 | 1 | 0 |
| Spring | -2 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| | 18 | 0 | 0 | 3 | 3 | 3 | 5 | 32 |

# Massachusetts School Building Authority

**Deborah B. Goldberg**
*Chairman, State Treasurer*

**James A. MacDonald**
*Chief Executive Officer*

**John K. McCarthy**
*Executive Director / Deputy CEO*

June 27, 2018

Mr. Kevin J. Mizikar, Shrewsbury Town Manager
Town Managers Office
100 Maple Avenue
Shrewsbury, MA 01545

Re: Town of Shrewsbury, Beal Early Childhood Center

Dear Mr. Mizikar:

I am pleased to report that the Board of the Massachusetts School Building Authority (the "MSBA") has voted to approve the Town of Shrewsbury (the "Town") as part of its invitation for Feasibility Study, to proceed into schematic design to replace the existing Beal Early Childhood Center with a new K-4 facility on the Glavin Center site (the "proposed project"), contingent upon the Town gaining full ownership, control, and exclusive use of the proposed site.

It is my understanding that the Town anticipates seeking community approval for this proposed project in October 2018. Therefore, it is critical that the Town, in conjunction with its Owner's Project Manager and Designer, submit a schedule to the MSBA as soon as possible, which should include: the work plan to complete all of the required documentation for presentation to the MSBA's Board of Directors at a future Board meeting; the date of the Town Meeting(s) at which the proposed project will be considered; and the anticipated design and construction schedule.

We will be contacting you soon to discuss these next steps in more detail, but in the meantime, I wanted to share with you the Board's vote to approve the Town of Shrewsbury to proceed into schematic design to replace the existing Beal Early Childhood Center with a new K-4 facility on the Glavin Center site, contingent upon the Town gaining full ownership, control, and exclusive use of the proposed site.

I look forward to continuing to work with you as the MSBA's grant program progresses. As always, feel free to contact me or my staff at (617) 720-4466 should you have any questions.

Sincerely,

John K. McCarthy
Executive Director

Cc: Legislative Delegation
John I. Lebeaux, Chair, Shrewsbury Board of Selectmen
Jason Palitsch, Chair, Shrewsbury School Committee
Dr. Joseph Sawyer, Superintendent, Shrewsbury Public Schools
Patrick C. Collins, Assistant Superintendent for Finance and Operations, Shrewsbury Public Schools
Paul Queeney, Owner's Project Manager, PMA Consultants
Deborah Shaer, Owner's Project Manager, PMA Consultants
Katie Crockett, Designer, Lamoureux Pagano & Associates, Inc.
Sean Brennan, Designer, Lamoureux Pagano & Associates, Inc.
File: Letters 10.2 (Region 2)

**This document has been updated by LPA with comments for the purpose of preparing a coordinated response from the District, OPM and LPA. Responses to comments are in red below.**

## MSBA REVIEW COMMENTS

The following comments[1] on the Preferred Schematic Report submittal are issued pursuant to a review of the project submittal document for the proposed project presented as a part of the Feasibility Study submission in accordance with the MSBA Module 3 Guidelines.

## ITEMS REQUIRING IMMEDIATE ACTION

*As noted in MSBA's Preliminary Design Program review comments, the MSBA understands that the Glavin Center property is currently state-owned land which the District anticipates acquiring for this project. The MSBA previously requested a description of the process, schedule, and estimated cost associated with the District's potential acquisition of this property and any other potential impact this may have on the proposed project. The information provided as part of the Preferred Schematic Report has not changed since the summary provided in the District's response to MSBA's Preliminary Design Program review comments. Please provide a more detailed description of the status of acquiring the Glavin Center site, and the District's back-up plan if they are unable to obtain control of the site in response to these review comments.*

## 3.3 PREFERRED SCHEMATIC REPORT

| Overview of Preferred Schematic Submittal | Complete | Provided; *Refer to comments following each section* | Not Provided; *Refer to comments following each section* | Receipt of District's Response; *To be filled out by MSBA Staff* |
|---|---|---|---|---|
| OPM Certification of Completeness and Conformity | ☒ | ☐ | ☐ | ☐ |
| Table of Contents. | ☒ | ☐ | ☐ | ☐ |
| 3.3.1 Introduction | ☐ | ☒ | ☐ | ☐ |
| 3.3.2 Evaluation of Existing Conditions | ☐ | ☒ | ☐ | ☐ |
| 3.3.3 Final Evaluation of Alternatives | ☐ | ☒ | ☐ | ☐ |
| 3.3.4 Preferred Solution | ☐ | ☒ | ☐ | ☐ |
| 3.3.5 Local Actions and Approval Certification | ☐ | ☒ | ☐ | ☐ |

[1] The written comments provided by the MSBA are solely for purposes of determining whether the submittal documents, analysis process, proposed planning concept and any other design documents submitted for MSBA review appear consistent with the MSBA's guidelines and requirements, and are not for the purpose of determining whether the proposed design and its process may meet any legal requirements imposed by federal, state or local law, including, but not limited to, zoning ordinances and by-laws, environmental regulations, building codes, sanitary codes, safety codes and public procurement laws or for the purpose of determining whether the proposed design and process meet any applicable professional standard of care or any other standard of care. Project designers are obligated to implement detailed planning and technical review procedures to effect coordination of design criteria, buildability, and technical adequacy of project concepts. Each city, town and regional school district shall be solely responsible for ensuring that its project development concepts comply with all applicable provisions of federal, state, and local law. The MSBA recommends that each city, town and regional school district have its legal counsel review its development process and subsequent bid documents to ensure that it is in compliance with all provisions of federal, state and local law, prior to bidding. The MSBA shall not be responsible for any legal fees or costs of any kind that may be incurred by a city, town or regional school district in relation to MSBA requirements or the preparation and review of the project's planning process or plans and specifications.

### 3.3.1 INTRODUCTION

| | Provide the following Items | Complete; *No response required* | Provided; *District's response required* | Not Provided; *District's response required* | Receipt of District's Response; *To be filled out by MSBA Staff* |
|---|---|---|---|---|---|
| 1 | Overview of the process undertaken since submittal of the Preliminary Design Program that concludes with submittal of the Preferred Schematic Report, including any new information and changes to previously submitted information | ☒ | ☐ | ☐ | ☐ |
| 2 | Summary of updated project schedule, including | | | | |
| | a) Projected MSBA Board of Directors Meeting for approval of Project Scope and Budget Agreement | ☒ | ☐ | ☐ | ☐ |
| | b) Projected Town/City vote for Project Scope and Budget Agreement | ☒ | ☐ | ☐ | ☐ |
| | c) Anticipated start of construction | ☐ | ☐ | ☒ | ☐ |
| | d) Target move in date | ☐ | ☐ | ☒ | ☐ |
| 3 | Summary of the final evaluation of existing conditions | ☒ | ☐ | ☐ | ☐ |
| 4 | Summary of final evaluation of alternatives | ☒ | ☐ | ☐ | ☐ |
| 5 | Summary of District's preferred solution | ☒ | ☐ | ☐ | ☐ |
| 6 | A copy of the MSBA Preliminary Design Program project review and corresponding District response | ☒ | ☐ | ☐ | ☐ |

**MSBA Review Comments:**

*2c) Provide the District's anticipated start of construction in response to these review comments.*

- **Date has been included in the updated Schedule, See attachment "G.1 Updated Project Schedule - Updated 06-20-18"**

*2d) Provide the District's target move-in date in response to these review comments.*

- **Date has been included in the updated Schedule, See attachment "G.1 Updated Project Schedule - Updated 06-20-18"**

*No further review comments for this section.*

### 3.3.2 EVALUATION OF EXISTING CONDITIONS

| | Provide the following Items | Complete; *No response required* | Provided; *District's response required* | Not Provided; *District's response required* | Receipt of District's Response; *To be filled out by MSBA Staff* |
|---|---|---|---|---|---|
| 1 | A narrative of any changes resulting from new information that informs the conclusions of the evaluation of the existing conditions and its impact on the final evaluation of alternatives | ☐ | ☒ | ☐ | ☐ |
| 2 | If changes are substantive, provide an updated Evaluation of Existing Conditions and identify as final. Identify additional testing that is recommended during future phases of the proposed project and indicate when the investigations and analysis will be completed | ☐ | ☒ | ☐ | ☐ |

**MSBA Review Comments:**

*1) The information provided indicates that the Glavin Center site has reportable levels of naturally occurring arsenic, and that the options developed at the Glavin Center site need to account for the impact of the soils relative to off-site disposal and recommendations for appropriate site preparation at the play areas. Additionally, the information provided indicates that further geotechnical work is recommended if the Glavin Center site is further developed. Please provide the anticipated timeline associated with this further analysis in response to these review comments, and keep the MSBA informed of developments resulting from additional work associated with the preferred solution.*

- **The district has authorized the Designer to proceed with procurement of the additional services. The team is currently working with DCAMM to coordinate access to the site so work can be performed. The work is anticipated to be completed in June 2018.**

*2) The information provided indicates that additional work is recommended during the schematic design phase which includes: a site survey, a comprehensive review, take-off and testing of all suspected hazardous materials, and a full geotechnical report. Please provide a narrative that describes the potential impact to the proposed scope, budget, and schedule associated with any additional testing that may occur during the schematic design phase of the preferred solution.*

- **The district has authorized the Designer to proceed with procurement of these additional services. The town will be performing their own site survey as they have the staff and experience to support such an effort. The geotechnical work and the hazardous material review, take-off, and testing is anticipated to be completed in June 2018. The purpose of these additional services is to get a better understanding of the scope and limit unforeseen conditions. No impact to the schedule is anticipated at this time and the reports will allow the team to better quantify the scope for budget purposes.** *No further review comments for this section.*

### 3.3.3 FINAL EVALUATION OF ALTERNATIVES

Include at least three potential alternatives, with at least one renovation and/or addition option. Include the following for each alternative where appropriate:

| Provide the following Items | | Complete; *No response required* | Provided; *District's response required* | Not Provided; *District's response required* | Receipt of District's Response; *To be filled out by MSBA Staff* |
|---|---|---|---|---|---|
| 1 | An analysis of each prospective site including: | | | | |
| | a) Natural site limitations | ☒ | ☐ | ☐ | ☐ |
| | b) Building footprint(s) | ☒ | ☐ | ☐ | ☐ |
| | c) Athletic fields | ☒ | ☐ | ☐ | ☐ |
| | d) Parking areas and drives | ☒ | ☐ | ☐ | ☐ |
| | e) Bus and parent drop-off areas | ☒ | ☐ | ☐ | ☐ |
| | f) Site access and surrounding site features. | ☒ | ☐ | ☐ | ☐ |
| 2 | Evaluation of the potential impact that construction of each option will have on students and measures recommended to mitigate impact | ☒ | ☐ | ☐ | ☐ |
| 3 | Conceptual architectural and site drawings that satisfy the requirements of the education program | ☒ | ☐ | ☐ | ☐ |
| 4 | An outline of the major building structural systems | ☒ | ☐ | ☐ | ☐ |
| 5 | The source, capacities, and method of obtaining all utilities | ☒ | ☐ | ☐ | ☐ |
| 6 | A narrative of the major building systems | ☒ | ☐ | ☐ | ☐ |
| 7 | A proposed total project budget and a construction cost estimate using the Uniformat II Elemental Classification format (to as much detail as the drawings and descriptions permit, but no less than Level 2) | ☒ | ☐ | ☐ | ☐ |
| 8 | Permitting requirements and associated approval schedule | ☐ | ☒ | ☐ | ☐ |
| 9 | Proposed project design and construction schedule including consideration of phasing | ☒ | ☐ | ☐ | ☐ |
| 10 | Completed Table 1 – MSBA Summary of Preliminary Design Pricing spreadsheet | ☐ | ☒ | ☐ | ☐ |

**MSBA Review Comments:**

*8) It should be noted that all permitting requirements and approvals must be obtained prior to construction bidding. Please acknowledge.*

- **Acknowledged.**

*10) The information provided includes preliminary pricing tables for both design-bid-build and construction manager at risk methodologies. The District indicated during the Pre-Facilities Assessment Subcommittee call on May 30, 2018 that subsequent to submittal of the Preferred Schematic Report they have decided to move forward with the construction manager at risk delivery method. Provide a narrative that describes the rationale for moving forward with construction manager at risk with as part of the schematic design submission. Additionally, provide an updated preliminary design pricing table that includes costs associated with an addition/renovation option in response to these review comments.*

- **Preliminary pricing table for an addition/renovation option has been provided, see attachments "G.3a Preliminary Design Pricing-Table-1 DBB-Updated 06-20-18" & "G.3b Preliminary Design Pricing-Table-1 CMR-Updated 06-20-18". The District will provide their rationale behind their decision to proceed with Construction Manager at Risk as part of the Schematic Design Submission.**

*No further review comments for this section.*

### 3.3.4 PREFERRED SOLUTION

| | Provide the following Items | Complete; *No response required* | Provided; *District's response required* | Not Provided; *District's response required* | Receipt of District's Response; *To be filled out by MSBA Staff* |
|---|---|---|---|---|---|
| 1 | Educational Program | | | | |
| | a) Summary of key components and how the preferred solution fulfills the educational program | ☒ | ☐ | ☐ | ☐ |
| | b) Design responses including desired features and/or layout considerations | ☒ | ☐ | ☐ | ☐ |
| | c) Proposed variances to, and benefits of, any changes to the current grade configuration (if any) and a related transition plan | ☒ | ☐ | ☐ | ☐ |
| 2 | Preferred Solution Space Summary | | | | |
| | a) Updated MSBA Space Summary spreadsheet | ☐ | ☒ | ☐ | ☐ |
| | b) Itemization and explanation of variations from the initial space summary (and MSBA review) included in the Preliminary Design Program | ☒ | ☐ | ☐ | ☐ |
| 3 | Preliminary NE-CHPS or LEED-S scorecard | ☐ | ☒ | ☐ | ☐ |
| 4 | Conceptual floor plans of the preferred solution, in color that are clearly labeled to identify educational spaces | ☐ | ☒ | ☐ | ☐ |
| 5 | Clearly labeled site plans of the preferred solution including, but not limited to: | | | | |
| | a) Structures and boundaries | ☒ | ☐ | ☐ | ☐ |
| | b) Site access and circulation | ☒ | ☐ | ☐ | ☐ |
| | c) Parking and paving | ☒ | ☐ | ☐ | ☐ |
| | d) Zoning setbacks and limitations | ☒ | ☐ | ☐ | ☐ |
| | e) Easements and environmental buffers | ☒ | ☐ | ☐ | ☐ |
| | f) Emergency vehicle access | ☐ | ☒ | ☐ | ☐ |
| | g) Safety and security features | ☐ | ☒ | ☐ | ☐ |
| | h) Utilities | ☒ | ☐ | ☐ | ☐ |
| | i) Athletic fields and outdoor educational spaces (existing and proposed) | ☐ | ☒ | ☐ | ☐ |
| | j) Site orientation | ☒ | ☐ | ☐ | ☐ |
| 6 | An overview of the Total Project Budget and local funding including the following: | | | | |
| | a) Estimated total construction cost | ☒ | ☐ | ☐ | ☐ |
| | b) Estimated total project cost | ☒ | ☐ | ☐ | ☐ |

| | Provide the following Items | Complete; *No response required* | Provided; *District's response required* | Not Provided; *District's response required* | Receipt of District's Response; *To be filled out by MSBA Staff* |
|---|---|---|---|---|---|
| | c) Estimated funding capacity | ☒ | ☐ | ☐ | ☐ |
| | d) List of other municipal projects currently planned or in progress | ☒ | ☐ | ☐ | ☐ |
| | e) District's not-to-exceed Total Project Budget | ☒ | ☐ | ☐ | ☐ |
| | f) Brief description of the local process for authorization and funding of the proposed project | ☐ | ☒ | ☐ | ☐ |
| | g) Estimated impact to local property tax, if applicable | ☒ | ☐ | ☐ | ☐ |
| | h) Completed MSBA Budget Statement | ☒ | ☐ | ☐ | ☐ |
| 7 | Updated Project Schedule including the following projected dates: | | | | |
| | a) Massachusetts Historical Commission Project Notification Form | ☐ | ☒ | ☐ | ☐ |
| | b) MSBA Board of Directors meeting for approval to proceed into Schematic Design | ☒ | ☐ | ☐ | ☐ |
| | c) MSBA Board of Directors meeting for approval of project scope and budget agreement and project funding agreement | ☒ | ☐ | ☐ | ☐ |
| | d) Town/City vote for project scope and budget agreement | ☒ | ☐ | ☐ | ☐ |
| | e) Design Development submittal date | ☐ | ☐ | ☒ | ☐ |
| | f) MSBA Design Development Submittal Review (include required 21-day duration) | ☐ | ☐ | ☒ | ☐ |
| | g) 60% Construction Documents submittal date | ☐ | ☐ | ☒ | ☐ |
| | h) MSBA 60% Construction Documents Submittal Review (include required 21-day duration) | ☐ | ☐ | ☒ | ☐ |
| | i) 90% Construction Documents submittal date | ☐ | ☐ | ☒ | ☐ |
| | j) MSBA 90% Construction Documents Submittal Review (include required 21-day duration) | ☐ | ☐ | ☒ | ☐ |
| | k) Anticipated bid date/GMP execution date | ☐ | ☐ | ☒ | ☐ |
| | l) Construction start | ☐ | ☐ | ☒ | ☐ |
| | m) Move-in date | ☐ | ☐ | ☒ | ☐ |
| | n) Substantial completion | ☐ | ☐ | ☒ | ☐ |

**MSBA Review Comments:**

*2a) Please refer to 'Attachment B' for more detailed comments.*

- **See "Attachment B" for District responses.**

*3) The information provided indicates the District intends to achieve two additional incentive points for energy efficiency. However, the proposed credits in the Energy and Atmosphere 'Optimize Energy Performance' category are below the threshold to achieve the minimum requirements (exceeding the Massachusetts State Energy Code by 20%) necessary to apply provisional incentive points to the District's reimbursement rate. As part of the schematic design submission, please provide an updated scorecard that meets the minimum requirements identified in MSBA Project Advisory 41.*

- **An updated Scorecard has been provided, see attachment "C.1 LEED v4 – Scorecard – Updated 06-20-18"**

*4) Provide the following information as part of the District's response to these review comments:*

- *An interior circulation diagram that describes how students will transition into the school from the drop off areas, from the classrooms to the cafeteria, and exit the school at time of dismissal. In addition, provide the same information for an individual that is physically challenged. The intent is to understand how students will be traveling through the building on a daily basis.*
  - **An interior circulation diagram has been provided, see attachment "D.2 Building Floor Plans - Circulation Diagrams"**
- *Describe how the building will be used by the community, how the community will enter the building, and how the building will be secured and monitored.*
  - **The community, for the most part, will access the building via the main entrance. The main entrance will act as the control point with visibility from the Administration Suite. When large events are conducted, potential access points to the building will be from both the main entrance and the parent pick-up and drop-off entrance. Both of the entry points will be monitored by staff.**

    **The community enjoys robust use of school facilities per School Committee Policy #850, Rental and Use of School Facilities. Typically, gymnasium space is used in the fall, winter, and spring months by either Shrewsbury Parks & Recreation Department or otherwise rented to local youth sports groups [i.e. youth basketball leagues]. Further, the School Department also operates a large-scale elementary enrichment program offering hands-on learning experiences for students entering grades PreK-4. The program runs for four weeks in June and July, with half-day and full day options available. Classes are taught by Shrewsbury Public School professionals and support the Shrewsbury elementary curriculum standards and Massachusetts curriculum frameworks. Topics include art, science, sports, technology, drama, writing, engineering and much more. With hundreds of classes to choose from, there's something for everyone. Finally, our Extended School Care Program also has begun to operate school vacation camps during the December, February, and April breaks to provide fun learning and social**

**activities for children who do not travel during these holidays. We expect Beal School will serve as a site for all aforementioned programs.**

- *For clarity, provide door openings and notations in future iterations of the layout in order to more clearly distinguish circulation patterns and access to spaces as they relate to the delivery of the proposed educational program.*
    - **Understood, items requested will be included on all future iterations.**

*5f) Confirm that first responding emergency representatives will be consulted in the planning process and associated requirements will be incorporated into the schematic design.*

- **Meetings were held previously with the Police & Fire Departments and future meetings have been scheduled for further input as the design evolves.**

*5g) Provide an updated site plan that identifies safety and security features for the proposed facility in response to these review comments.*

- **An updated Site Plan has been provided, see attachment "E.5 Site Plan - Security Features"**

*5i) Please refer to comment in section 3.3.3, item 1c.*

- **There is no comment in Section 3.3.3, item 1c. MSBA acknowledged this comment was included by error and advised the District to disregard.**

*6f) In response to these review comments, describe how the process of acquiring the Glavin Center site will impact the schedule and local process for authorization and funding of the proposed project.*

- **The Town is working diligently to ensure that the acquisition of the Glavin Center has minimal impact on the schedule and local process for authorization of this project. The special legislation, H. 4312, which authorizes the Division of Capital Asset Management and Maintenance (DCAMM) to sell the Glavin Center to the Town of Shrewsbury, has made its way through the House and is now under the consideration of the Senate. Given the thorough review in the House as well as comments and defined requirements of DCAMM, Shrewsbury's legislators are very confident that this legislation will be signed into law by the Governor by early August.**

  **The Town has been working with DCAMM throughout this process to ensure we satisfy all their requirements including the appraisal of the property, which will be completed before the end of August. Further, the Town has requested DCAMM provide site access in order to perform additional testing and site evaluations which will enable and inform the design process. All legal documents including the deed will be drafted by Town Counsel and sent to DCAMM for review once the bill is signed into law.**

  **A tentative date for a Special Town Meeting has been set for October 22nd to request the borrowing authorization for the entire cost of the project including the site acquisition. A special election will be held November 6, 2018, the same date as the biennial State Election, seeking to exclude the funding of this entire project from the provisions of Proposition 2 1/2. Subject to these local approvals and MSBA approval, the Town will finalize all documents to acquire the Glavin Center and close on property within 30 days of the debt exclusion vote.**

*7a) Provide an updated schedule that indicates the timeline associated with filing with the Massachusetts Historical Commission ("MHC") and obtaining MHC approval prior to construction bids. The District should keep the MSBA informed of any decisions and/or proposed actions and should confirm that the proposed project is in conformance with Massachusetts General Law 950, and CMR 71.00.*

**The Project Notification Form [PNF] will be submitted to MHC during the Schematic Design phase. The anticipated submission date is June 29th, 2018 and review period and it is anticipated that a final decision will be rendered within the initial 30-day review period. These dates are included in the updated schedule, see attachment "G.1 Updated Project Schedule - Updated 06-20-18"**

*7e-n) Provide an updated project schedule that includes the missing dates in response to these review comments.*

- **An updated Schedule has been provided, See attachment "G.1 Updated Project Schedule - Updated 06-20-18"**

*No further review comments for this section.*

### 3.3.5 LOCAL ACTIONS AND APPROVALS

| | Provide the following Items | Complete; *No response required* | Provided; *District's response required* | Not Provided; *District's response required* | Receipt of District's Response; *To be filled out by MSBA Staff* |
|---|---|---|---|---|---|
| 1 | Certified copies of the School Building Committee meeting notes showing specific submittal approval vote language and voting results, and a list of associated School Building Committee meeting dates, agenda, attendees and description of the presentation materials. | ☒ | ☐ | ☐ | ☐ |
| 2 | Signed Local Actions and Approvals Certification(s): | | | | |
| | a) Submittal approval certificate | ☒ | ☐ | ☐ | ☐ |
| | b) Grade reconfiguration and/or redistricting approval certificate (if applicable) | ☒ | ☐ | ☐ | ☐ |
| 3 | Provide the following to document approval and public notification of school configuration changes associated with the proposed project: | | | | |
| | a) A description of the local process required to authorize a change to the existing grade configuration or redistricting in the district | ☐ | ☒ | ☐ | ☐ |
| | b) A list of associated public meeting dates, agenda, attendees and description of the presentation materials | ☒ | ☐ | ☐ | ☐ |
| | c) Certified copies of the governing body (e.g. School Building Committee) meeting notes showing specific grade reconfiguration and/or redistricting, vote language, and voting results if required locally | ☒ | ☐ | ☐ | ☐ |
| | d) A certification from the Superintendent stating the District's intent to implement a grade configuration or consolidate schools, as applicable. The certification must be signed by the Chief Executive Officer, Superintendent of Schools, and Chair of the School Committee. | ☒ | ☐ | ☐ | ☐ |

**MSBA Review Comments:**

*3a) Provide a draft redistricting plan as part of the schematic design submission.*

- **Redistricting plan will be included as part of the Schematic Design Submission.**

*No further review comments for this section.*

**Additional Comments:**

- *It should be noted that the District will be required to execute a final Design Enrollment Certification based on the preferred solution. The MSBA will prepare a certification to be forwarded for signature upon approval by the Board of Directors for the preferred solution.*
    - **Understood; District will execute final Design Enrollment Certification upon receipt**
- *The MSBA issues project advisories from time to time, as informational updates for Districts, Owner's Project Managers ("OPM"), and Designers in an effort to facilitate the efficient and effective administration of proposed projects currently pending review by the MSBA. The advisories can be found on the MSBA's website. In response to these review comments, please confirm that the District's consultants have reviewed all project advisories and they have been incorporated into the proposed project as applicable.*
    - **Understood; The District's Consultants have reviewed the Project Advisories and will ensure they are incorporated into the project.**
- *The MSBA offers the following information to assist the District and its Owner's Project Manager in completing the total project budget template that is required as part of its Schematic Design Submittal.*
    - *The District must include negotiated costs for OPM and Designer fees for the remainder of the project as part of their Total Project Budget. In response to these review comments, please confirm that the District and its consultants will negotiate fees for the remainder of the project that are to be included in the District's Schematic Design documents to the MSBA.*
        - **Understood; The District's Consultants will ensure fees have been negotiated with the district in time for inclusion in the Total Project Budget.**
    - *The Preferred Schematic Report indicates the District is targeting MSBA approval of its proposed project scope and budget at the October 31, 2018 Board meeting. The District's reimbursement rate before incentives for calendar year 2018 is 50.16%. Please note that the MSBA updates district reimbursement rates annually and applies the reimbursement in effect at the time the MSBA Board of Directors approves a district's proposed project scope and budget. The reimbursement rate is established based on statutory requirements and information provided by the Departments of Revenue and Elementary and Secondary Education.*
        - **Understood.**
    - ***Maintenance** (0-2) – 1.70%. This value is based on MSBA review of district provided materials regarding routine and capital maintenance programs during Eligibility Period at which time the value is finalized.*
        - **Understood, 1.7% will be carried for Maintenance reimbursement rate.**

- ***CM@Risk*** *(0 or 1) – 1.00%. Since the District was invited to the MSBA Capital Pipeline before January 2, 2017 it would be eligible to conditionally receive one incentive point subject to the approval of the Office of the Inspector General for the District's use of the Construction Manager at Risk construction delivery method for the Proposed Project and that the District actually used that construction delivery method for the Proposed Project.*
  - **Understood, 1.o% will be carried for CM@Risk reimbursement rate.**
- ***Newly Formed Regional School District*** *(0-6) – The District is not a newly formed or expanded regional school district as a result of working with the MSBA, therefore these incentive points do not apply.*
  - **Understood.**
- ***Major Reconstruction or Reno/Reuse*** *(0-5) – The District's preferred solution is for new construction therefore these incentive points do not apply.*
  - **Understood.**
- ***Overlay Zoning 40R & 40S*** *(0 or 1) – Refer to Module 4, appendix 4E to review documentation requirements and to determine if this incentive point may be applicable. Please note that required authorizations must be documented prior to MSBA approval of the District's proposed project scope and budget to be eligible to receive this incentive point.*
  - **Understood.**
- ***Overlay Zoning 100 units or 50% of units for 1, 2 or 3 family structures*** *(0 or 0.5) – Refer to Module 4, appendix 4E to review documentation requirements and to determine if this incentive point may be applicable. Please note that required authorizations must be documented prior to MSBA approval of the District's proposed project scope and budget to be eligible to receive this incentive point.*
  - **Understood.**
- ***Energy Efficiency*** *– "Green Schools" (0 or 2) – The Preferred Schematic Report indicates the District's intent to achieve the 2% additional reimbursement through the MSBA Green School Program, refer to additional comments above in section 3.3.4, item 3. Please note, subject to the District's intention to meet certain energy efficiency sustainability requirements for the Proposed Project, the MSBA will provisionally include two (2) incentive points, however if the District does not ultimately qualify for some or all of these incentive points the MSBA will adjust the District's reimbursement rate, accordingly.*
  - **An updated Scorecard has been provided, see attachment "C.1 LEED v4 – Scorecard – Updated 06-20-18"**

**End**

**ATTACHMENT B**
**MODULE 3 – PREFERRED SCHEMATIC SPACE SUMMARY REVIEW**

The Massachusetts School Building Authority (the "MSBA") has completed its review of the proposed space summary of the preferred alternative as produced by Lamoureux Pagano & Associates, Inc. and its consultants. This review involved evaluating the extent to which the Beal Early Childhood Center's proposed space summary conforms to the MSBA guidelines and regulations.

The MSBA considers it critical that the Districts and their Designers aggressively pursue design strategies to achieve compliance with the MSBA guidelines for all proposed projects in the new program and strive to meet the gross square footage allowed per student and the core classroom space standards, as outlined in the guidelines. The MSBA also considers its stance on core classroom space critical to its mission of supporting the construction of successful school projects throughout the Commonwealth that meet current and future educational demands. The MSBA does not want to see this critical component of education suffer at the expense of larger or grander spaces that are not directly involved in the education of students.

The following review is based on the submitted new construction project option with an agreed upon design enrollment of 790 students in grades K-4.

**The MSBA review comments are as follows:**

- **Core Academic** – The District is proposing to provide a total of 46,650 net square feet (nsf) which exceeds the MSBA guidelines by 12,850 nsf. The MSBA notes the following variations to guidelines:
    - (2) Kindergarten classrooms in excess of the guidelines by 2,000 nsf. Based on the information provided in the District's Educational Program, the District is targeting 17-19 students per classroom. The MSBA accepts this variation to the guidelines. No further action required.
        - **Understood.**
    - (4) General classrooms in excess of the guidelines by 3,000 nsf. Based on the information provided in the District's Educational Program, the District is targeting 20-22 students in grades 1-2; and 22-24 students in grades 3-4. However, the preferred solution provides eight classrooms per grade (20 students per classroom). Please provide additional information that clarifies the difference between the District's targeted number of students per classroom and number of classrooms being proposed in response to these review comments.
        - **Shrewsbury School Committee established guidelines [School Committee Policy #525] for elementary classrooms are:**

- **Kindergarten: 17-19 students per class**
- **Grades 1 and 2: 20-22 students per class**
- **Grades 3 and 4: 22-24 students per class**

**Using the low-end of each respective range requires eight classrooms per grade level per the chart below. We expect to achieve this enrollment distribution through a careful and thorough elementary school redistricting plan. If our community continues to grow beyond its enrollment projection, this arrangement also provides for some additional enrollment without needing additional space.**

| Grade | K | 1 | 2 | 3 | 4 | |
|---|---|---|---|---|---|---|
| Students per Classroon | 17 | 20 | 20 | 22 | 22 | |
| Classrooms Required | 8 | 8 | 8 | 8 | 8 | *40* |
| Capacity | 136 | 160 | 160 | 176 | 176 | *808* |

**It should be noted that the District recognized the so noted classroom square footage beyond guideline and consequently reduced each classroom by 25 square feet to mitigate the overage as it places a greater long-term value on the number of classrooms.**

- (8) 650 nsf Commons areas in excess of the guidelines by 5,200 nsf. Based on the information provided and the proposed size of the general classrooms compared to the square foot range allowed in the MSBA guidelines, the MSBA will participate in a portion of the overall proposed square footage associated with the Commons areas. The MSBA calculates ineligible square footage to be approximately 4,200 gross square feet.

  - **Understood.**

  (3) 450 nsf ESL/ELL classrooms in excess of the guidelines by 1,350 nsf. Based on the information provided in the District's Educational Program, the District anticipates 5% of the student population (40 students) being English Language Learners. Please provide additional information that further describes how this space will be utilized and scheduled during a typical school day in response to these review comments.

  - **As noted in the teaching philosophy statement, "Current space limitations constrain the ability of educators to collaborate with parents or other professionals. Some small group instruction must take place in offices, which means that parent and teacher meetings must take place in more public settings and/or after hours." Given the heavy involvement of a variety of support EL students receive, we seek to design space that can accommodate collaboration. This collaboration could take many forms: some ELs are in co-taught classrooms with special educators, and will need services and/or additional practice in order to successfully to apply their language learning. Families may need to "see" instruction in order to replicate strategies at home. Parents may want to**

**volunteer and share their cultures with teachers in order to promote strong school partnerships. Finally, hands on activities with ELs help to engage them in key concepts. Accordingly, these spaces are designed with multipurpose instructional needs in mind.**

- (4) 325 nsf Teacher Planning areas in excess of the guidelines by 1,300 nsf. One of the proposed teacher planning areas on the first floor appears to be the same size as a general classroom. Please clarify. Additionally, please provide additional information that further describes what activities will occur in the teacher planning areas as an elementary school and if this can be done in the general classroom in response to these review comments.

  - **One of the most important indicators of a successful school is the degree to which teachers collaborate. For that reason, the design of the new Beal depicts thoughtful attention to how spaces encourage connections between and across grade levels and departments. The plan allocates additional square footage to planning spaces for several reasons:**

    - **In addition to making space for the larger copier machines that have replaced more expensive printers and other equipment that must be charged and secured in common areas*, adequate planning space is necessary to accommodate the variety of educators that may work together. This space will need to adequately hold and provision classroom teachers meeting together as teams, grade level teams meeting with instructional coaches around curriculum training, specialists joining a vertical group, and outside PD providers offering resources (like anti-bullying, SEL or gender identity training) to paraprofessionals.**

    - **A larger space offers flexibility based in the face of time constraints and with the goal of replicating modern working conditions and trends. A planning room this size rooms provides teachers the flexibility of having "working lunches" in proximity instructional materials or material resources, including projection systems.**

    - **Teacher planning space will be used after hours by clubs, parent groups and ESC. The plan as detailed offers flexibility to educators and community programs alike.**

      ***like Sphero robots**

  **The larger "Teacher Planning" room in question will be addressed and rectified in Schematic Design.**

- **Special Education** – The District is proposing to provide a total of 12,360 net square feet (nsf) which exceeds the MSBA guidelines by 3,300 nsf. Please note that the Special Education program is subject to approval by the Department of Elementary and Secondary Education ("DESE"). The District should provide this with the Schematic Design submittal. Formal approval of the District's proposed Special Education program by the DESE is a prerequisite for executing a Project Funding Agreement with the MSBA.

    - **Understood, the District will provide all required information needed for DESE Review and approval and for the Schematic Design Submittal.**

- **Art and Music** – The District is proposing to provide a total of 5,075 nsf which meets the MSBA guidelines. No further preliminary comments.

    - **Acknowledged.**

- **Health and Physical Education** – The District is proposing to provide a total of 7,650 nsf which exceeds the MSBA guidelines by 1,350 nsf. The MSBA notes the following variations to guidelines:
    - (1) 7,000 nsf Gymnasium in excess of the guidelines by 1,000 nsf. The information provided in the Preliminary Design Program submission indicated the gymnasium is larger than MSBA guidelines in order to provide space for a school wide meeting/assembly that can hold 1,000 occupants.
    - (1) 500 nsf Gym Storeroom in excess of the MSBA guidelines by 350 nsf.

  Please note as of the November 9, 2016 Board of Directors meeting, the District may choose to build a gymnasium and related spaces in excess of MSBA guidelines, but in no event shall the gymnasium exceed 12,000 nsf. The MSBA will participate in a gymnasium of up to 6,000 nsf unless adjusted by the MSBA to increase teaching stations for enrollment and/or the educational plan. Please note the areas in excess of the MSBA guidelines will be at the sole expense of the District. Refer to the attached memorandum which outlines MSBA's policy regarding auditorium and gym spaces beyond those included in the guidelines.

  Based on the estimated preliminary costs submitted as part of the Preferred Schematic Report, the MSBA is providing the following calculation that will be reevaluated again at schematic design that gives a preliminary estimated cost associated with the ineligible spaces:

| | |
|---|---|
| Total net square footage (nsf) requested by the District for Health and Physical Education Category | 7,650 nsf |
| Total nsf for Health and Physical Education Category allowed as eligible by MSBA space guidelines | 6,300 nsf |
| Excess net square footage equals District request | 1,350 nsf |

| | |
|---|---|
| minus net square footage allowable by MSBA space guidelines | |
| Gross square foot (gsf) exclusion = Excess net square feet times the project's grossing factor | 1,350 nsf x 1.50 = 2,025 gsf |
| Preliminary Total cost of exclusion = Gross square foot times the project's total construction cost/square foot | 2,025 gsf x $525/gsf = $1,063,125 |
| Preliminary Total cost of exclusion from the Estimated Basis of Grant | $1,063,125 |

- **Understood, The District and Design Team will review items and adjust when the revisions do not impact the education program and/or delivery of services as the design progresses.**

- **Media Center** – The District is proposing to provide a total of 4,225 nsf which meets the MSBA guidelines. No further preliminary comments.

  - **Acknowledged.**

- **Dining and Food Service** – The District is proposing to provide a total of 10,461 nsf which exceeds the MSBA guidelines by 685 nsf. The MSBA notes the following variations to guidelines:
  - (1) 5,000 nsf Cafeteria/Dining area which is 925 nsf below the guidelines. The information provided in the Preliminary Design Program submission indicated a smaller cafeteria space is adequate for the District. Please note the MSBA guidelines are based on two seatings for elementary school populations.
  - (1) 1,500 nsf Stage in excess of the guidelines by 500 nsf. The information provided in the Preliminary Design Program submission indicated this excess square footage is necessary to accommodate the choral program.
  - (1) 3,200 nsf Kitchen in excess of the guidelines by 1,110 nsf. The information provided in the Preliminary Design Program submission indicated the excess square footage is necessary to support the continuous high volume of student and storage of fresh food offerings.

  The MSBA continues to encourage the District and its consultants to continue to seek opportunities to increase efficiencies to align with MSBA guidelines. Please note area beyond that included in the guidelines will be deemed ineligible.

  - **Understood, The District and Design Team will review items and adjust when the revisions do not impact the education program and/or delivery of services as the design progresses.**

- **Medical** – The District is proposing to provide a total of 950 nsf which exceeds the MSBA guidelines by 240 nsf. The MSBA notes the following variations to guidelines:
  - (1) 100 nsf Medical Suite with Toilet in excess of the guidelines by 40 nsf.
  - (1) 350 nsf Nurse's Office/Waiting Room in excess of the guidelines by 100 nsf.
  - (1) 100 nsf Examination Room/Resting area in excess of the guidelines by 100 nsf.

The MSBA continues to encourage the District and its consultants to continue to seek opportunities to increase efficiencies to align with MSBA guidelines. Please note area beyond that included in the guidelines will be deemed ineligible.

- **Understood, The District and Design Team will review items and adjust when the revisions do not impact the education program and/or delivery of services as the design progresses.**

- **Administration and Guidance** – The District is proposing to provide a total of 2,925 nsf which meets the MSBA guidelines. No further preliminary comments.

  - **Understood.**

- **Custodial and Maintenance** – The District is proposing to provide a total of 2,390 nsf which meets the MSBA guidelines. No further preliminary comments.

  - **Understood.**

- **Total Building Net Floor Area** – The District is proposing to provide a total of 92,686 nsf which exceeds the MSBA guidelines by 18,425 nsf. Please address the comments provided in the categories above as part of the District's response to these comments in order for the MSBA to establish an allowable net square footage.

  - **Understood, See comments above.**

- **Total Building Gross Floor Area** – The District is proposing to provide a total of 142,736 gsf which exceeds the MSBA guidelines by 31,345 gsf. The District's grossing factor remains 1.54 and as indicated in MSBA's Preliminary Design Program review comments, the MSBA will not support a new construction project with a grossing factor that exceeds 1.50. Please adjust accordingly. Please address the comments provided in the categories above as part of the District's response to these comments and resubmit in order for the MSBA to establish an allowable gross square footage.

  - **Understood, The grossing factor will be adjusted accordingly during the Schematic Design Phase.**

Please note that upon moving forward into subsequent phases of the proposed project, the Designer will be required to provide, with each submission, a signed, updated space summary that reflects the design and demonstrates that the design remains, except as agreed to in writing by the MSBA, in accordance with the guidelines, rules, regulations and policies of the MSBA. Should the updated space summary demonstrate changes to the previous space summary include a narrative description of the change(s) and the reason for the proposed changes to the project.

- **Understood.**

**Attachments Included:**

- "Board appointing TM as CEO for Beal_6_14_2018"
- "C.1 LEED v4 - Scorecard - Updated 06-20-18"
- "D.2 Building Floor Plans - Circulation Diagrams"
- "E.5 Site Plan - Security Features"
- "G.1 Updated Project Schedule - Updated 06-20-18"
- "G.3a Preliminary Design Pricing-Table-1 DBB - Updated 06-20-18"
- "G.3b Preliminary Design Pricing-Table-1 CMR - Updated 06-20-18"
- "PMA Memo to MSBA-Local Action & Approval Supplement"

# 4.1.2 SCHEMATIC DESIGN BINDER

## B. Final Design Program

1. Final Design Program
2. Space Summary Template
3. Changes to the Space Summary Template
4. Educational Program Narrative
5. Instructional Technology
6. Functional Relationships & Adjacencies
7. Security & Visual Access Requirements
8. Site Development Requirements
9. Visual or Aesthetic Focal Points

ARCHITECTURAL CHARACTERISTICS

The design of the proposed Beal Elementary School was developed according to criteria established early in the process, and was developed further during the Schematic Design process. The design team has participated in extensive programming meetings with various owner constituencies in the past months in order to fully understand the space requirements to efficiently and effectively deliver the educational, site and building program. Design team members from various disciplines have integrated programming feedback from the following entities:

- Shrewsbury Public Schools K-4 teaching staff and Department Heads
- Shrewsbury Public Schools Superintendent, Assistant Superintendent, Business Manager and Beal School Principal
- Transportation company
- SPS Director of Food Services
- Shrewsbury Electric Light Company (SELCO)
- Shrewsbury Town Department Representatives: Town Manager, Asst. Town Manager, Inspectional Services, Shrewsbury Fire Department, Shrewsbury Police Department, Engineering, Facilities, Parks and Recreation, Public Works, Public Health, and SELCO.

The Final Design Program includes the following:

- Main entry vestibule that opens into the Main Administration suite for security purposes once school is in session
- Centralized core facilities including the Cafetorium, Gym, Media Center and Administration
- Two L-shaped academic wings with classrooms grouped around flexible Common Rooms, sized to break down the overall scale of the facility to an appropriate level for the K-4 students.
- Fully integrated Special education program including: autism support programs, inclusion, reading, speech, OT/PT, and administrative support areas
- Kindergarten classroom grouping located with access to an exterior play area and close proximity to the core facilities
- Gymnasium sized to accommodate full school assembly, physical education programs, and community use, with access to the multipurpose play field
- Cafetorium with stage adjacent to the Music classrooms for assembly large enough for two grade levels. Additionally, seating at tables and chairs for daily lunch service.

- Centralized Media Center designed to support Maker Space inquiry development program areas as well as seating for 80 to accommodate full faculty meetings. Art rooms to be adjacent to the Media Center for flexibility of program opportunities
- Dispersed teacher planning areas to support team teaching concept
- Full perimeter paved access around the school for emergency purposes
- Separate vehicular circulation patterns to accommodate 120 parent pick-up/drop off cars and 15 buses
- Daily parking for 130 and overflow parking accommodations for 350 vehicles
- Two distinct playground areas, one multi-purpose play field and one large paved play area for recess
- Flexible technology throughout the school, incorporating wireless technology and interactive white boards into all teaching spaces and select support spaces
- Design to allow the building to function independently for academic and community uses
- Super-insulated envelope and large expanses of flat roof for future incorporation of photovoltaic array system

Architecturally, the proposed design is intended to convey a clean aesthetic approach to a building type, using a vocabulary of both traditional (masonry, metal windows and doors) and modern (glass, sun control, metal panel) materials. Materials have been selected for their longevity and ease of maintenance. The exterior/interior color palette will respond to the context of the natural landscape, and enhance the individuality of the academic wings.

# *Proposed Space Summary- Elementary Schools*

Date: 9/12/2018 Schematic Design Submittal

| Beal K-4 Elementary | Existing Conditions | | | PROPOSED | | | | | | | | | MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Existing to Remain/Renovated | | | New | | | Total | | | | | | |
| ROOM TYPE | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | Comments |
| **CORE ACADEMIC SPACES** | | | **11,359** | | | **0** | | | **47,865** | | | **47,865** | | **34** | **33,800** | |
| ***(List classrooms of different sizes separately)*** | | | | | | | | | | | | | | | | |
| Pre-Kindergarten w/ toilet | | | | | | | | | 0 | | | 0 | 1,200 | | - | 1,100 SF min - 1,300 SF max |
| Kindergarten w/ toilet | | 10 | 7,185 | | | | 1,135 | 8 | 9,080 | | | 9,080 | 1,200 | 6 | 7,200 | 1,100 SF min - 1,300 SF max |
| General Classrooms - Grade 1-4 | | 3 | 2,087 | | | | 925 | 30 | 27,750 | | | 27,750 | 950 | 28 | 26,600 | 900 SF min - 1,000 SF max |
| General Classrooms - Grade 1-4 | | 3 | 2,087 | | | | 965 | 2 | 1,930 | | | 1,930 | | | | 4,240 NSF of Eligible Space is available from "Kindergarten & General/SPED Classrooms," based on MSBA maximum allowable size |
| Commons | | | | | | | 785 | 3 | 2,355 | | | 2,355 | | | | |
| Commons | | | | | | | 990 | 4 | 3,960 | | | 3,960 | | | | |
| ESL/ELL | | | | | | | 470 | 3 | 1,410 | | | 1,410 | | | | |
| Teacher Planning | | | | | | | 345 | 4 | 1,380 | | | 1,380 | | | | |
| **SPECIAL EDUCATION** | | | **2,753** | | | **0** | | | **13,310** | | | **13,310** | | | **9,060** | |
| ***(List rooms of different sizes separately)*** | | | | | | | | | | | | | | | | |
| Self-Contained SPED | | 2 | 2,248 | | | | 925 | 4 | 3,700 | | | 3,700 | 950 | 6 | 5,700 | 900-1,300 SF equal to surrounding classrooms |
| Self-Contained SPED - toilet | | | | | | | 80 | 4 | 320 | | | 320 | 60 | 6 | 360 | |
| Resource Room | | | | | | | 450 | 12 | 5,400 | | | 5,400 | 500 | 4 | 2,000 | 1/2 size Genl. Clrm. |
| Small Group Room / Reading | | | | | | | 250 | 3 | 750 | | | 750 | 500 | 2 | 1,000 | 1/2 size Genl. Clrm. |
| Reading Office | | | | | | | 120 | 1 | 120 | | | 120 | | | | |
| Reading Storage | | | | | | | 120 | 1 | 120 | | | 120 | | | | |
| Speech | | | | | | | 250 | 2 | 500 | | | 500 | | | | |
| OT/PT | | | | | | | 950 | 2 | 1,900 | | | 1,900 | | | | |
| Special Education Site Coordinator Office | | 1 | 285 | | | | 150 | 1 | 150 | | | 150 | | | | |
| Special Educaiton Conference Room | | 1 | 220 | | | | 350 | 1 | 350 | | | 350 | | | | |
| **ART & MUSIC** | | | **332** | | | **0** | | | **5,075** | | | **5,075** | | | **5,075** | |
| Art Classroom - 25 seats | | 1 | 332 | | | | 1,000 | 2 | 2,000 | | | 2,000 | 1,000 | 2 | 2,000 | assumed schedule 2 times / week / student |
| Art Workroom w/ Storage / Kiln | | | | | | | | 2 | 300 | | | 300 | 150 | 2 | 300 | |
| Music Classroom / Large Group - 25-50 seats | | | | | | | 1,500 | 1 | 1,500 | | | 1,500 | 1,200 | 2 | 2,400 | assumed schedule 2 times / week / student |
| Music Classroom | | | | | | | 1,000 | 1 | 1,000 | | | 1,000 | | | | |
| Music Practice / Ensemble | | | | | | | 0 | 0 | 0 | | | 0 | 75 | 5 | 375 | |
| Music Storage | | | | | | | | 2 | 275 | | | 275 | | | | |
| **HEALTH & PHYSICAL EDUCATION** | | | **3,269** | | | **0** | | | **7,650** | | | **7,650** | | | **6,300** | |
| Gymnasium | | 1 | 3,126 | | | | 7,000 | 1 | 7,000 | | | 7,000 | 6,000 | 1 | 6,000 | 6000 SF Min. Size |
| Gym Storeroom | | 3 | 143 | | | | | 4 | 500 | | | 500 | 150 | 1 | 150 | |
| Health Instructor's Office w/ Shower & Toilet | | | | | | | 150 | 1 | 150 | | | 150 | 150 | 1 | 150 | |
| **MEDIA CENTER** | | | **691** | | | **0** | | | **4,225** | | | **4,225** | | | **4,225** | |
| Media Center | | 1 | 691 | | | | 4,225 | 1 | 4,225 | | | 4,225 | 4,225 | 1 | 4,225 | |
| **DINING & FOOD SERVICE** | | | **2,175** | | | **0** | | | **10,236** | | | **10,236** | | | **9,776** | |
| Cafeteria / Dining | | 1 | 954 | | | | 5,000 | 1 | 5,000 | | | 5,000 | 5,925 | 1 | 5,925 | 2 seatings - 15SF per seat |
| Stage | | | | | | | 1,500 | 1 | 1,500 | | | 1,500 | 1,000 | 1 | 1,000 | |
| Chair / Table Storage | | | | | | | | 2 | 463 | | | 463 | 463 | 1 | 463 | |
| Kitchen | | 1 | 650 | | | | 2,975 | 1 | 2,975 | | | 2,975 | 2,090 | 1 | 2,090 | 1600 SF for first 300 + 1 SF/student Add'l |
| Staff Lunch Room | | 1 | 571 | | | | 298 | 1 | 298 | | | 298 | 298 | 1 | 298 | 20 SF/Occupant |

# *Proposed Space Summary- Elementary Schools*

Date: 9/12/2018 Schematic Design Submittal

| Beal K-4 Elementary | Existing Conditions | | | PROPOSED | | | | | | | | | MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Existing to Remain/Renovated | | | New | | | Total | | | | | | |
| ROOM TYPE | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | Comments |
| **MEDICAL** | | | **172** | | | **0** | | | **906** | | | **906** | | | **710** | |
| Medical Suite Toilet | | 1 | 54 | | | | 75 | 1 | 75 | | | 75 | 60 | 1 | 60 | |
| Nurses' Office / Waiting Room | | | | | | | 410 | 1 | 410 | | | 410 | 250 | 1 | 250 | |
| Resting | | 1 | 118 | | | | 72 | 3 | 216 | | | 216 | 100 | 4 | 400 | |
| Exam Room | | | | | | | 85 | 1 | 85 | | | 85 | | | - | |
| Exam Room | | | | | | | 120 | 1 | 120 | | | 120 | | | - | |
| **ADMINISTRATION & GUIDANCE** | | | **1,026** | | | **0** | | | **2,925** | | | **2,925** | | | **2,925** | |
| General Office / Waiting Room / Toilet | | 2 | 384 | | | | 590 | 1 | 590 | | | 590 | 545 | 1 | 545 | |
| Teachers' Mail and Time Room & Duplicating | | | | | | | 250 | 1 | 250 | | | 250 | 100 | 1 | 100 | |
| Duplicating Room | | | | | | | 0 | 0 | 0 | | | 0 | 150 | 1 | 150 | |
| Records Room | | | | | | | 110 | 1 | 110 | | | 110 | 110 | 1 | 110 | |
| Principal's Office w/ Conference Area | | 1 | 168 | | | | 175 | 1 | 175 | | | 175 | 375 | 1 | 375 | |
| Principal's Secretary / Waiting | | | | | | | | 0 | 0 | | | 0 | 125 | 1 | 125 | |
| Assistant Principal's Office | | | | | | | 175 | 1 | 175 | | | 175 | 120 | 1 | 120 | |
| Supervisory / Spare Office | | | | | | | 150 | 1 | 150 | | | 150 | 120 | 1 | 120 | |
| Conference Room | | | | | | | 400 | 1 | 400 | | | 400 | 250 | 1 | 250 | |
| Guidance Office | | | | | | | 150 | 3 | 450 | | | 450 | 150 | 3 | 450 | |
| Guidance Storeroom | | | | | | | 35 | 1 | 35 | | | 35 | 35 | 1 | 35 | |
| Teachers' Work Room | | 1 | 208 | | | | | 0 | 0 | | | 0 | 545 | 1 | 545 | |
| Instructional Coaches/Cirriculum Coordinator | | 1 | 133 | | | | 120 | 2 | 240 | | | 240 | | | | |
| Instructional/Cirriculum Conference Room | | 1 | 133 | | | | 350 | 1 | 350 | | | 350 | | | | |
| **CUSTODIAL & MAINTENANCE** | | | **531** | | | **0** | | | **2,390** | | | **2,390** | | | **2,390** | |
| Custodian's Office | | 1 | 445 | | | | 100 | 1 | 100 | | | 100 | 150 | 1 | 150 | |
| Custodian's Workshop | | | | | | | 425 | 1 | 425 | | | 425 | 375 | 1 | 375 | |
| Custodian's Storage/Trash/Recycling | | 2 | 38 | | | | 775 | 1 | 775 | | | 775 | 375 | 1 | 375 | |
| Recycling Room / Trash | | | | | | | | | 0 | | | 0 | 400 | 1 | 400 | |
| Receiving and General Supply | | | | | | | | 2 | 363 | | | 363 | 363 | 1 | 363 | |
| Storeroom | | | | | | | 527 | 1 | 527 | | | 527 | 527 | 1 | 527 | |
| Network / Telecom Room [IT Workroom] | | 1 | 48 | | | | 200 | 1 | 200 | | | 200 | 200 | 1 | 200 | |
| **OTHER** | | | **0** | | | **0** | | | **0** | | | **0** | | | **0** | |
| Other *(specify)* | | | | | | | | | 0 | | | | | | | |

# *Proposed Space Summary- Elementary Schools*

Date: 9/12/2018 Schematic Design Submittal

| Beal K-4 Elementary | Existing Conditions | | | PROPOSED: Existing to Remain/Renovated | | | PROPOSED: New | | | PROPOSED: Total | | | MSBA Guidelines (refer to MSBA Educational Program & Space Standard Guidelines) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ROOM TYPE | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | ROOM NFA[1] | # OF RMS | area totals | Comments |
| Total Building Net Floor Area (NFA) | | | 22,308 | | | 0 | | | 94,582 | | | 94,582 | | | 74,261 | |
| Proposed Student Capacity / Enrollment | | | 310 | | | | | | 790 | | | | | | 790 | |
| **NON-PROGRAMMED SPACES** | | | | | % of GFA | 0 | | % of GFA | 47,018 | | % of GFA | -94,582 | | | | |
| Other Occupied Rooms (list separately) | | | | | #DIV/0! | | | 0% | | | #DIV/0! | | | | | Non-Programmed space areas are |
| | | | | | #DIV/0! | | | 0% | | | #DIV/0! | | | | | required to be included in the |
| | | | | | #DIV/0! | | | 0% | | | #DIV/0! | | | | | following submittals: |
| | | | | | #DIV/0! | | | 0% | | | #DIV/0! | | | | | Schematic Design Submittal |
| Unoccupied MEP/FP Spaces | | | | | #DIV/0! | | | 2% | 3,400 | | #DIV/0! | | | | | Design Development Submittal |
| Unoccupied Closets, Supply Rooms & Storage Rooms | | | | | #DIV/0! | | | 1% | 2,112 | | #DIV/0! | | | | | 60% Construction Documents |
| Toilet Rooms | | | | | #DIV/0! | | | 2% | 2,759 | | #DIV/0! | | | | | 90% Construction Documents |
| Circulation (corridors, stairs, ramps & elevators) | | | | | #DIV/0! | | | 18% | 25,086 | | #DIV/0! | | | | | Final Construction Documents |
| Remaining[3] | | | | | #DIV/0! | 0 | | 10% | 13,661 | | #DIV/0! | -94,582 | | | | |
| Total Building Gross Floor Area (GFA)[2] | | | 33,779 | | | | | | 141,600 | | | 0 | | | 114,550 | |
| Grossing factor (GFA/NFA) | | | 1.51 | | | #DIV/0! | | | 1.50 | | | 0.00 | | | 1.54 | |

[1] **Individual Room Net Floor Area (NFA)** Includes the net square footage measured from the inside face of the perimeter walls and includes all specific spaces assigned to a particular program area including such spaces as non-communal toilets and storage rooms.

[2] **Total Building Gross Floor Area (GFA)** Includes the entire building gross square footage measured from the outside face of exterior walls

[3] **Remaining** Includes exterior walls, interior partitions, chases, and other areas not listed above. Do not calculate this area, it is assumed to equal the difference between the Total Building Gross Floor Area and area not accounted for above.

**Architect Certification**

I hereby certify that all of the information provided in this "Proposed Space Summary" is true, complete and accurate and, except as agreed to in writing by the Massachusetts School Building Authority, in accordance with the guidelines, rules, regulations and policies of the Massachusetts School Building Authority to the best of my knowledge and belief. A true statement, made under the penalties of perjury.

**Name of Architect Firm:** Lamoureux Pagano Associates Architects

**Name of Principal Architect:** Kathryn Crockett

**Signature of Principal Architect:**

**Date:** 9/12/2018

## SPACE SUMMARY

Two signed copies of the educational space summary, reflecting the current design, are included in this section. The main differences between the current space summary and the previously submitted Preferred Schematic Report summary are as follows:

- The proposed Total Building Gross Floor Area has been decreased from 142,736 GSF to 141,600 GSF. This is due to the following factors:
  - Greater efficiency with circulation areas
  - Reduced Kitchen and Nurse Suite areas achieved through planning efficiency
  - The evolution of the design from PSR to SD reduced the overall net/gross square footage ratio 1.5 from 1.54.

**The following chart indicates the area changes between the PSR and SD submissions:**

| Space Description | PSR Net SF | SD Net SF |
|---|---|---|
| CORE ACADEMIC SPACES | 46,650 | 47,865 |
| Kindergarten w/toilet | 9200 | 9080 |
| Commons | 5200 | 6315 |
| ESL/ELL | 1350 | 1410 |
| Teacher Planning | 1300 | 1380 |
| SPECIAL EDUCATION | 12,360 | 13,310 |
| Resource Room | 4500 | 5400 |
| OT/PT | 1850 | 1900 |
| ART & MUSIC | 5075 | 5075 |
| Music | 2775 | 2500 |
| DINING & FOOD SERVICE | 10,461 | 10,236 |
| Kitchen | 3200 | 4353 |
| MEDICAL | 960 | 906 |
| Medical Suite toilet | 100 | 75 |
| Nurse Office/Waiting | 350 | 410 |
| Exam/Resting | 500 | 421 |
| ADMINISTRATION & GUIDANCE | 2925 | 2925 |
| Principal Office | 200 | 175 |
| Asst. Principal | 150 | 175 |

| CUSTODIAL & MAINTENANCE | 2390 | 2390 |
|---|---|---|
| Custodian's Office | 150 | 100 |
| Workshop | 375 | 425 |
| Storage | 375 | 775 |
| Recycling/Trash | 400 | 0 |
| | | |
| **TOTAL** | | |
| Net Square Footage | **50,050** | **47,018** |
| Gross Square Footage | **142,736** | **141,600** |

**Core Academic Spaces:**

- Kindergartens were slightly reduced in size, but still within MSBA guidelines.
- Commons net square footage increased due to efficient circulation
- Each ELL/ESL and Teacher Planning space increased slightly

**Special Education:**

- A benefit of the overall design included the opportunity to enlarge the Special Education inclusion classrooms from 375 sf each to 450 sf each without increasing the overall facility size or grossing factor. Following the Schematic Design program meetings, it was determined that the somewhat larger inclusion rooms were needed to meet the program.
- OT/PT Rooms were increased slightly to better accommodate program.

**Art and Music:**

- Music Room was slightly decreased in size

**Health & Physical Education:**

- No changes

**Media Center:**

- No changes

**Dining & Food Service**

- The kitchen plan has been optimized to efficiently support the spatial and equipment needs of the proposed kitchen program within a reduced area.

**Medical Suite:**

- Efficiencies of the plan development allowed for a smaller overall suite that meets the program.

**Administration and Guidance:**

- Most of the adjustments in area are due to combined spaces (such as Duplicating/Mailroom) and corresponding small increases and decreases of spaces following programming meetings.

**Custodial and Maintenance:**

- The facilities department and custodial staff indicated that the trash and recycling are collected in large bins and deposited directly into the dumpsters. As no Trash & Recycle room is required, this 400 NSF space has been removed from the space summary template.
- Increased storage needs were noted and included in the current template.

**Other:**

- No changes.

This is an acknowledgement and certification that the sum of all programmed floor areas plus all other floor areas equal the gross floor area of the Final Design Program.

Kathryn Crockett AIA

Lamoureux Pagano Associates Architects

DISTRICT EDUCATIONAL PROGRAM

The proposed design supports the District's Educational Program by grouping the core facilities together near the main entrance to support the strong extended day learning program, extensive community use, and administrative supervision. As desired in the program, the main entrance vestibule is designed to limit access to the school through the administration suite only during school hours. In this manner, the public flow is controlled through the administration prior to entering the facility – providing a security control point as well as a welcoming feature. The academic wings are designed to radiate from the core facilities, minimizing the length of travel from the classroom areas to the core facilities. Within the academic wings, special education spaces are well integrated with general classrooms. Additionally, the academic wings are organized with clusters of classrooms around multi-purpose Common Rooms – facilitating diverse curriculum delivery opportunities as well as effectively breaking down the school into smaller scale "neighborhoods."

The Site Plan has been carefully developed to provide the desired adjacencies between the building and the outdoor features to support the program. The main entrance will function as the bus drop off/pick up point while a secondary entrance has been integrated into the lower level to facilitate parent pick up/drop off as well as access to the paved play area/playground to be used at recess at extended day. The multi-purpose athletic field is positioned with direct access from the gymnasium to support outdoor physical education programs. Directly outside the kindergarten wing, a second play area is located for non- recess play schedules. Academic outdoor activities will be supported with a raised bed garden, butterfly garden and reading areas, and bioswale drainage area.

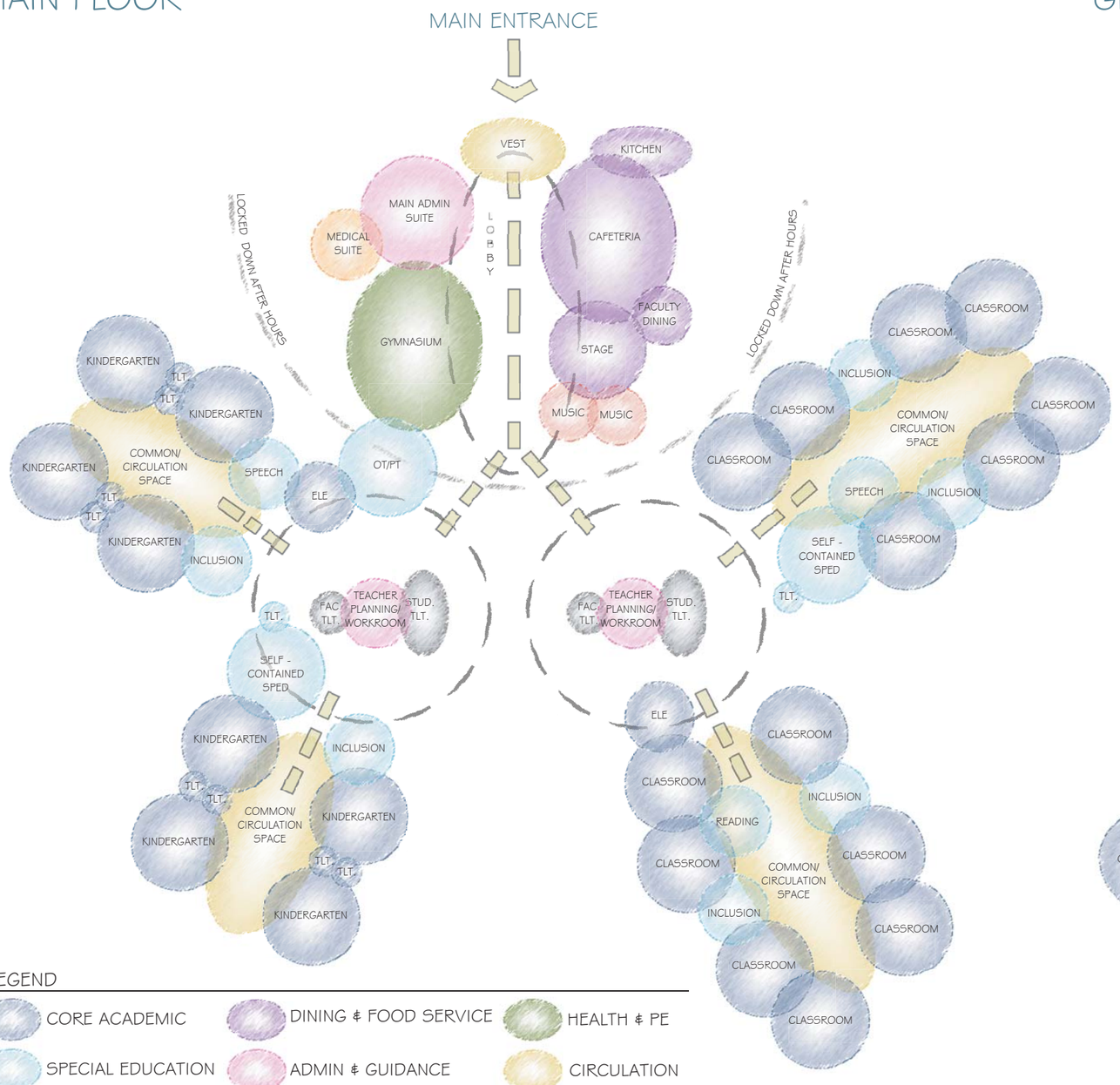
The significant vehicular traffic is designed to be separated with parent pick-up/drop off and bus traffic completely distinct without crossover. Additionally, daily parking is accommodated in designated parking lots with overflow parking plans as dual use of other paved areas on the site.

INSTRUCTIONAL TECHNOLOGY

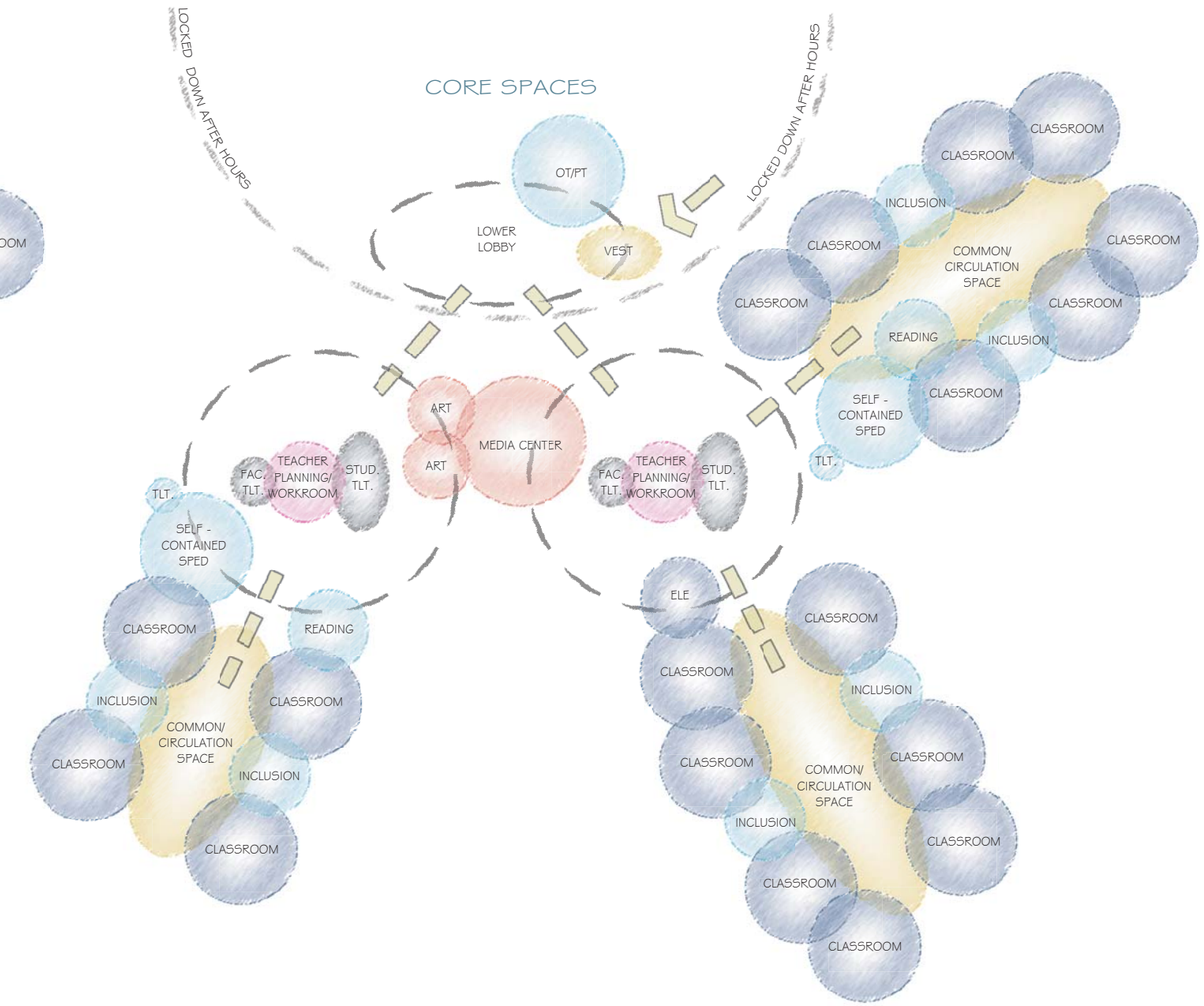
The Beal school will be developed with wireless access throughout to eventually support a 1:1 program. Each classroom and several auxiliary spaces including conference rooms and faculty planning will feature and interactive wall mounted projector. The program calls for mobile devices and charging carts – each classroom will include adequate charging outlets. The Beal Elementary School will include IT standards as defined by the town's power/telecommunications company, SELCO.

SCHEMATIC DESIGN

## MAIN FLOOR




## GROUND FLOOR




LEGEND

- CORE ACADEMIC
- SPECIAL EDUCATION
- MEDIA / ART / MUSIC
- DINING & FOOD SERVICE
- ADMIN & GUIDANCE
- MEDICAL
- HEALTH & PE
- CIRCULATION
- OTHER

SECURITY AND VISUAL ACCESS

**Process:** Three meetings have been held to confirm security policy and facility requirements. Along with representatives of the police and fire departments, school facilities and inspectional services personnel have been present.

Following the District and Town policies, the following security and visual access measures have been incorporated into the Beal design:

- Full perimeter vehicular access
- Access control at all major entry doors
- Knox boxes to be located at the upper and lower lobby entrances as well as the Outdoor Storage entrance near the main electrical service
- Classroom hardware to be the classroom lock function all keyed alike
- Exterior and interior surveillance system with cameras at all exterior doors, interior corridors, and toilet room entrances. Additionally site cameras will be positioned to cover the building perimeter.
- Main entry vestibule design to limit access to the facility during school hours only through the main administration suite where check in will take place
- Visibility from corridors to all classrooms
- Rawlings system used for lockdown
- Telephone system will all school announcement capabilities from any location with an appropriate password
- Call assurance system in each classroom to connect with the main administration suite directly during an emergency
- Fire/Police will have ability to log into video surveillance system
- Intrusion motion detection at grade level windows, doors
- Exterior building lighting sufficient for emergencies/monitoring

See Attached Minutes from latest meeting.

# Beal Early Childhood Center

1 Maple Avenue, Shrewsbury, MA 01545

# MEMO OF PROGRAMMING MEETING
# SECURITY AND VISUAL ACCESS

30 August 2018

ATTENDANCE: Patty Sheehan, Building Inspector
Brian L'Heureux, Director of Information Technology
James Hester Jr., Chief, Shrewsbury Police Department
Scott Mentzer, School Resource Officer, Shrewsbury Police Department
James Vuona, Chief, Shrewsbury Fire Department
Bruce Card, Deputy Chief, Shrewsbury Fire Department
Patrick Collins, SPS, Asst. Superintendent for Finance & Operations
Bob Cox, Superintendent of Public Buildings
Kathryn Crockett, LPA
Sean Brennan, LPA

| ITEM: | DESCRIPTION: | RESPONSIBILITY: |
|---|---|---|
| | | |
| 08.30.18.01 | **GENERAL OVERVIEW OF BUILDING**<br>Katie gave quick overview of the status of the project and reported that the town is anticipating the new school to be ±142,000 sq.ft. and it will be constructed on the Glavin Center Site. This will require full demolition of the existing Glavin Center Facility and improvements to Lake Street. The school is anticipated to open in the fall of 2021 and will be utilized year round. The project is being procured under the Construction Manager at Risk delivery method and may include some early site bid packages. | |
| | | |
| 08.30.18.02 | The group reviewed the site layout and the following items were requested/confirmed for inclusion in the project:<br>• Additional bollards at the main entry to supplement the natural barrier created by the canopy<br>• Ensuring that roof access is not easily achievable due to placement of building elements, i.e. rain leaders, fencing, etc.<br>• Site lighting will be via lamp post lights and wall packs on the building.<br>• Security cameras will give pull perimeter surveillance of the building including all entry doors.<br>• Full perimeter vehicular access is provided<br>• Two separate entry points to the site should one of them become blocked during an emergency<br>• Separate Pick-up/Drop-off loops for parents and buses<br>• Lake Street improvements to remediate horizontal and vertical alignment issues and designation as a "School Zone" | LPA |
| | | |
| 08.30.18.03 | The group reviewed the building layout and the following items were requested/confirmed for inclusion in the project:<br>• Entry through the main entrance will require visitors to first be buzzed into the vestibule then buzzed yet again into the main office reception area before being allowed access to the remainder of the building. | LPA |

# MEMO OF PROGRAMMING MEETING
# SECURITY AND VISUAL ACCESS

30 August 2018

| ITEM: | DESCRIPTION: | RESPONSIBILITY: |
|---|---|---|
| | • [2] Knox boxes are to be placed at each of the following entry points: the main entrance, the lower lobby entrance, and the electrical/outdoor storage entrance.<br>• Classrooms to be outfitted with "Classroom" operation locksets. Each room will also have a communicating door to the adjacent classrooms located on either side.<br>• Sidelights and door vision panels were discussed at length and will be studied and reviewed further during Design Development<br>• Rawlings system for lockdown<br>• Call Assurance system will be tied into Public address system<br>• Brivo Access controls<br>• Video Surveillance System: exterior doors, interior corridors, toilet room entrances. Remote access will be available to both Police and Fire Departments<br>• Intrusion detection at grade level windows and doors<br>• Room numbering will utilize 100's on the "ground" level and 200's on the "main" level<br>• Rated Electrical Rooms to be outfitted with smoke and/or heat detectors along with a sprinkler head immediately outside of access doors to the room. | LPA |
| | | |
| 08.30.18.04 | Egress Paths were reviewed/discussed at length and will be further studied during the Design Development Phase. The following remarks/comments were made:<br>• The lockset functions of doors during after hour use needs to be selected carefully to ensure that police and fire can access all portions of the building.<br>• Doors may need to be alarmed rather than locked down during after hour use to maintain required egress paths in the case of an emergency. This would apply to after hour use of both the gymnasium and the cafeteria.<br>• The proposed egress paths for the gymnasium are acceptable to the building inspector. The option of introducing a set of doors directly to the exterior was also discussed and would be an acceptable alternative to one of the other interior sets of egress doors.<br>• The Cafeteria egress was reviewed and in order to meet the three distinct egress pathways the pathway to the loading dock area would require a 42" high guardrail in order to be an acceptable means of egress. The two other pathways were deemed acceptable; one directly through the vestibule and the other out through the lobby down the corridor and out the vestibule next to the gymnasium.<br>• Common Rooms egress was reviewed and the district would like to pursue some type of floor pattern similar to the pattern at Sherwood's commons to help staff and students ensure egress pathways are kept open. The town has not observed any | LPA |

# MEMO OF PROGRAMMING MEETING
# SECURITY AND VISUAL ACCESS

30 August 2018

| ITEM: | DESCRIPTION: | RESPONSIBILITY: |
|---|---|---|
| | violations during their inspections at Sherwood with the exception that the projection screen has on occasion obstructed the emergency lighting. This should be accounted for in the new design.<br>• The lower level corridor next to the Art rooms can be eliminated as it is not required to satisfy egress requirements. | LPA |
| | | |
| 08.30.18.05 | All departments strongly recommended that ample storage be provided to alleviate code violations. Additionally education spaces should be sized appropriately to ensure spaces not originally intended as occupiable space are not used as instructional space, i.e. storage areas | LPA |
| | | |
| 08.30.18.06 | The main stair in the lobby was discussed at length in regards to its effect on after hours use and will be reviewed further during the Design Development Phase. | LPA |
| | | |

Memo by: Sean Brennan, LPA
cc: Attendees
Seth Colby, Captain, Shrewsbury Fire Department

SITE DEVELOPMENT REQUIREMENTS

The site layout, in particular the configuration of the bus drop-off and the parent vehicles evolved as the result of meetings with town officials and multiple design iterations. In addition, to the site program outlined above, the following features are worthy of note:

- As the site will be unoccupied, demolition of the existing building and site preparation can begin without consideration of maintaining an existing occupancy
- The plan calls for realignment and regrading of Lake Street the length of the school property. This improvement will greatly improve sight lines at the site driveways and improve the road width in this portion of the street
- A well and associated irrigation system is planned for the multi-purpose physical education field
- Sidewalk access throughout the site and along the realigned Lake Street will provide accessible walks to all major features of the site
- Parent pick up/drop off will accommodate 120 cars. This paved area will become one way during events allowing for parallel parking along its length.
- Buses will circulate in a separate route from the parent cars and will accommodate 15 buses in queue.
- Two access points to the site will remain, but will be adjusted to better accommodate the flow of traffic as appropriate
- The paved recess area will be used as overflow parking during special events
- Land acquisition by the town from the state has gone through legislative and governor approval

DESIRED VISUAL OR AESTHETIC FOCAL POINTS

The intended primary visual focal point of the proposed building is the main entrance Lobby signified by the sloped roof that extends from the bus drop off canopy through the main vestibule past the cafeteria and gym through the lower level media center.

At the end of each academic wing, the Common Room provides visual connections to all classrooms in the cluster as well as the exterior.

The building is designed for users to easily identify the major program components, provide intuitive circulation paths, and strong interior and exterior connections throughout. The scale is intentionally reduced to provide a welcoming, inviting environment for the young students. This is achieved through the upper level entrance, maximum two story height, and compact academic wings.

# 4.1.2 SCHEMATIC DESIGN BINDER

## C. Traffic Analysis

1. Traffic Analysis
2. Traffic Impact Study

As part of the PSR submission, Nitsch Engineering prepared a traffic impact study for both of the alternative sites. That report has been revised for this submission to include only references to the preferred site, the Glavin Center site. The existing conditions assessment identified that that the Stopping Sight Distance in the southbound direction at the northern curb cut to the site did not meet the minimum requirements. Additionally, the Intersection Sight Distance for both right-turning and left-turning vehicles onto Lake Street do not meet the minimum requirements. The proposed realignment of Lake Street and designation of the street as a "School Zone" would resolve both of these deficiencies. This scope of work is reflected in the Total Project Budget that is part of this submission.

The report also reviewed the impact of traffic at the intersection of Lake Street and the Boston Turnpike. The intersection already sees heavy traffic volumes and delays during peak hours which will overlap slightly with the pick-up/drop-off traffic at the new school. The overall impact on this intersection can be characterized as marginal in comparison to the current and projected no-build Level of Service Criteria. Also reviewed were the required queuing lengths for the pick-up/drop-off. The queuing lengths available on site were sufficient to support the number of cars both entering and leaving the site without causing any delays in traffic flow on Lake Street.

The bus and parental vehicular traffic loops are completely separate from one another in the proposed design allowing both safe pick-up/drop-off of students. The report mentions the potential need for a crossing guard along Lake Street, however, the likely hood of students walking to the school from this direction is extremely rare. The School District is currently in the process of acquiring an easement through the lower portion of the westerly parcel to provide a pedestrian pathway to the school from the adjoin neighborhood.

Nitsch Engineering

August 24, 2018

# TRAFFIC IMPACT STUDY

For

**THE BEAL EARLY CHILDHOOD CENTER SCHOOL**
1-7 Maple Street
Shrewsbury, MA

Prepared for:

**LAMOUREUX PAGANO ARCHITECTS**
108 Grove Street
Worcester, MA 01605

Prepared by:

**NITSCH ENGINEERING, INC.**
2 Center Plaza, Suite 430
Boston, MA 02108

Nitsch Project #12345.

Building better communities with you.

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# 1 INTRODUCTION

Nitsch Engineering has been retained by Lamoureux Pagano Architects (LPA) to prepare a qualitative assessment of safety, traffic circulation, and traffic access/egress associated with the schematic design for the Beal Early Childhood Center project in Shrewsbury, Massachusetts. The following alternative has been considered for the reconstruction:

Glavin Center Site:

Construct a new Beal Early Childhood Center building and grounds on the site of the existing Glavin Center, located at 214 Lake Street in Shrewsbury, Massachusetts.

This report will outline the existing and proposed traffic volumes, operations, and safety of the adjacent surrounding roadways and intersections. The site-generated trips for the Center will be estimated using Institute of Transportation Engineers (ITE) *Trip Generation,* 10th Edition. The report will use this information to project future conditions for the proposed site.

The standards used for analysis conform to the 2009 edition of the Manual on Uniform Traffic Control Devices (MUTCD) and the 2010 edition of the Highway Capacity Manual.

The following conditions are analyzed in this report:

- 2018 Existing Conditions;
- Future 2025 No-Build; and
- Future 2025 Build.

The Locus Map is shown in Figure 1. The study area for the proposed site is shown in Figure 2.

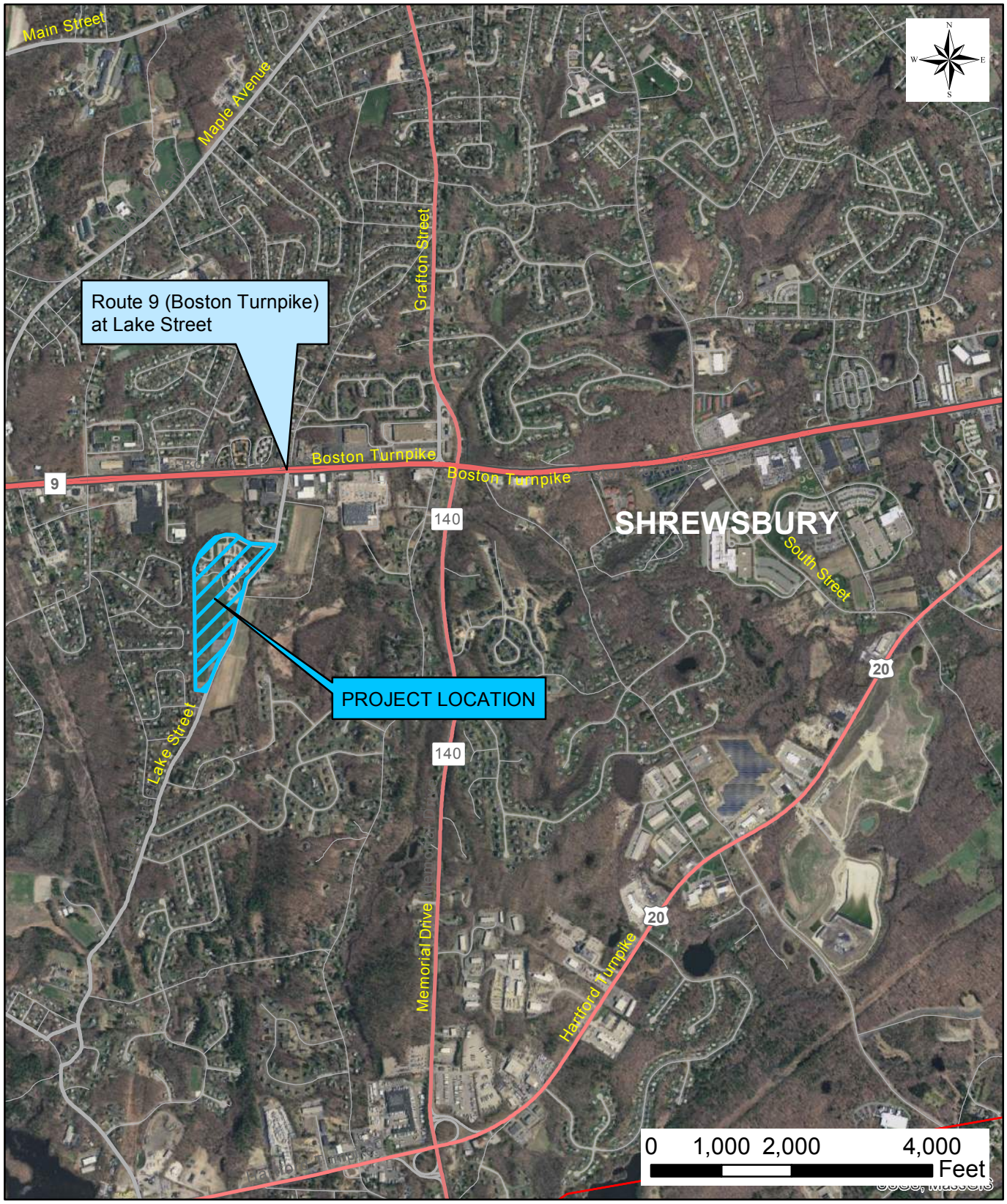



**Figure 1: Locus Map**
Beal Early Childhood Center
Shrewsbury, MA

Data Source: MassGIS
Nitsch Project #12345

Nitsch Engineering

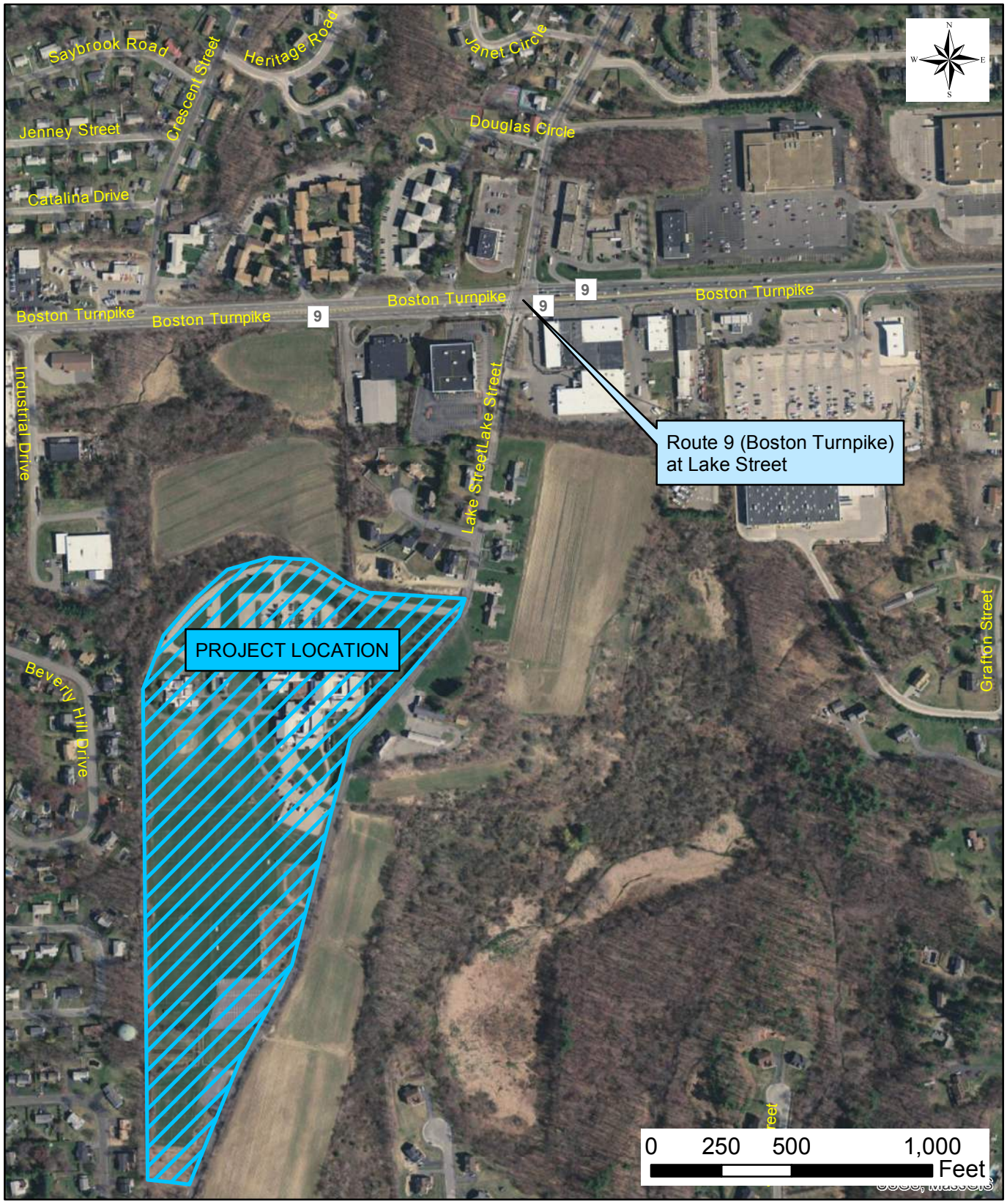



**Figure 2: Study Area**
Beal Early Childhood Center
Shrewsbury, MA

Data Source: MassGIS
Nitsch Project #12345

Nitsch Engineering

# 2 EXISTING CONDITIONS

## 2.1 Study Area Roadways

To examine the existing conditions, we studied and collected data at the following roadways:

1. Boston Turnpike (Route 9);
2. Hartford Turnpike (Route 20); and
3. Lake Street.

*Boston Turnpike (Route 9)*

Boston Turnpike (Route 9) is a major east-west roadway in Massachusetts that runs between Boston and Pittsfield, serving as a major alternative to the Massachusetts Turnpike (I-90). It is classified by the Massachusetts Department of Transportation (MassDOT) as an urban principal arterial roadway and is on the National Highway System (NHS). In the study area vicinity, it is a limited access route with a posted speed limit of 45 miles per hour (MPH), except westbound from South Street to west of Grafton Street is 50 MPH, and eastbound east of South Street is 55 MPH. The land use along Boston Turnpike is primarily commercial in the study area. The roadway is under MassDOT jurisdiction.

*Hartford Turnpike (U.S. Route 20)*

U.S. Route 20 in Massachusetts extends from Boston to Hancock on the New York state border. In the study area vicinity, it is called Hartford Turnpike. It is classified by MassDOT as an urban principal arterial roadway and is on the NHS. The posted speed limit is 50 MPH. The land use along Hartford Turnpike is primarily commercial and open space in the study area. The roadway is under MassDOT jurisdiction.

*Lake Street*

Lake Street extends from Grafton Street (Route 140) in the north to Hartford Turnpike in the south. It is classified by MassDOT as an urban minor arterial roadway between Boston Turnpike and Hartford Turnpike, and it is classified as an urban collector between Boston Turnpike and Grafton Street. There is no posted regulatory speed limit on Lake Street, though an advisory speed of 30 MPH is posted. The land use along Lake Street is primarily residential. The roadway is under the jurisdiction of the Town of Shrewsbury.

## 2.2 Study Area Intersections

To examine the existing conditions, we included the following intersection in the study area. The intersection location is shown in Figure 1.

*Boston Turnpike (Route 9) at Lake Street*

Boston Turnpike and Lake Street intersect to form a four-way signalized intersection with Boston Turnpike approaching from the east and west, and Lake Street approaching from the north and south.

From the east, Boston Turnpike is a two-way roadway with two lanes in each direction, separated by a concrete median barrier. The approach to the intersection consists of four lanes: an exclusive left-turn lane with 250 feet of storage, two through lanes, and an exclusive right-turn lane with 260 feet of storage. There are two eastbound

receiving lanes. Boston Turnpike is approximately 95 feet wide at the intersection. There are no sidewalks on this leg of the intersection.

From the west, Boston Turnpike is a two-way roadway with two lanes in each direction, separated by a concrete median barrier. The approach to the intersection consists of four lanes: an exclusive left-turn lane with 415 feet of storage, two through lanes, and an exclusive right-turn lane with 415 feet of storage. There are two westbound receiving lanes. Boston Turnpike is approximately 95 feet wide at the intersection. There are no sidewalks on this leg of the intersection.

From the north, Lake Street is a two-way roadway with one lane in each direction, separated by a double yellow centerline. The approach to the intersection consists of two lanes: an exclusive left-turn lane with 160 feet of storage and a shared through/right-turn lane. There is one northbound receiving lane. Lake Street is approximately 46 feet wide at the intersection. Bituminous sidewalk is present on the west side of Lake Street.

From the south, Lake Street is a two-way roadway with one lane in each direction, separated by a double yellow centerline. The approach to the intersection consists of two lanes: an exclusive left-turn lane with 120 feet of storage and a shared through/right-turn lane. There is one southbound receiving lane. Lake Street is approximately 40 feet wide at the intersection. There are no sidewalks on this leg of the intersection.

Crosswalks are present across the west and south legs of the intersection. There are no bicycle accommodations at the intersection.

The fully actuated traffic signal operates in five phases. The first phase is a protected left-turn phase for eastbound and westbound. If one of those movements gaps out before the other, the second phase serves all movements in the opposing direction, including the continuation of the protected left-turn. The third phase serves eastbound and westbound through and right-turn movements, with left turns prohibited. In the fourth phase, northbound and southbound movements are served with permissive left turns. The fifth phase is a pushbutton-actuated exclusive pedestrian phase serving the two marked crossings.

# 3 SAFETY ANALYSIS

## 3.1 Crash Data

Nitsch Engineering reviewed the crash data from MassDOT for the three most recent years available – 2013 to 2015 – for the study intersection. A summary of the crashes, including the severity and the manner of collision are shown in Table 1.

**Table 1 - Crash Summary**

| Location | Number of Crashes | | | Severity | | | | Manner of Collision | | | | | Percent During | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | Total Crashes | Average | PD[a] | PI[b] | NR[c] | F[d] | A[e] | RE[f] | HO[g] | Other[h] | Incl. Ped-Bike[j] | Peak Hours[k] | Wet/Icy Conditions |
| Route 9 at Lake Street | 2013 | 8 | 17.00 | 7 | 1 | 0 | 0 | 0 | 7 | 0 | 1 | 0 | 0% | 25% |
| | 2014 | 11 | | 9 | 2 | 0 | 0 | 4 | 4 | 1 | 2 | 0 | 18% | 18% |
| | 2015 | 15 | | 12 | 2 | 1 | 0 | 2 | 10 | 1 | 2 | 1 | 33% | 20% |
| **TOTAL** | | ***34*** | **17.00** | ***28*** | ***5*** | ***1*** | ***0*** | ***6*** | ***21*** | ***2*** | ***5*** | ***1*** | ***21%*** | ***21%*** |

[a]Property Damage Only; [b]Personal Injury Only (non-Fatal Injury); [c]Not Reported; [d]Fatality; [e]Angle; [f]Rear end; [g]Head on; [h]Sideswipe, opposite direction; sideswipe, same direction, single vehicle crash, rear-to-rear, not reported, unknown, etc.; [j]Includes pedestrian or cyclist; [k]Occurred between 7-9am or 4-6pm

A total of 35 crashes were reported within the study areas for the three locations from 2013 to 2015. In terms of severity, 28 of the crashes involved property damage only, 5 reported personal injury, and one was not reported. In terms of manner of collision, 6 of the crashes were angle collisions, 21 were rear-end, two were head-on, and 5 were of other type. One of the crashes involved a pedestrian. Approximately 21% of the crashes occurred during the peak hours of 7:00 to 9:00 AM or 4:00 to 6:00 PM and 21% occurred during wet/icy conditions. Analyzing the crash data, as most crashes were of angle or rear-end type, the crashes were most likely caused by driver carelessness or inattentiveness.

## 3.2 Intersection Crash Rates

The intersection crash rate is recognized as an effective tool to measure the safety of intersections. For intersections, crash rates are expressed by the number of crashes per million entering vehicles (MEV). As of February 9, 2016, the average statewide crash rate for signalized intersections is 0.58 crashes per MEV and 0.77 crashes per MEV for signalized intersections. For District 3, which includes the Town of Shrewsbury, the rate for signalized intersections is 0.65 crashes per MEV and 0.90 crashes per MEV for signalized intersections. Intersection crash rate worksheets can be found in Appendix A-3.

# 4 EXISTING TRAFFIC CONDITIONS

## 4.1 2015 Traffic Count Data

*Turning Movement Count (TMC) Data*

LPA provided Nitsch Engineering with TMCs for the intersection of Boston Turnpike (Route 9) at Lake Street, which was collected by MassDOT on Tuesday, March 29, 2016.

The peak hours within the study area were established as 7:30 AM to 8:30 AM during the weekday morning period and 5:15 PM to 6:15 PM during the evening period. The typical school afternoon peak hour normally occurs between 2:30 PM and 3:30 PM. However, to remain conservative in our analysis we used the evening peak periods. The 2018 existing traffic volumes are shown in Figures 3A and 3B.

## 4.2 Seasonal Adjustment

Nitsch Engineering researched data from MassDOT to establish if any seasonal adjustment to the traffic counts was necessary. We researched and used the MassDOT's 2013 Weekday Seasonal Adjustment Factors, which is the latest data set available. The data compares monthly traffic volumes from different types of roadways across the Commonwealth to compare the traffic volumes from each individual month to the annual average. During the month of March on urban arterials and collectors, traffic volumes are approximately 2% higher than an average month. Therefore, we made no adjustment to the collected volumes. The Weekday Seasonal Adjustment Factors are included in Appendix A-2.

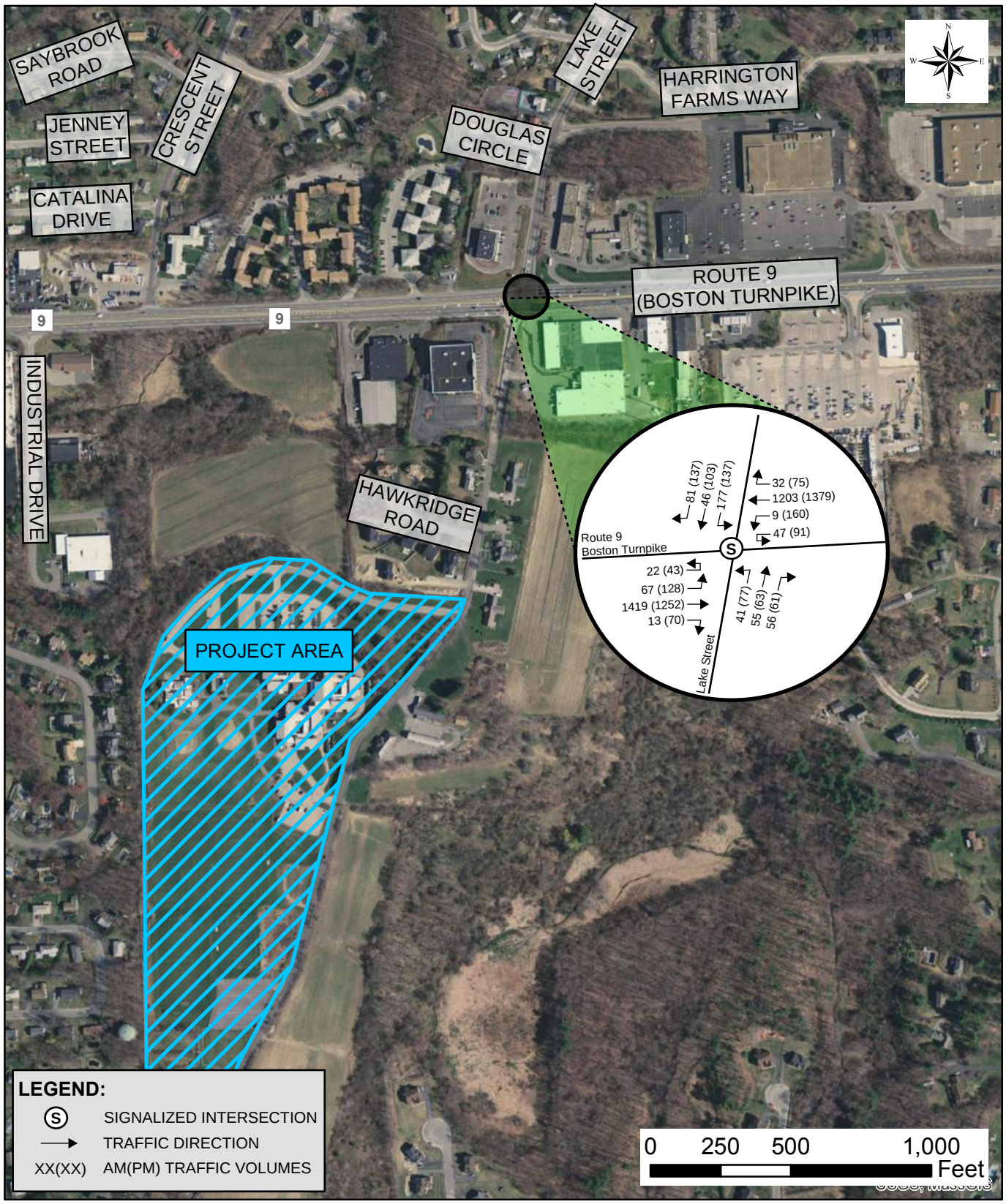



**Figure 3: 2018 Existing Peak Hour Volumes**
Beal Early Childhood Center
Shrewsbury, MA

Data Source: MassGIS
Nitsch Project #12345

Nitsch Engineering

# 5 FUTURE NO-BUILD TRAFFIC CONDITIONS

## 5.1 Background Growth

Consistent with recent MassDOT projects in eastern and central Massachusetts, we used an annual background traffic growth rate factor of 0.5%.

## 5.2 No-Build Traffic Volumes

The 2025 No-Build Traffic Volumes for the proposed site are shown in Figures 4, and are derived by applying the traffic growth rate of 0.5% per year over the seven-year design horizon to project the 2025 traffic volumes.

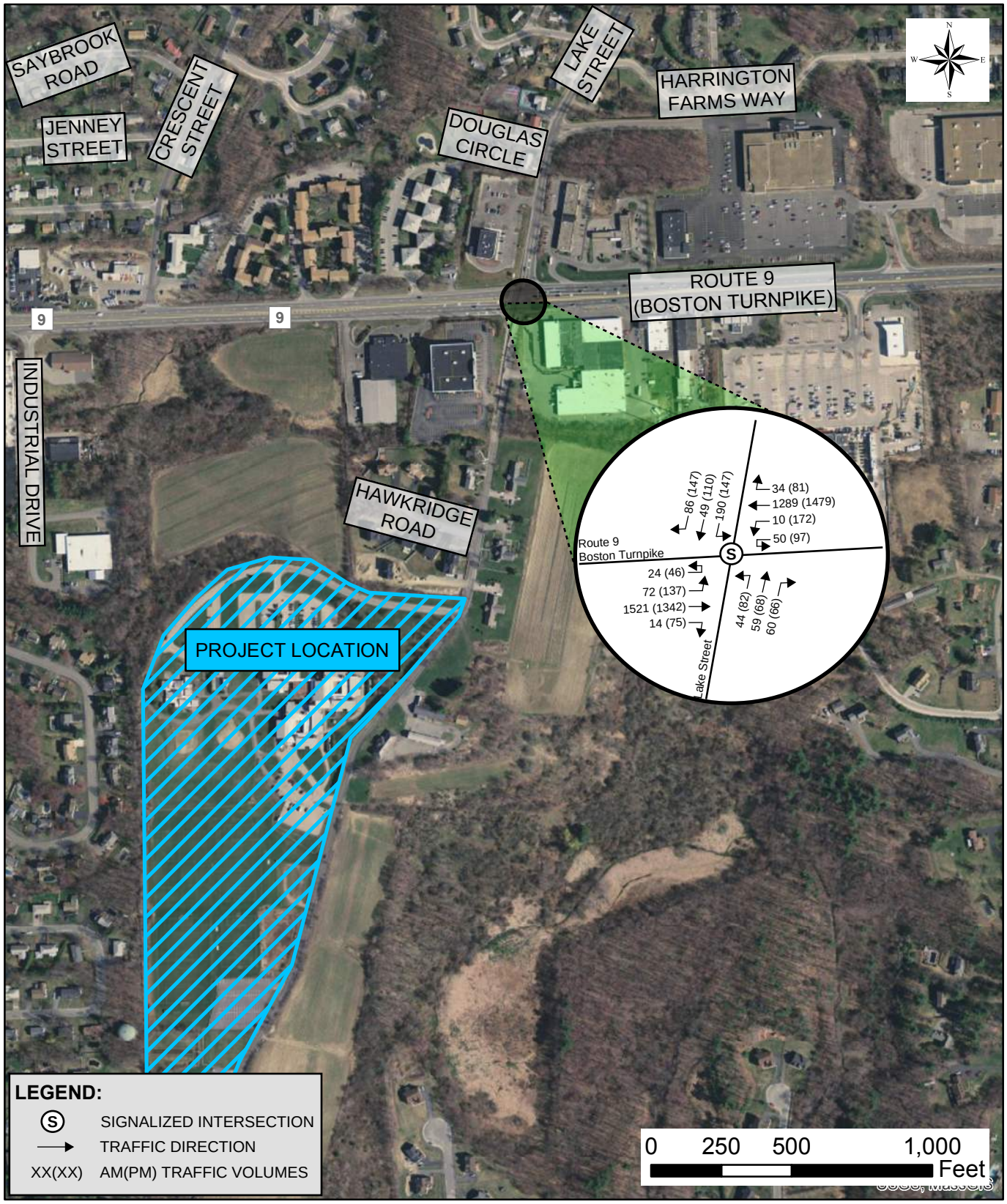



**Figure 4: 2025 No-Build Peak Hour Volumes**
Beal Early Childhood Center
Shrewsbury, MA

Data Source: MassGIS
Nitsch Project #12345

Nitsch Engineering

## 6 FUTURE CONDITIONS

We examined the proposed future conditions with respect to the feasibility of constructing a new Beal Early Childhood Center building and grounds on the proposed Glavin Center site.

### 6.1 Proposed Trip Generation

The proposed Beal Early Childhood Center consists of 790 students. The Proposed School Program calls for 120 parental pick-ups/drop-offs, 15 buses, and approximately 130 staff and visitors. The Program also calls for 350 trips during its summer program.

Nitsch Engineering also used the Institute of Transportation Engineers (ITE) publication *Trip Generation*, 10th Edition to estimate the vehicle trip rates for the proposed center. To be conservative in our analysis, we compared both rates, and used the higher one.

Trip generation rates for the early childhood educational center were based on Land Use Code (LUC) 520 (Elementary School).

Based on ITE Trip Generation, the proposed Beal Early Childhood Center would result in approximately 1500 new daily trips (750 trips in and 750 trips out), with 514 trips (278 trips in and 236 trips out) during the weekday morning peak hour and 269 additional trips (121 trips in and 148 trips out) during the weekday afternoon peak hour. These numbers account for vehicular traffic associated with 15 buses, visitors, teachers, and staff at the new school, as well as the additional student drop-offs and pick-ups during adverse weather. The Trip Generation reports are included in Appendix 4.

**Table 2 - Proposed Trip Generation**

| TIME PERIOD | | FUTURE VEHICLE TRIPS BASED ON SCHOOL PROGRAM | FUTURE VEHICLE TRIPS BASED ON ITE TRIP GENERATION RATES |
|---|---|---|---|
| AM | ENTERING | 265 | 278 |
| | EXITING | 135 | 236 |
| | TOTAL | 400 | 514 |
| PM | ENTERING | 120 | 121 |
| | EXITING | 135 | 148 |
| | TOTAL | 255 | 269 |

Since the ITE Trip Generation rates project more trips than the School Program, we used the ITE Trip Generation numbers for new trips in this Study.

## 6.2 Proposed Beal Early Childhood Center on the Glavin Center Site

A sketch plan of the redevelopment of Beal Early Childhood Center on the Glavin Center Site is shown in Appendix 5. The sketch plan shows the proposed driveway location of the school on an existing base map with the site location and outline.

*Site Layout*

For the construction of the new Beal Early Childhood Center building and grounds on the Glavin Center site, the building would be constructed oriented north-south on the westerly side of the site on Lake Street.

*Parking*

Approximately 130 parking spaces are proposed. During the summer programs, 350 vehicles will be able to park in the grounds.

*Sight Distance*

Stopping Sight Distance (SSD) is the length of the roadway ahead that is visible to the driver and should be sufficiently long to enable a vehicle traveling at or near the design speed to stop before reaching a stationary object in its path. Stopping sight distance is the sum of the distance traversed by the vehicle from the instant the driver sights an object necessitating a stop to the instant the brakes are applied and the distance needed to stop the vehicle from the instant brake application begins.

Intersection Sight Distance (ISD) is the length of the leg of the departure sight triangle along the major road in both directions for a vehicle stopped on the minor road waiting to depart. The critical departure sight triangles for the Beal Early Childhood Center driveway are for traffic approaching from either the left or right for left turns from the driveways onto the main road. The methods for determining the sight distances needed by drivers approaching intersections are based on the same principles as stopping sight distance, but incorporate modified assumptions based on observed driver behavior at intersections.

The SSD and ISD values associated with a given design speed are shown in Table 3. The site distance evaluations for the Glavin Center Site are shown in Table 4.

**Table 3 – Sight Distance Criteria**

| DESIGN SPEED | DESIGN STOPPING SIGHT DISTANCE VALUE[1] (SSD) | RECOMMENDED INTERSECTION SIGHT DISTANCE VALUE[2] (ISD) |
|---|---|---|
| (MPH) | (FT) | (FT) |
| 15 | 80 | 170 |
| 20 | 115 | 225 |
| 25 | 155 | 280 |
| 30 | 200 | 335 |
| 35 | 250 | 390 |
| 40 | 305 | 445 |
| 45 | 360 | 500 |
| 50 | 425 | 555 |
| 55 | 495 | 610 |
| 60 | 570 | 665 |
| 65 | 645 | 720 |
| 70 | 730 | 775 |
| 75 | 820 | 830 |
| 80 | 910 | 885 |

Source: *A Policy on Geometric Design of Highways and Streets, AASHTO, Washington DC (2011)*

[1]Design value based on a grade of less than 3%, a brake reaction distance predicted on a time of 2.5 seconds and a deceleration rate of 11.2 ft/s$^2$

[2]Recommended value based on Case B1 - a stopped passenger car to turn left onto a two-lane highway with no median and grades 3% or less

Lake Street is not posted with a regulatory speed limit. A 35 MPH speed was used to calculate the minimum sight distance to be conservative.

At Lake Street and Proposed Beal Early Childhood Center Driveway, the SSD in the northbound direction of Lake Street approaching the Driveway exceeds the minimum values. However, the SSD in the southbound direction as well as the ISD for right-turning and left-turning vehicles onto Lake Street do not meet the minimum requirements.

**Table 4 - Proposed Sight Distance Evaluation**

| INTERSECTION | POSTED SPEED (MPH) | 85th PERCENTILE SPEED (MPH) | MINIMUM (FEET)[1,2] | MEASURED (FEET) | OBSTRUCTION |
|---|---|---|---|---|---|
| *Lake Street at Potential Site Driveway* | | | | | |
| Stopping Sight Distance: | | | | | |
| Lake Street Northbound | Not Posted | 35 | 250 | >600 | Vertical curve |
| Lake Street Southbound | Not Posted | 35 | 250 | 208 | Horizontal curve |
| Intersection Sight Distance: | | | | | |
| Looking to the right from Site Driveway | Not Posted | 35 | 390 | >600 | Vertical curve |
| Looking to the left from Site Driveway | Not Posted | 35 | 390 | 208 | Horizontal curve, utility pole |

*Source: A Policy on Geometric Design of Highways and Streets, AASHTO, Washington DC (2011)*

[1] Table 3-1. Stopping Sight Distance on Level Roadways

[2] Table 9-6. Design Intersection Sight Distance - Case B1, Left Turn from Stop

*Trip Distribution, Diversion, and Assignment – Glavin Center Site*

The trips to/from the Glavin Center Site were distributed and assigned based on the exiting travel patterns and logical travel routes, which are based on the existing roadway network both within the Town of Shrewsbury and around the surrounding region.

In order to properly assess the effect of trips associated with the Glavin Center Site, projected trips generated by the site as described in Section 6.1 were assigned to study intersections. The Trip Distribution percentages specific to the Glavin Center Site are shown in Figure 5.

The resultant Trip Assignment volumes for both the weekday morning and weekday afternoon peak hours were calculated by multiplying the Trip Distribution by the Trip Generation from Table 2 and are shown in 6.

*Proposed 2025 Build Volumes*

The corresponding trip assignment volumes were added to the 2025 No-Build Volumes to yield the 2025 Build Volumes. The 2025 Build Volumes for the proposed school at Glavin Center site are shown in Figures 7.

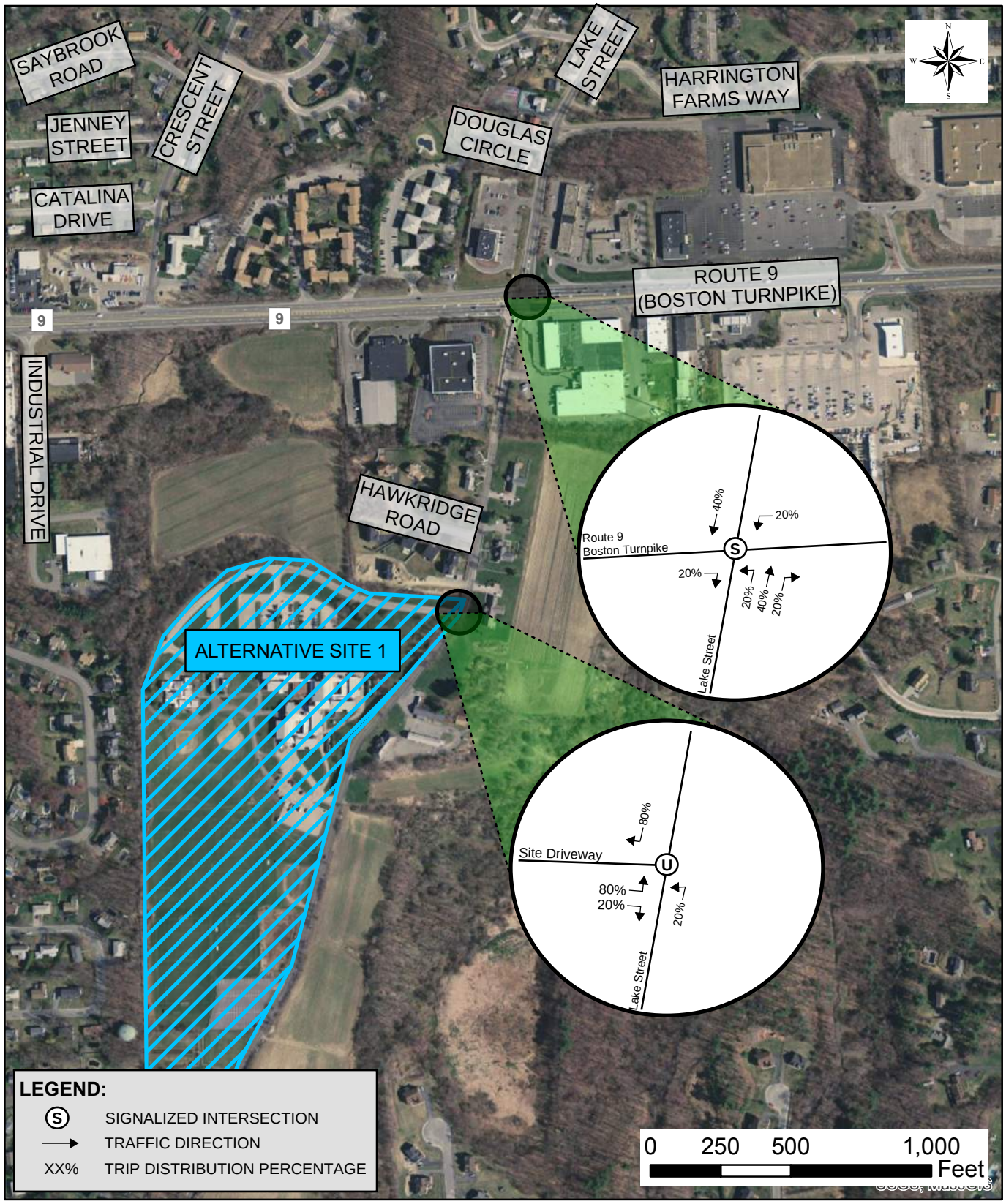



**Figure 5: Trip Distribution**
Beal Early Childhood Center
Shrewsbury, MA

Data Source: MassGIS
Nitsch Project #12345

Nitsch Engineering

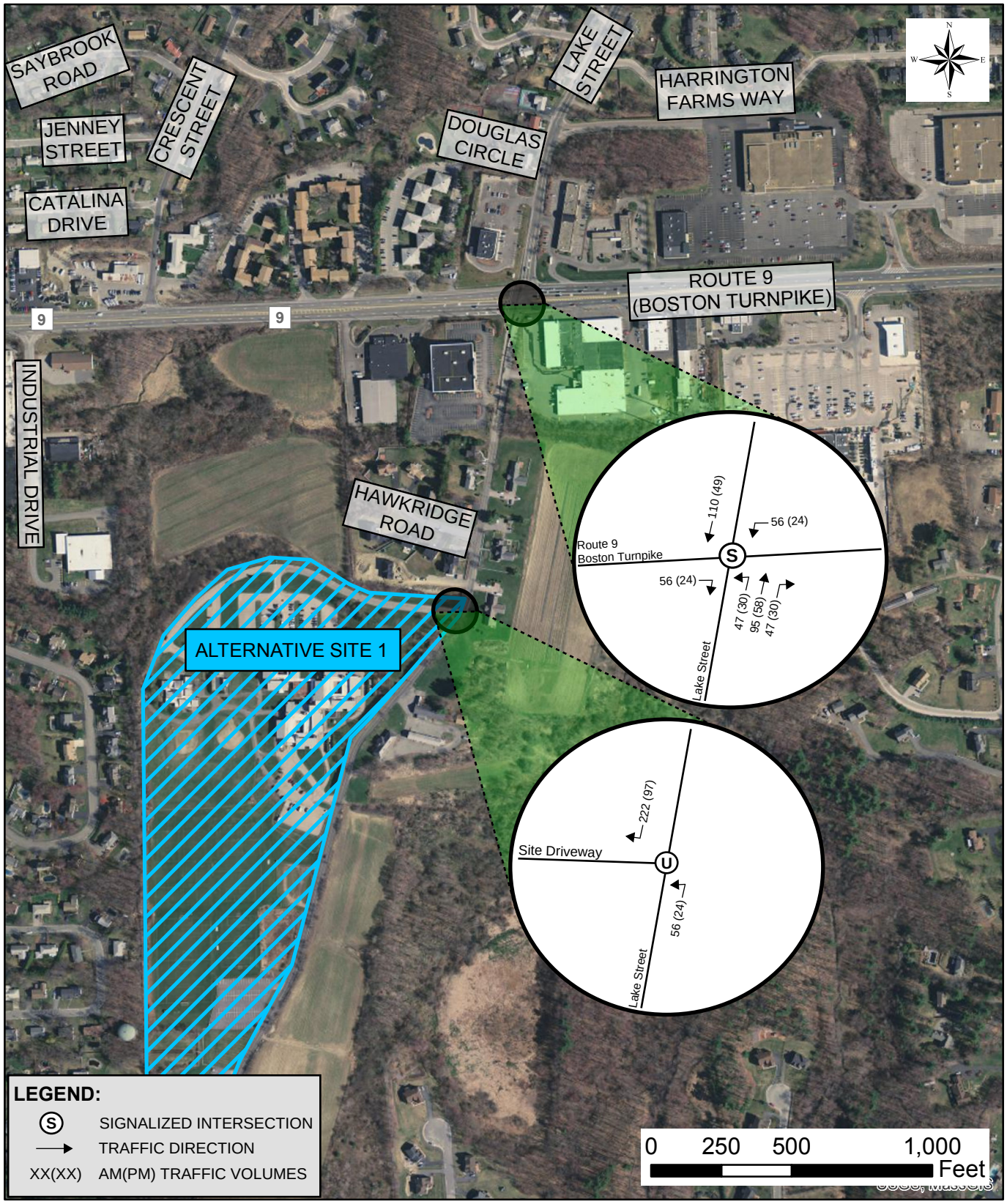
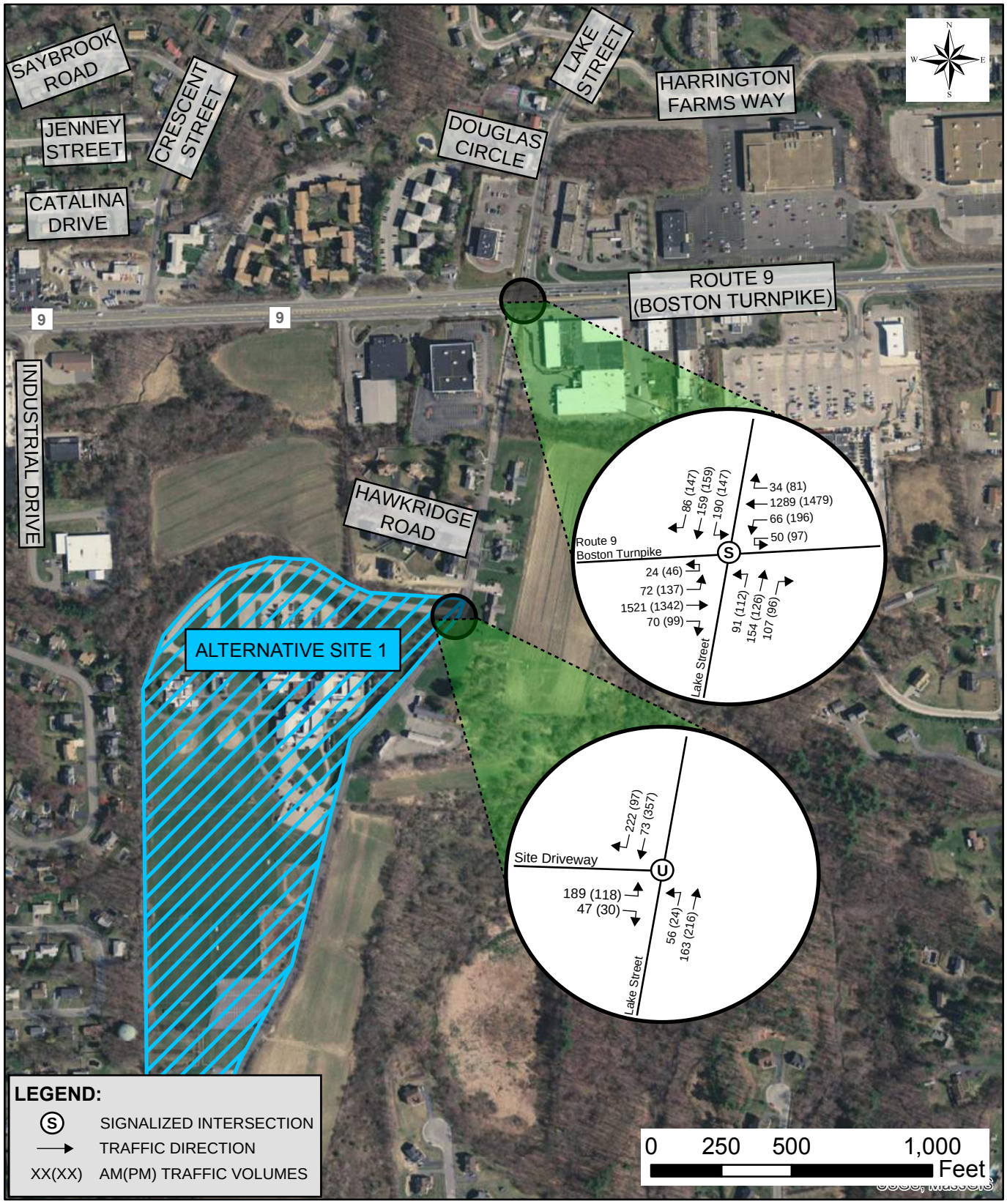



**Figure 6: Trip Assignment**
Beal Early Childhood Center
Shrewsbury, MA

Data Source: MassGIS
Nitsch Project #12345

Nitsch Engineering




# Figure 7: 2025 Build Peak Hour Volumes

Beal Early Childhood Center
Shrewsbury, MA

Data Source: MassGIS
Nitsch Project #12345

Nitsch Engineering

# 7 OPERATIONS ANALYSIS

## 7.1 Level of Service Criteria

Level of Service (LOS) is a qualitative measure describing operational conditions within a traffic stream. Six LOS criteria are used to describe the quality of traffic flow for any type of facility controls. LOS A represents the best operating conditions and LOS F represents the worst operating conditions. LOS D or better is generally considered acceptable levels of service in an urban or suburban setting. Nitsch Engineering analyzed the levels of service for the study intersections using Synchro 8 software, which is based on the traffic operational analysis methodology of the Highway Capacity Manual[1] (HCM). The methodology for signalized intersections assesses the effects of signal type, timing, phasing, progression, vehicle mix, and geometrics on control delay. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Table 5 summarizes the relationship between LOS and average control delay for signalized and unsignalized intersections.

**Table 5 - Level of Service Criteria**

| SIGNALIZED INTERSECTIONS | | UNSIGNALIZED INTERSECTIONS | | |
|---|---|---|---|---|
| Level of Service | Control Delay (seconds/vehicle) | Level of Service by Volume-to-Capacity (v/c) Ratio | | Control Delay (seconds/vehicle) |
| | | v/c ≤ 1.0 | v/c > 1.0 | |
| A | 0 to 10 | A | F | 0 to 10 |
| B | >10 to 20 | B | F | >10 to 15 |
| C | >20 to 35 | C | F | >15 to 25 |
| D | >35 to 55 | D | F | >25 to 35 |
| E | >55 to 80 | E | F | >35 to 50 |
| F | >80 | F | F | >50 |

Source: 2010 Highway Capacity Manual, Transportation Research Board, Washington D.C. 2010

## 7.2 Capacity Analysis

Nitsch Engineering performed traffic analyses to evaluate traffic operations for the 2018 Existing Conditions, 2025 No-Build Conditions, and 2025 Build Conditions during the weekday morning and weekday afternoon peak hours at the study intersections. The analyses determine the volume-to-capacity (v/c) ratio, vehicle delay, LOS, and the 50th/95th percentile vehicle queues.

## 7.3 2018 Existing Capacity Analysis

Nitsch Engineering analyzed the 2018 Existing Conditions traffic operations at the study intersections based on the existing traffic counts. The Level of Service summaries are shown in Table 6. The analysis worksheets are provided in Appendix A-6.

[1] Highway Capacity Manual, 2010 Edition, Transportation Research Board (TRB), Washington, D.C.

**Table 6 – Level of Service Summary – 2018 Existing Conditions**

| INTERSECTION | MOVEMENT | WEEKDAY MORNING PEAK HOUR | | | | | WEEKDAY EVENING PEAK HOUR | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | V/C[1] | DELAY[2] | LOS[3] | 50th Q[4] | 95th Q[5] | V/C[1] | DELAY[2] | LOS[3] | 50th Q[4] | 95th Q[5] |
| Boston Turnpike (Rte 9) at Lake St | Rte 9 EB - L | 0.52 | 54.3 | D | 56 | 136 | 0.72 | 61.2 | E | 111 | #247 |
| | Rte 9 EB - T | 0.95 | 40.6 | D | 452 | 1013 | 0.90 | 38.8 | D | 387 | #832 |
| | Rte 9 EB - R | 0.02 | 19.2 | B | 4 | 22 | 0.11 | 2.6 | C | 27 | 82 |
| | Rte 9 WB - L | 0.39 | 52.6 | D | 39 | 96 | 0.80 | 60.7 | E | 170 | #428 |
| | Rte 9 WB - T | 0.91 | 36.7 | D | 387 | #812 | 0.87 | 33.8 | C | 440 | #972 |
| | Rte 9 WB - R | 0.05 | 2.0 | A | 0 | 6 | 0.11 | 6.0 | A | 0 | 36 |
| | Lake St NB - L | 0.16 | 35.4 | D | 21 | 70 | 0.65 | 63.0 | E | 52 | #147 |
| | Lake St NB - TR | 0.28 | 35.2 | D | 59 | 153 | 0.39 | 41.0 | D | 78 | 169 |
| | Lake St SB - L | 0.71 | 52.0 | D | 112 | #301 | 0.68 | 58.1 | E | 86 | #223 |
| | Lake St SB - TR | 0.36 | 35.6 | D | 73 | 173 | 0.75 | 55.7 | E | 154 | #347 |
| | Overall | 0.95 | 39.5 | D | | | 0.90 | 40.9 | E | | |
| | | | | | | | | | | | |

[1] Volume to Capacity Ratio; [2] Vehicle Delay, measured in seconds; [3] Level Of Service; [4] 50th Percentile Queue (in feet); [5] 95th Percentile Queue (in feet) based upon 22 feet per vehicle; * = Defacto Left Lane; # = volume exceeds capacity, queue may be longer; m = 95th percentile queue is metered by upstream signal; ~ = Volume exceeds capacity, queue is theoretically infinite

## 7.4 2025 No-Build Capacity Analysis

Nitsch Engineering analyzed the 2025 No-Build Conditions traffic operations at the study intersections. The 2025 No-Build Condition represents the 2018 Existing Conditions and projects a traffic increase at the rate of 0.5% per year between 2018 and 2025. The Level of Service summaries are shown in Table 7. The analysis worksheets are provided in Appendix A-6.

**Table 7 – Level of Service Summary – 2025 Future No-Build Conditions**

| INTERSECTION | MOVEMENT | WEEKDAY MORNING PEAK HOUR | | | | | WEEKDAY EVENING PEAK HOUR | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | V/C[1] | DELAY[2] | LOS[3] | 50th Q[4] | 95th Q[5] | V/C[1] | DELAY[2] | LOS[3] | 50th Q[4] | 95th Q[5] |
| Boston Turnpike (Rte 9) at Lake St | Rte 9 EB - L | 0.55 | 54.9 | D | 63 | 147 | 0.74 | 63.2 | E | 121 | #274 |
| | Rte 9 EB - T | 1.02 | 56.3 | E | ~572 | 1130 | 1.00 | 57.4 | E | 463 | #920 |
| | Rte 9 EB - R | 0.02 | 19.6 | B | 4 | 24 | 0.12 | 23.2 | C | 30 | 87 |
| | Rte 9 WB - L | 0.42 | 53.3 | D | 44 | 105 | 0.98 | 73.2 | E | 189 | #465 |
| | Rte 9 WB - T | 0.98 | 46.7 | D | 443 | 914 | 0.99 | 52.3 | D | 530 | 1074 |
| | Rte 9 WB - R | 0.05 | 2.4 | A | 0 | 7 | 0.12 | 6.4 | A | 1 | 39 |
| | Lake St NB - L | 0.18 | 36.2 | D | 23 | 74 | 0.59 | 55.8 | E | 55 | #155 |
| | Lake St NB - TR | 0.30 | 35.9 | D | 63 | 163 | 0.37 | 39.9 | D | 85 | 182 |
| | Lake St SB - L | 0.79 | 59.1 | E | 125 | 341 | 0.64 | 53.7 | D | 94 | #248 |
| | Lake St SB - TR | 0.39 | 38.5 | D | 79 | 185 | 0.70 | 50.8 | D | 167 | #383 |
| | Overall | 1.02 | 50.4 | D | | | 1.00 | 54.0 | D | | |
| | | | | | | | | | | | |

[1] Volume to Capacity Ratio; [2] Vehicle Delay, measured in seconds; [3] Level Of Service; [4] 50th Percentile Queue (in feet); [5] 95th Percentile Queue (in feet) based upon 22 feet per vehicle; * = Defacto Left Lane; # = volume exceeds capacity, queue may be longer; m = 95th percentile queue is metered by upstream signal; ~ = Volume exceeds capacity, queue is theoretically infinite

## 7.5 2025 Build Capacity Analysis

Nitsch Engineering analyzed the 2025 Build Conditions traffic operations at the study intersections for constructing the Beal Early Childhood Center on Glavin Center site. The 2025 Build Conditions represents the 2025 No-Build Conditions traffic volumes with added Trip Assignment volumes for the Beal Early Childhood Center. The Level of Service summaries are shown in Table 8. The analysis worksheets are provided in Appendix A-6.

**Table 8 – Level of Service Summary – 2025 Future Build Conditions**

| INTERSECTION | MOVEMENT | WEEKDAY MORNING PEAK HOUR | | | | | WEEKDAY EVENING PEAK HOUR | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | V/C[1] | DELAY[2] | LOS[3] | 50th Q[4] | 95th Q[5] | V/C[1] | DELAY[2] | LOS[3] | 50th Q[4] | 95th Q[5] |
| Boston Turnpike (Rte 9) at Lake St | Rte 9 EB - L | 0.54 | 55.3 | E | 62 | 146 | 0.74 | 63.3 | E | 121 | #274 |
| | Rte 9 EB - T | 1.14 | 99.3 | F | ~609 | 1188 | 1.00 | 57.8 | E | 463 | 920 |
| | Rte 9 EB - R | 0.12 | 21.5 | C | 26 | 86 | 0.16 | 23.5 | C | 41 | 110 |
| | Rte 9 WB - L | 0.60 | 55.4 | E | 81 | 168 | 0.97 | 88.3 | F | 209 | 519 |
| | Rte 9 WB - T | 0.96 | 44.3 | D | 443 | 910 | 0.99 | 52.7 | D | 530 | 1074 |
| | Rte 9 WB - R | 0.05 | 2.4 | A | 0 | 7 | 0.12 | 6.4 | A | 1 | 39 |
| | Lake St NB - L | 0.60 | 54.0 | D | 54 | #184 | 1.09 | 149.8 | F | 94 | 264 |
| | Lake St NB - TR | 0.65 | 44.3 | D | 157 | #393 | 0.60 | 45.6 | D | 151 | 295 |
| | Lake St SB - L | 1.50 | 289.7 | F | ~187 | #434 | 1.00 | 116.5 | F | 104 | 312 |
| | Lake St SB - TR | 0.70 | 47.8 | D | 159 | #379 | 0.82 | 58.4 | E | 205 | 486 |
| | Overall | 1.50 | 77.4 | E | | | 1.09 | 60.6 | E | | |
| | | | | | | | | | | | |
| Lake St at BECC Driveway | BECC EB - LR | 0.47 | 17.2 | C | - | 62 | 0.39 | 19.3 | C | - | 46 |
| | Lake St NB -LT | 0.05 | 2.4 | A | - | 4 | 0.02 | 1.1 | A | - | 2 |
| | Lake St SB - TR | 0.19 | 0.0 | A | - | 0 | 0.29 | 0.0 | A | - | 0 |
| | | | | | | | | | | | |

[1] Volume to Capacity Ratio; [2] Vehicle Delay, measured in seconds; [3] Level Of Service; [4] 50th Percentile Queue (in feet); [5] 95th Percentile Queue (in feet) based upon 22 feet per vehicle; * = Defacto Left Lane; # = volume exceeds capacity, queue may be longer; m = 95th percentile queue is metered by upstream signal; ~ = Volume exceeds capacity, queue is theoretically infinite

# 8 CONCLUSIONS AND RECOMMENDATIONS

## 8.1 Conclusions

Nitsch Engineering has been retained by Lamoureux Pagano Architects to prepare a qualitative assessment of safety, traffic circulation, and traffic access/egress associated with the schematic design for the Beal Early Childhood Center project in Shrewsbury, Massachusetts. The project involves constructing the new Beal Early Childhood Center building and grounds on the site of the existing Glavin Center, located at 214 Lake Street in Shrewsbury, Massachusetts.

We examined the future conditions as well as site circulation with respect to the projected student drop-off and pick-up at the Beal Early Childhood Center. This would result in an increase in traffic volumes at the school during the weekday morning drop-off and weekday afternoon pick-up, totaling approximately 514 trips (278 entering and 236 exiting) during the weekday morning drop-off, and approximately 269 trips (121 entering and 148 exiting) during the weekday afternoon pick-up. The parking lot will contain approximately 130 spaces, of which approximately 20 to 30 spaces may be available for parental parking, based on existing parking utilization. The curbs at the parking lot and at the car loop may provide additional space for temporary parking during drop-off and pick-up.

We anticipate that the following summarizes the vehicular circulation at the school during morning drop-off and afternoon pick-up periods:

- During the morning drop-off, approximately 278 vehicles (of which approximately 121 will be the parents dropping off their children) will arrive between 7:00 and 9:00 AM. The children will be dropped-off at the car loop. Our analysis indicates that during the morning drop-off, the 95th percentile queue length at exiting the school driveway for the left and right turns to Lake Street will be 62 feet (approximately 4 vehicles), and the 95th percentile queue length on Lake Street for the left turn to the school will be 4 feet (approximately 1 vehicle).

- During the afternoon pick-up, the parents (approximately 121) will start arriving between 2:00 and 3:30 PM. The parking lot may accommodate approximately 30 vehicles, and the parental pick-up/drop-off curb line may accommodate additional vehicles. Once the parents have picked up their children, they will proceed to exit the parking lot and the school. Our analysis indicates that during the afternoon pick-up, the 95th percentile queue length exiting the school driveway for the left and right turns to Lake Street will be 46 feet (approximately 3 vehicles), the 95th Percentile Queue length on Lake Street for the left turn to School will be 2 feet (approximately 1 vehicle).

The existing roadway network along Boston Turnpike (Route 9) contains heavy traffic volumes and delays during the weekday morning peak hours, and the proposed Beal Early Childhood Center pick-up and drop-off traffic will overlap slightly with the peak hour of the commuter traffic. The site driveways also lack adequate site distance. To mitigate the impacts, geometric improvements and changes to speed regulations may be necessary at Lake Street. Nitsch Engineering has outlined recommendations in the next section to improve traffic conditions based on the estimated increase in traffic volumes due to the proposed Beal Early Childhood Center.

## 8.2 Recommendations

Based on the proposed Beal Early Childhood Center, Nitsch Engineering offers the following recommendations:

- Designate Lake Street as a School Zone under State and local statute, and install the appropriate School Zone signs.
- Crossing guards may be required at Lake Street during school drop-off and pick-up.
- Improve the site distance at the school exiting driveway using geometric changes and implementing traffic calming measures.
- Reach out to parents via social media to increase safety awareness.

# 4.1.2 SCHEMATIC DESIGN BINDER

## D. Environmental Assessment

1. Environmental Assessment
2. Hazardous Material Report
3. Arsenic Analysis Results for Soil Samples
4. COMM-97 Soil Analysis Results

Two additional reports were commissioned for the Schematic Design phase of the project to better assess the impact of existing hazardous materials at the Glavin Center building campus and the soil content.

The hazardous materials study of the existing buildings was conducted by UEC and the full report follows in this section. A limited number of interior materials contained high levels of asbestos. Much of the exterior wall and structural dampproofing, window caulking, and some roofing materials also showed asbestos content that will require removal per regulatory statute. It is assumed that little of the existing building would be reusable as processed structural fill for the new construction. The report abatement estimate has been included in the construction estimate.

Additional testing of the soils was conducted to get more information on the levels of naturally occurring arsenic on site as well as the requisite Comm-97 filing. The results of this report will be used as the site development parameters are finalized for the project. More information on the proposed strategy is outlined in the next section with the geotechnical report narrative.

# FINAL REPORT
# FOR
# HAZARDOUS MATERIALS IDENTIFICATION
# STUDY
# AT THE
# GLAVIN CENTER
# SHREWSBURY, MASSACHUSETTS

PROJECT NO: 218 255.00

Survey Dates:
August 16-23, 2018

CONDUCTED BY:

**UNIVERSAL ENVIRONMENTAL CONSULTANTS**
**12 Brewster Road**
**Framingham, MA 01702**

UEC universal environmental consultants

September 4, 2018

Ms. Katie Crockett
President
Lamoureux Pagano Associates
108 Grove Street
Worcester, MA 01605

Reference: Report for Hazardous Materials Identification Study
Glavin Center, Shrewsbury, MA

Dear Ms. Crockett:

Thank you for the opportunity for Universal Environmental Consultants (UEC) to provide professional services.

Enclosed please find the report for the hazardous materials identification study at the Glavin Center, Shrewsbury, MA.

Please do not hesitate to call should you have any questions.

Very truly yours,

Universal Environmental Consultants

_____
Ammar M. Dieb
President

UEC:\218 255.00\Report.DOC

Enclosure

## 1.0 INTRODUCTION:

Universal Environmental Consultants (UEC) has been providing comprehensive asbestos services since 2001 and has completed projects throughout New England. We have completed projects for a variety of clients including commercial, industrial, municipal, and public and private schools. We maintain appropriate asbestos licenses and staff with a minimum of thirty years of experience.

UEC was contracted by Lamoureux Pagano Associates to conduct the following services at the Glavin Center, Shrewsbury, Massachusetts:

- Asbestos Containing Materials (ACM) determination inspection and sampling;
- Polychlorinated Biphenyls (PCB's)-Electrical Equipment and Light Fixtures inspection;
- PCB's in Caulking inspection;
- Lead Based Paint (LBP) inspection;
- Other hazardous materials inspection.

The scope of work included the inspection of accessible ACM, collection of bulk samples from materials suspected to contain asbestos, determination and quantities of types of ACM found and cost estimates for remediation. A comprehensive survey per the Environmental Protection Agency (EPA) NESHAP regulation would be required prior to any renovation or demolition activities.

Bulk samples analyses for asbestos were performed using the standard Polarized Light Microscopy (PLM) Meth3od in accordance with EPA standard. Bulk samples were collected by Massachusetts licensed asbestos inspectors Mr. Leonard J. Busa (AI-030673) and Mr. Jason Becotte (AI-034167) and analyzed by Massachusetts licensed laboratories Asbestos Identification Laboratory and EMSL, Woburn, MA.

Samples results are attached.

## 2.0 FINDINGS:

**Asbestos Containing Materials (ACM):**
The regulations for asbestos inspection are based on representative sampling. It would be impractical and costly to sample all materials in all areas. Therefore, representative samples of each homogenous area were collected and analyzed or assumed.

All suspect materials were grouped into homogenous areas. By definition a homogenous area is one in which the materials are evenly mixed and similar in appearance and texture throughout. A homogeneous area shall be determined to contain asbestos based on findings that the results of at least one sample collected from that area shows that asbestos is present in an amount greater than 1 percent in accordance with EPA regulations. Per the Department of Environmental Protection (DEP) any amount of asbestos found must be disposed as asbestos.

***Number of Samples Collected:***
Barn 1:

Five (5) bulk samples were collected from materials suspected of containing asbestos, including:

**Type and Location of Suspect Material**

1. Exterior window glazing
2. Exterior window glazing
3. Roof shingle at low roof
4. Roof shingle (front) as debris on ground
5. Roof shingle (side) as debris on ground

***Sample Results:***

| **Type and Location of Suspect Material** | **Sample Result** |
|---|---|
| 1. Exterior window glazing | 2% Asbestos |
| 2. Exterior window glazing | No Asbestos Detected |
| 3. Roof shingle at low roof | No Asbestos Detected |
| 4. Roof shingle (front) as debris on ground | No Asbestos Detected |
| 5. Roof shingle (side) as debris on ground | No Asbestos Detected |

Barn 2:
Twenty-three (23) bulk samples were collected from materials suspected of containing asbestos, including:

**Type and Location of Suspect Material**

1. Sink damproofing at kitchen
2. 9” x 9” Green vinyl floor tile at office
3. Mastic on 9” x 9” green vinyl floor tile at office
4. 9” x 9” Green vinyl floor tile at bathroom
5. Mastic on 9” x 9” green vinyl floor tile at bathroom
6. Joint compound over boiler
7. Joint compound over boiler
8. Black in wall batting insulation from exterior
9. Black in ceiling batting insulation at office
10. 1’ x 1’ Acoustical tile at office
11. 1’ x 1’ Acoustical tile at office
12. Blown in insulation above acoustical tile at office
13. Blown in insulation above acoustical tile at office
14. Exterior roof shingle
15. Exterior roof shingle
16. Exterior ice and water associated with roof shingle
17. Exterior ice and water associated with roof shingle
18. Exterior new roofing at rear shed
19. Mastic on nail head at exterior new roofing at rear shed
20. Mastic on nail head at exterior new roofing at rear shed
21. New roofing as siding for rear shed
22. Old roofing intermixed with new roofing at rear shed
23. Old roofing intermixed with new roofing at rear shed

***Sample Results:***

| **Type and Location of Suspect Material** | **Sample Result** |
|---|---|
| 1. Sink damproofing at kitchen | 3% Asbestos |
| 2. 9” x 9” Green vinyl floor tile at office | 2% Asbestos |
| 3. Mastic on 9” x 9” green vinyl floor tile at office | No Asbestos Detected |
| 4. 9” x 9” Green vinyl floor tile at bathroom | 2% Asbestos |
| 5. Mastic on 9” x 9” green vinyl floor tile at bathroom | No Asbestos Detected |
| 6. Joint compound over boiler | No Asbestos Detected |
| 7. Joint compound over boiler | No Asbestos Detected |
| 8. Black in wall batting insulation from exterior | No Asbestos Detected |
| 9. Black in ceiling batting insulation at office | No Asbestos Detected |
| 10. 1’ x 1’ Acoustical tile at office | No Asbestos Detected |
| 11. 1’ x 1’ Acoustical tile at office | No Asbestos Detected |
| 12. Blown in insulation above acoustical tile at office | No Asbestos Detected |

| | |
|---|---|
| 13. Blown in insulation above acoustical tile at office | No Asbestos Detected |
| 14. Exterior roof shingle | No Asbestos Detected |
| 15. Exterior roof shingle | No Asbestos Detected |
| 16. Exterior ice and water associated with roof shingle | No Asbestos Detected |
| 17. Exterior ice and water associated with roof shingle | No Asbestos Detected |
| 18. Exterior new roofing at rear shed | No Asbestos Detected |
| 19. Mastic on nail head at exterior new roofing at rear shed | 20% Asbestos |
| 20. Mastic on nail head at exterior new roofing at rear shed | 10% Asbestos |
| 21. New roofing as siding for rear shed | No Asbestos Detected |
| 22. Old roofing intermixed with new roofing at rear shed | No Asbestos Detected |
| 23. Old roofing intermixed with new roofing at rear shed | No Asbestos Detected |

Barn 3:
Twenty-eight (28) bulk samples were collected from materials suspected of containing asbestos, including:

**Type and Location of Suspect Material**

1. Wall plaster as debris at basement oil tank room
2. Wall plaster as debris at basement furnace room
3. Wall plaster at basement bay 1
4. Wall plaster at basement bay 2
5. Wall plaster at basement bay 3
6. Wall plaster at basement water heater room
7. Old sheet rock wall at basement bay 1
8. Old sheetrock wall at basement bay 2
9. Black in ceiling batt insulation at basement bay 1
10. Exterior window glazing at side ramp
11. Exterior window glazing at rear
12. Exterior window glazing at front basement
13. Exterior window glazing for basement entrance door
14. Paper behind exterior wood siding
15. Paper behind exterior wood siding
16. Exterior roof shingle as debris at side
17. Exterior roof shingle as debris at rear
18. Exterior red cement on slate roof shingles as debris at side of building
19. Assumed red cement as debris at front of building associated with slate shingles
20. Paper under hardwood floor at first floor random
21. Paper under hardwood floor at first floor random
22. Wall plaster at first floor bathroom
23. Wall plaster at main area of first floor
24. Ceiling plaster at main area of first floor
25. Ceiling plaster at first floor side room
26. Ceiling room at first floor side room II
27. Exterior damproofing on stone foundation at asphalt ramp
28. Exterior damproofing on stone foundation at asphalt ramp

***Sample Results:***

| **Type and Location of Suspect Material** | **Sample Result** |
|---|---|
| 1. Wall plaster as debris at basement oil tank room | No Asbestos Detected |
| 2. Wall plaster as debris at basement furnace room | No Asbestos Detected |
| 3. Wall plaster at basement bay 1 | No Asbestos Detected |
| 4. Wall plaster at basement bay 2 | No Asbestos Detected |
| 5. Wall plaster at basement bay 3 | No Asbestos Detected |

| | | |
|---|---|---|
| 6. | Wall plaster at basement water heater room | No Asbestos Detected |
| 7. | Old sheet rock wall at basement bay 1 | No Asbestos Detected |
| 8. | Old sheetrock wall at basement bay 2 | No Asbestos Detected |
| 9. | Black in ceiling batt insulation at basement bay 1 | No Asbestos Detected |
| 10. | Exterior window glazing at side ramp | 2% Asbestos |
| 11. | Exterior window glazing at rear | 2% Asbestos |
| 12. | Exterior window glazing at front basement | 2% Asbestos |
| 13. | Exterior window glazing for basement entrance door | 2% Asbestos |
| 14. | Paper behind exterior wood siding | No Asbestos Detected |
| 15. | Paper behind exterior wood siding | No Asbestos Detected |
| 16. | Exterior roof shingle as debris at side | No Asbestos Detected |
| 17. | Exterior roof shingle as debris at rear | No Asbestos Detected |
| 18. | Exterior red cement on slate roof shingles as debris at side of building | 5% Asbestos |
| 19. | Assumed red cement as debris at front of building associated with slate shingles | 3% Asbestos |
| 20. | Paper under hardwood floor at first floor random | No Asbestos Detected |
| 21. | Paper under hardwood floor at first floor random | No Asbestos Detected |
| 22. | Wall plaster at first floor bathroom | No Asbestos Detected |
| 23. | Wall plaster at main area of first floor | No Asbestos Detected |
| 24. | Ceiling plaster at main area of first floor | No Asbestos Detected |
| 25. | Ceiling plaster at first floor side room | No Asbestos Detected |
| 26. | Ceiling room at first floor side room II | No Asbestos Detected |
| 27. | Exterior damproofing on stone foundation at asphalt ramp | No Asbestos Detected |
| 28. | Exterior damproofing on stone foundation at asphalt ramp | No Asbestos Detected |

Pool Area:
Four (4) bulk samples were collected from materials suspected of containing asbestos, including:

**Type and Location of Suspect Material**

1. Roof shingle small shed at pool area
2. Roof shingle large shed at pool area
3. Homosote wall panel at interior large shed at pool area
4. Homosote wall panel at interior large shed at pool area

***Sample Results:***

| **Type and Location of Suspect Material** | **Sample Result** |
|---|---|
| 1. Roof shingle small shed at pool area | No Asbestos Detected |
| 2. Roof shingle large shed at pool area | No Asbestos Detected |
| 3. Homosote wall panel at interior large shed at pool area | No Asbestos Detected |
| 4. Homosote wall panel at interior large shed at pool area | No Asbestos Detected |

Nursery:
Thirty-three (33) bulk samples were collected from materials suspected of containing asbestos, including:

**Type and Location of Suspect Material**

1. 1’ x 1’ Acoustical tile at hall by mechanical room
2. 1’ x 1’ Acoustical tile at reception
3. Purple damproofing for sink at room 4
4. Purple damproofing for sink at room x
5. 12” x 12” Brown/gold vinyl floor tile at room 4
6. Mastic on 12” x 12” brown/gold vinyl floor tile at room 4
7. 12” x 12” Brown/gold vinyl floor tile at room by workshop coordinator

8. Mastic on 12” x 12” brown/gold vinyl floor tile at room by workshop coordinator
9. Vinyl floor tile under dark carpet at classroom by fire hose
10. Mastic on vinyl floor tile under dark carpet at classroom by fire hose
11. Thick cementitious leveler on vinyl floor tile under dark carpet at classroom by fire hose
12. Soft grey leveler at open area facing reception
13. Mastic on soft grey leveler at open area facing reception
14. Carpet glue on soft grey leveler at open area facing reception
15. Vinyl floor tile under dark carpet at reception
16. Mastic on vinyl floor tile under dark carpet at reception
17. Carpet glue on vinyl floor tile under dark carpet at reception
18. Glazing for mesh window in wood door at room 5
19. Glazing for interior mesh window at reception area
20. Glazing for interior mesh window at reception area
21. Window glazing
22. Window glazing
23. Window glazing
24. Glazing in wood seams of window system
25. Window framing caulking
26. Window framing caulking
27. Window framing caulking
28. Glazing for exterior door at rear wide window
29. Glazing for exterior door at front wide window
30. Roof shingle
31. Roof shingle
32. Transite wall at roof mechanical room
33. Hard joint elbow off fiberglass pipe insulation at water heater room

***Sample Results:***

| **Type and Location of Suspect Material** | **Sample Result** |
|---|---|
| 1. 1’ x 1’ Acoustical tile at hall by mechanical room | No Asbestos Detected |
| 2. 1’ x 1’ Acoustical tile at reception | No Asbestos Detected |
| 3. Purple damproofing for sink at room 4 | 10% Asbestos |
| 4. Purple damproofing for sink at room x | 10% Asbestos |
| 5. 12” x 12” Brown/gold vinyl floor tile at room 4 | 2% Asbestos |
| 6. Mastic on 12” x 12” brown/gold vinyl floor tile at room 4 | 10% Asbestos |
| 7. 12” x 12” Brown/gold vinyl floor tile at room by workshop coordinator | 2% Asbestos |
| 8. Mastic on 12” x 12” brown/gold vinyl floor tile at room by workshop coordinator | 10% Asbestos |
| 9. Vinyl floor tile under dark carpet at classroom by fire hose | 2% Asbestos |
| 10. Mastic on vinyl floor tile under dark carpet at classroom by fire hose | 10% Asbestos |
| 11. Cementitious leveler on vinyl floor tile under dark carpet at classroom by fire hose | No Asbestos Detected |
| 12. Soft grey leveler at open area facing reception | No Asbestos Detected |
| 13. Mastic on soft grey leveler at open area facing reception | 10% Asbestos |
| 14. Carpet glue on soft grey leveler at open area facing reception | No Asbestos Detected |
| 15. Vinyl floor tile under dark carpet at reception | 2% Asbestos |
| 16. Mastic on vinyl floor tile under dark carpet at reception | 10% Asbestos |
| 17. Carpet glue on vinyl floor tile under dark carpet at reception | No Asbestos Detected |
| 18. Glazing for mesh window in wood door at room 5 | 5% Asbestos |
| 19. Glazing for interior mesh window at reception area | 2% Asbestos |
| 20. Glazing for interior mesh window at reception area | 2% Asbestos |
| 21. Window glazing | No Asbestos Detected |
| 22. Window glazing | No Asbestos Detected |
| 23. Window glazing | No Asbestos Detected |
| 24. Glazing in wood seams of window system | No Asbestos Detected |

| | |
|---|---|
| 25. Window framing caulking | No Asbestos Detected |
| 26. Window framing caulking | No Asbestos Detected |
| 27. Window framing caulking | No Asbestos Detected |
| 28. Glazing for exterior door at rear wide window | 2% Asbestos |
| 29. Glazing for exterior door at front wide window | 2% Asbestos |
| 30. Roof shingle | No Asbestos Detected |
| 31. Roof shingle | No Asbestos Detected |
| 32. Transite wall at roof mechanical room | 10% Asbestos |
| 33. Hard joint elbow off fiberglass pipe insulation at water heater room | No Asbestos Detected |

Exterior:
Forty six (46) bulk samples were collected from materials suspected of containing asbestos, including:

**Type and Location of Suspect Material**

1. Exterior black damproofing at nursery on foundation
2. Exterior black damproofing at nursery on foundation
3. Exterior black damproofing at nursery on foundation
4. Exterior black damproofing on steel beam at nursery wall cut
5. Exterior black damproofing on steel beam at nursery wall cut
6. Exterior roof edge caulking at nursery at metal edge roof
7. Exterior flashing tar at wall of nursery roof
8. Exterior black tar on metal edge of nursery roof
9. Exterior black tar on metal edge of nursery roof
10. Exterior asphalt shingle at nursery roof
11. Exterior paper under asphalt shingle at nursery roof
12. Exterior paper under asphalt shingle at nursery roof
13. Exterior black damproofing at administration on foundation
14. Exterior black damproofing at administration on foundation
15. Exterior asphalt shingle at administration roof
16. Exterior paper under asphalt shingle at administration roof
17. Exterior black tar on metal edge at administration roof
18. Exterior black tar on metal edge at administration roof
19. Exterior lightweight cement deck at administration roof
20. Exterior lightweight cement deck at administration roof
21. Exterior tar on vent penetration at administration roof
22. Exterior pipe penetration caulking at administration roof
23. Exterior pipe penetration caulking at administration roof
24. Exterior old roofing tar paper at administration roof
25. Exterior edge caulking at wall at covered walkway
26. Exterior asphalt shingle at Hab-1 roof
27. Exterior paper under asphalt shingle at Hab-1 roof
28. Exterior pipe penetration caulking at Hab-1 roof
29. Exterior pipe penetration caulking at Hab-1 roof
30. Exterior black tar on metal edge at Hab-1 roof
31. Exterior lightweight cement deck at Hab-1 roof
32. Exterior lightweight cement deck at Hab-1 roof
33. Exterior old roof tar at Hab-1 roof
34. Exterior asphalt shingle at Hab-2 roof
35. Exterior paper under asphalt shingle at Hab-2 roof
36. Exterior black tar on metal edge at Hab-2 roof
37. Exterior black tar on metal edge at Hab-2 roof
38. Exterior flashing tar at wall at Hab-2 roof
39. Exterior lightweight cement deck at Hab-2 roof
40. Exterior lightweight cement deck at Hab-2 roof

41. Exterior old tar roof at Hab-2 loading dock roof
42. Exterior asphalt shingle at barn I rear shed roof
43. Exterior asphalt shingle at barn I rear shed roof
44. Exterior paper under asphalt shingle at barn I rear shed roof
45. Exterior paper under asphalt shingle at barn I rear shed roof
46. Exterior edge caulking at metal trim at Hab-1 roof

***Sample Results:***

| Type and Location of Suspect Material | Sample Result |
|---|---|
| 1. Exterior black damproofing at nursery on foundation | 10% Asbestos |
| 2. Exterior black damproofing at nursery on foundation | 10% Asbestos |
| 3. Exterior black damproofing at nursery on foundation | 10% Asbestos |
| 4. Exterior black damproofing on steel beam at nursery wall cut | 10% Asbestos |
| 5. Exterior black damproofing on steel beam at nursery wall cut | 10% Asbestos |
| 6. Exterior roof edge caulking at nursery at metal edge roof | No Asbestos Detected |
| 7. Exterior flashing tar at wall of nursery roof | No Asbestos Detected |
| 8. Exterior black tar on metal edge of nursery roof | 10% Asbestos |
| 9. Exterior black tar on metal edge of nursery roof | 10% Asbestos |
| 10. Exterior asphalt shingle at nursery roof | No Asbestos Detected |
| 11. Exterior paper under asphalt shingle at nursery roof | No Asbestos Detected |
| 12. Exterior paper under asphalt shingle at nursery roof | No Asbestos Detected |
| 13. Exterior black damproofing at administration on foundation | 10% Asbestos |
| 14. Exterior black damproofing at administration on foundation | 10% Asbestos |
| 15. Exterior asphalt shingle at administration roof | No Asbestos Detected |
| 16. Exterior paper under asphalt shingle at administration roof | No Asbestos Detected |
| 17. Exterior black tar on metal edge at administration roof | No Asbestos Detected |
| 18. Exterior black tar on metal edge at administration roof | 10% Asbestos |
| 19. Exterior lightweight cement deck at administration roof | No Asbestos Detected |
| 20. Exterior lightweight cement deck at administration roof | No Asbestos Detected |
| 21. Exterior tar on vent penetration at administration roof | No Asbestos Detected |
| 22. Exterior pipe penetration caulking at administration roof | No Asbestos Detected |
| 23. Exterior pipe penetration caulking at administration roof | No Asbestos Detected |
| 24. Exterior old roofing tar paper at administration roof | No Asbestos Detected |
| 25. Exterior edge caulking at wall at covered walkway | No Asbestos Detected |
| 26. Exterior asphalt shingle at Hab-1 roof | No Asbestos Detected |
| 27. Exterior paper under asphalt shingle at Hab-1 roof | No Asbestos Detected |
| 28. Exterior pipe penetration caulking at Hab-1 roof | No Asbestos Detected |
| 29. Exterior pipe penetration caulking at Hab-1 roof | No Asbestos Detected |
| 30. Exterior black tar on metal edge at Hab-1 roof | 10% Asbestos |
| 31. Exterior lightweight cement deck at Hab-1 roof | No Asbestos Detected |
| 32. Exterior lightweight cement deck at Hab-1 roof | No Asbestos Detected |
| 33. Exterior old roof tar at Hab-1 roof | No Asbestos Detected |
| 34. Exterior asphalt shingle at Hab-2 roof | No Asbestos Detected |
| 35. Exterior paper under asphalt shingle at Hab-2 roof | No Asbestos Detected |
| 36. Exterior black tar on metal edge at Hab-2 roof | 5% Asbestos |
| 37. Exterior black tar on metal edge at Hab-2 roof | No Asbestos Detected |
| 38. Exterior flashing tar at wall at Hab-2 roof | No Asbestos Detected |
| 39. Exterior lightweight cement deck at Hab-2 roof | No Asbestos Detected |
| 40. Exterior lightweight cement deck at Hab-2 roof | No Asbestos Detected |
| 41. Exterior old tar roof at Hab-2 loading dock roof | No Asbestos Detected |
| 42. Exterior asphalt shingle at barn I rear shed roof | No Asbestos Detected |
| 43. Exterior asphalt shingle at barn I rear shed roof | No Asbestos Detected |
| 44. Exterior paper under asphalt shingle at barn I rear shed roof | No Asbestos Detected |

45. Exterior paper under asphalt shingle at barn I rear shed roof — No Asbestos Detected
46. Exterior edge caulking at metal trim at Hab-1 roof — No Asbestos Detected

HAB-1:
Fifty two (52) bulk samples were collected from materials suspected of containing asbestos, including:

**Type and Location of Suspect Material**

1. Wall plaster at basement media center
2. Wall plaster at first floor hall by 123
3. Wall plaster from column at basement hall
4. Wall plaster at room 127
5. Wall plaster at first floor yellow room
6. Joint compound on wall plaster at first floor yellow room
7. Joint compound on wall plaster at first floor yellow room
8. Wall plaster at basement large open room
9. Ceiling plaster at room 127
10. Wall plaster at basement office
11. Roof deck at exit hall by first floor elevators
12. Purple sink damproofing at first floor kitchen
13. Black sink damproofing at boiler room
14. 1’ x 1’ Hashmarks acoustical tile at basement hallway
15. Glue tab for foil fiberglass duct insulation at boiler room
16. Glue tab for foil fiberglass duct insulation at boiler room
17. Hard joint elbows off fiberglass insulation at boiler room
18. Hard joint elbows off fiberglass insulation at boiler room
19. Gold linoleum at room 122
20. Adhesive on gold linoleum at room 122
21. Gold linoleum at basement media center
22. Adhesive on gold linoleum at basement media center
23. Gold linoleum at basement large open room
24. Adhesive on gold linoleum at basement large open room
25. Red linoleum at basement hallway
26. Adhesive on red linoleum at basement hallway
27. Red linoleum at hallway by GC-6
28. Adhesive on red linoleum at hallway by GC-6
29. New grey linoleum at first floor exercise room
30. Residue black adhesive on new grey linoleum at first floor exercise room
31. New grey linoleum at first floor exercise room
32. Residue black adhesive on new grey linoleum at first floor exercise room
33. Thick blue/white linoleum at first floor time out room
34. Adhesive on thick blue/white linoleum at first floor time out room
35. Thick blue/white linoleum at first floor time out room
36. Adhesive on thick blue/white linoleum at first floor time out room
37. Blown in insulation as debris on floor at first floor kitchen
38. Mesh backing for 1” ceramic floor at room by 123
39. Red duct sealant at boiler room
40. Red duct sealant at boiler room
41. Window glazing caulking for interior window at basement random
42. Window glazing caulking for interior window at basement random
43. Window glazing caulking for interior window at basement by double door assembly
44. Glazing for window in metal door at basement by double door assembly
45. Rough wall plaster over exit door by room 127
46. Interior window glazing for exterior window at first floor exercise room
47. Interior window glazing for exterior window at basement media center

48. Red window framing caulking at front
49. Red/brown window framing caulking at front
50. Brown/ red glaze at front
51. Brown/ red glaze at side
52. Brown door framing caulking at side

***Sample Results:***

| Type and Location of Suspect Material | Sample Result |
|---|---|
| 1. Wall plaster at basement media center | No Asbestos Detected |
| 2. Wall plaster at first floor hall by 123 | No Asbestos Detected |
| 3. Wall plaster from column at basement hall | No Asbestos Detected |
| 4. Wall plaster at room 127 | No Asbestos Detected |
| 5. Wall plaster at first floor yellow room | No Asbestos Detected |
| 6. Joint compound on wall plaster at first floor yellow room | No Asbestos Detected |
| 7. Joint compound on wall plaster at first floor yellow room | No Asbestos Detected |
| 8. Wall plaster at basement large open room | No Asbestos Detected |
| 9. Ceiling plaster at room 127 | No Asbestos Detected |
| 10. Wall plaster at basement office | No Asbestos Detected |
| 11. Roof deck at exit hall by first floor elevators | No Asbestos Detected |
| 12. Purple sink damproofing at first floor kitchen | 15% Asbestos |
| 13. Black sink damproofing at boiler room | 10% Asbestos |
| 14. 1’ x 1’ Hashmarks acoustical tile at basement hallway | No Asbestos Detected |
| 15. Glue tab for foil fiberglass duct insulation at boiler room | No Asbestos Detected |
| 16. Glue tab for foil fiberglass duct insulation at boiler room | No Asbestos Detected |
| 17. Hard joint elbows off fiberglass insulation at boiler room | 40% Asbestos |
| 18. Hard joint elbows off fiberglass insulation at boiler room | 25% Asbestos |
| 19. Gold linoleum at room 122 | 30% Asbestos |
| 20. Adhesive on gold linoleum at room 122 | No Asbestos Detected |
| 21. Gold linoleum at basement media center | 30% Asbestos |
| 22. Adhesive on gold linoleum at basement media center | No Asbestos Detected |
| 23. Gold linoleum at basement large open room | 30% Asbestos |
| 24. Adhesive on gold linoleum at basement large open room | No Asbestos Detected |
| 25. Red linoleum at basement hallway | 30% Asbestos |
| 26. Adhesive on red linoleum at basement hallway | No Asbestos Detected |
| 27. Red linoleum at hallway by GC-6 | 30% Asbestos |
| 28. Adhesive on red linoleum at hallway by GC-6 | 5% Asbestos |
| 29. New grey linoleum at first floor exercise room | No Asbestos Detected |
| 30. Residue black adhesive on new grey linoleum at first floor exercise room | No Asbestos Detected |
| 31. New grey linoleum at first floor exercise room | No Asbestos Detected |
| 32. Residue black adhesive on new grey linoleum at first floor exercise room | No Asbestos Detected |
| 33. Thick blue/white linoleum at first floor time out room | 30% Asbestos |
| 34. Adhesive on thick blue/white linoleum at first floor time out room | No Asbestos Detected |
| 35. Thick blue/white linoleum at first floor time out room | 30% Asbestos |
| 36. Adhesive on thick blue/white linoleum at first floor time out room | No Asbestos Detected |
| 37. Blown in insulation as debris on floor at first floor kitchen | No Asbestos Detected |
| 38. Mesh backing for 1” ceramic floor at room by 123 | No Asbestos Detected |
| 39. Red duct sealant at boiler room | No Asbestos Detected |
| 40. Red duct sealant at boiler room | 10% Asbestos |
| 41. Window glazing caulking for interior window at basement random | 2% Asbestos |
| 42. Window glazing caulking for interior window at basement random | 2% Asbestos |
| 43. Window glazing caulking for interior window at basement by double door assembly | 2% Asbestos |
| 44. Glazing for window in metal door at basement by double door assembly | 2% Asbestos |
| 45. Rough wall plaster over exit door by room 127 | No Asbestos Detected |

46. Interior window glazing for exterior window at first floor exercise room — 20% Asbestos
47. Interior window glazing for exterior window at basement media center — 20% Asbestos
48. Red window framing caulking at front — No Asbestos Detected
49. Red/brown window framing caulking at front — No Asbestos Detected
50. Brown/ red glaze at front — 2% Asbestos
51. Brown/ red glaze at side — No Asbestos Detected
52. Brown door framing caulking at side — <1% Asbestos

HAB-2:
Sixty-two (62) bulk samples were collected from materials suspected of containing asbestos, including:

**Type and Location of Suspect Material**

1. Black damproofing at laundry room
2. Brown mastic for vinyl baseboard at GC-2
3. Brown mastic for vinyl baseboard at C-214
4. New grey linoleum at G8-C
5. Adhesive on new grey linoleum at G8-C
6. New grey linoleum at G8-C
7. Adhesive on new grey linoleum at G8-C
8. New blue linoleum at dental
9. Adhesive on new blue linoleum at dental
10. Old red linoleum at hallway by 220
11. Adhesive on old red linoleum at hallway by 220
12. Old gold linoleum at C-218
13. Adhesive on old gold linoleum at C-218
14. 12” x 12” Brown vinyl floor tile at GC-1
15. Mastic on 12” x 12” brown vinyl floor tile at GC-1
16. 12” x 12” Brown vinyl floor tile at GC-6
17. Mastic on 12” x 12” brown vinyl floor tile at GC-6
18. Glazing for wood door window at hallway by laundry
19. Glazing for interior window at double door assembly by C-211
20. Blown in insulation in wall hatch at room C-216
21. Red duct sealant at boiler room
22. Red duct sealant at boiler room
23. Glue daub for foil lined fiberglass duct insulation at boiler room
24. 1’ x 1’ Fissured acoustical tile at hall by C-205
25. 1’ x 1’ Fissured acoustical tile at entrance hall from breezeway
26. 1’ x 1’ Hashmarks acoustical tile at entrance hall from breezeway
27. 1’ x 1’ Hashmarks acoustical tile at hall by C-213
28. Ceiling plaster at C-223
29. Ceiling plaster at basement exit hall by food services
30. Ceiling plaster at basement men’s room
31. Ceiling plaster at C-217
32. Ceiling plaster at GC-15
33. Wall plaster at column C-211
34. Wall plaster at column C-214
35. Wall plaster at column C-209
36. Joint compound on wall plaster at column C-209
37. Joint compound on wall plaster at column C-209
38. Red glaze at exterior rear
39. Red glaze at exterior front
40. Brown window framing caulking at exterior front
41. White door framing caulking at exterior rear
42. White window framing caulking at exterior rear

43. Brown door framing caulking at exterior side
44. Interior glazing caulking for exterior window at C-217
45. Interior glazing caulking for exterior window at basement dental
46. 12” x 12” Brown vinyl floor tile at hallway outside boiler room
47. Mastic on 12” x 12” brown vinyl floor tile at hallway outside boiler room
48. Glaze in metal door window at dental by elevators
49. Interior window glazing at double door assembly by 211
50. Blown in insulation at top of ceiling plaster C-204
51. Red duct sealant at hall by C-204
52. Exposed glue daub on uninsulated metal duct at hall by C-204
53. Yellow adhesive on foil wrapped fiberglass insulation duct at C-207
54. Roof drain hard joint insulation above ceiling at C-207
55. Roof drain hard joint insulation debris on top of acoustical tile at hall by C-204
56. Roof drain hard joint insulation debris on top of acoustical tile at hall by C-204
57. Wood fire door insulation at room 209
58. Wood fire door insulation at room 211
59. Glue tab for dark Styrofoam ceiling panel at room across from GC-7
60. Red adhesive on dark Styrofoam ceiling panel at room across from GC-7
61. Red adhesive on dark Styrofoam ceiling panel at room across from GC-7
62. Door framing caulking for interior door at C-207

***Sample Results:***

| Type and Location of Suspect Material | Sample Result |
|---|---|
| 1. Black damproofing at laundry room | 5% Asbestos |
| 2. Brown mastic for vinyl baseboard at GC-2 | No Asbestos Detected |
| 3. Brown mastic for vinyl baseboard at C-214 | No Asbestos Detected |
| 4. New grey linoleum at G8-C | No Asbestos Detected |
| 5. Adhesive on new grey linoleum at G8-C | No Asbestos Detected |
| 6. New grey linoleum at G8-C | No Asbestos Detected |
| 7. Adhesive on new grey linoleum at G8-C | No Asbestos Detected |
| 8. New blue linoleum at dental | No Asbestos Detected |
| 9. Adhesive on new blue linoleum at dental | No Asbestos Detected |
| 10. Old red linoleum at hallway by 220 | 30% Asbestos |
| 11. Adhesive on old red linoleum at hallway by 220 | No Asbestos Detected |
| 12. Old gold linoleum at C-218 | 30% Asbestos |
| 13. Adhesive on old gold linoleum at C-218 | No Asbestos Detected |
| 14. 12” x 12” Brown vinyl floor tile at GC-1 | 2% Asbestos |
| 15. Mastic on 12” x 12” brown vinyl floor tile at GC-1 | 10% Asbestos |
| 16. 12” x 12” Brown vinyl floor tile at GC-6 | 2% Asbestos |
| 17. Mastic on 12” x 12” brown vinyl floor tile at GC-6 | 10% Asbestos |
| 18. Glazing for wood door window at hallway by laundry | No Asbestos Detected |
| 19. Glazing for interior window at double door assembly by C-211 | 2% Asbestos |
| 20. Blown in insulation in wall hatch at room C-216 | No Asbestos Detected |
| 21. Red duct sealant at boiler room | No Asbestos Detected |
| 22. Red duct sealant at boiler room | No Asbestos Detected |
| 23. Glue daub for foil lined fiberglass duct insulation at boiler room | No Asbestos Detected |
| 24. 1’ x 1’ Fissured acoustical tile at hall by C-205 | No Asbestos Detected |
| 25. 1’ x 1’ Fissured acoustical tile at entrance hall from breezeway | No Asbestos Detected |
| 26. 1’ x 1’ Hashmarks acoustical tile at entrance hall from breezeway | No Asbestos Detected |
| 27. 1’ x 1’ Hashmarks acoustical tile at hall by C-213 | No Asbestos Detected |
| 28. Ceiling plaster at C-223 | No Asbestos Detected |
| 29. Ceiling plaster at basement exit hall by food services | No Asbestos Detected |
| 30. Ceiling plaster at basement men’s room | No Asbestos Detected |

| | |
|---|---|
| 31. Ceiling plaster at C-217 | No Asbestos Detected |
| 32. Ceiling plaster at GC-15 | No Asbestos Detected |
| 33. Wall plaster at column C-211 | No Asbestos Detected |
| 34. Wall plaster at column C-214 | No Asbestos Detected |
| 35. Wall plaster at column C-209 | No Asbestos Detected |
| 36. Joint compound on wall plaster at column C-209 | No Asbestos Detected |
| 37. Joint compound on wall plaster at column C-209 | No Asbestos Detected |
| 38. Red glaze at exterior rear | No Asbestos Detected |
| 39. Red glaze at exterior front | No Asbestos Detected |
| 40. Brown window framing caulking at exterior front | No Asbestos Detected |
| 41. White door framing caulking at exterior rear | No Asbestos Detected |
| 42. White window framing caulking at exterior rear | No Asbestos Detected |
| 43. Brown door framing caulking at exterior side | No Asbestos Detected |
| 44. Interior glazing caulking for exterior window at C-217 | 20% Asbestos |
| 45. Interior glazing caulking for exterior window at basement dental | 20% Asbestos |
| 46. 12” x 12” Brown vinyl floor tile at hallway outside boiler room | 3% Asbestos |
| 47. Mastic on 12” x 12” brown vinyl floor tile at hallway outside boiler room | 10% Asbestos |
| 48. Glaze in metal door window at dental by elevators | 2% Asbestos |
| 49. Interior window glazing at double door assembly by 211 | 2% Asbestos |
| 50. Blown in insulation at top of ceiling plaster C-204 | No Asbestos Detected |
| 51. Red duct sealant at hall by C-204 | 5% Asbestos |
| 52. Exposed glue daub on uninsulated metal duct at hall by C-204 | 30% Asbestos |
| 53. Yellow adhesive on foil wrapped fiberglass insulation duct at C-207 | No Asbestos Detected |
| 54. Roof drain hard joint insulation above ceiling at C-207 | No Asbestos Detected |
| 55. Roof drain hard joint insulation debris on top of acoustical tile at hall by C-204 | No Asbestos Detected |
| 56. Roof drain hard joint insulation debris on top of acoustical tile at hall by C-204 | No Asbestos Detected |
| 57. Wood fire door insulation at room 209 | No Asbestos Detected |
| 58. Wood fire door insulation at room 211 | No Asbestos Detected |
| 59. Glue tab for dark Styrofoam ceiling panel at room across from GC-7 | 30% Asbestos |
| 60. Red adhesive on dark Styrofoam ceiling panel at room across from GC-7 | 30% Asbestos |
| 61. Red adhesive on dark Styrofoam ceiling panel at room across from GC-7 | 30% Asbestos |
| 62. Door framing caulking for interior door at C-207 | |

Administration:
Forty eight (48) bulk samples were collected from materials suspected of containing asbestos, including:

**Type and Location of Suspect Material**

1. Wall plaster at G-6
2. Wall plaster at G-4
3. Wall plaster at 128
4. Wall plaster at C-123
5. Wall plaster at C-120
6. Wall plaster at C-123
7. Wall plaster at hall by 118
8. Roof deck at hall by 118
9. Roof deck at bathroom C-111
10. Purple sink damproofing at regional conference room
11. Bedding for brick floor at main lobby
12. Bedding for brick floor at main lobby
13. Glue daub for 1’ x 1’ acoustical tile attached to ceiling hatch C-123
14. Glue daub for 1’ x 1’ acoustical tile attached to ceiling hatch G-5
15. 1’ x 1’ acoustical tile at G-5
16. 1’ x 1’ acoustical tile at 116
17. 1’ x 1’ acoustical tile fissures at hall by 117

18. 1’ x 1’ acoustical tile fissures at G-6
19. 1’ x 1’ acoustical tile frosty at GC-11
20. 1’ x 1’ acoustical tile frosty at GC-11
21. Glazing for window in wood door at room 109
22. Glazing for window in metal door at stairwell by room 115
23. Glazing for interior window over double door at room 109
24. Gold linoleum at C-124
25. Gold linoleum at C-124
26. Grey linoleum at basement hearing/sound testing
27. Brown adhesive on grey linoleum at basement hearing/sound testing
28. Grey linoleum at basement hearing/sound testing
29. Brown adhesive on grey linoleum at basement hearing/sound testing
30. 12” x 12” Brown/gold vinyl floor tile at stairwell by room 116
31. Mastic on 12” x 12” brown/gold vinyl floor tile at stairwell by room 116
32. 12” x 12” Dark brown/gold vinyl floor tile at G-5 hall closet
33. Mastic on 12” x 12” dark brown/gold vinyl floor tile at G-5 hall closet
34. 12” x 12” Dark brown/gold vinyl floor tile at main lobby
35. Mastic on 12” x 12” dark brown/gold vinyl floor tile at main lobby
36. Red sealant on duct at health office in wall
37. Damproofing on vertical steel column at C-121
38. Black debris on top of acoustical tile at C-121
39. Damproofing on Styrofoam board debris at top of acoustical tile bathroom C-111
40. White window framing caulking at exterior rear
41. White / red window framing caulking at exterior facing Hab-2
42. White window framing caulking at exterior facing Hab-2
43. Red window framing caulking interior of exterior window at courtyard 119
44. Red glaze at exterior rear
45. Red glaze at exterior facing Hab-2
46. Interior glazing for exterior window at basement room
47. Red/white framing caulking for door at exterior facing Hab-2
48. Red/white framing caulking for door at exterior facing nurse’s office

***Sample Results:***

| **Type and Location of Suspect Material** | **Sample Result** |
|---|---|
| 1. Wall plaster at G-6 | No Asbestos Detected |
| 2. Wall plaster at G-4 | No Asbestos Detected |
| 3. Wall plaster at 128 | No Asbestos Detected |
| 4. Wall plaster at C-123 | No Asbestos Detected |
| 5. Wall plaster at C-120 | No Asbestos Detected |
| 6. Wall plaster at C-123 | No Asbestos Detected |
| 7. Wall plaster at hall by 118 | No Asbestos Detected |
| 8. Roof deck at hall by 118 | No Asbestos Detected |
| 9. Roof deck at bathroom C-111 | No Asbestos Detected |
| 10. Purple sink damproofing at regional conference room | 5% Asbestos |
| 11. Bedding for brick floor at main lobby | No Asbestos Detected |
| 12. Bedding for brick floor at main lobby | No Asbestos Detected |
| 13. Glue daub for 1’ x 1’ acoustical tile attached to ceiling hatch C-123 | No Asbestos Detected |
| 14. Glue daub for 1’ x 1’ acoustical tile attached to ceiling hatch G-5 | No Asbestos Detected |
| 15. 1’ x 1’ acoustical tile at G-5 | No Asbestos Detected |
| 16. 1’ x 1’ acoustical tile at 116 | No Asbestos Detected |
| 17. 1’ x 1’ acoustical tile fissures at hall by 117 | No Asbestos Detected |
| 18. 1’ x 1’ acoustical tile fissures at G-6 | No Asbestos Detected |
| 19. 1’ x 1’ acoustical tile frosty at GC-11 | No Asbestos Detected |

| | |
|---|---|
| 20. 1’ x 1’ acoustical tile frosty at GC-11 | No Asbestos Detected |
| 21. Glazing for window in wood door at room 109 | 2% Asbestos |
| 22. Glazing for window in metal door at stairwell by room 115 | 2% Asbestos |
| 23. Glazing for interior window over double door at room 109 | 2% Asbestos |
| 24. Gold linoleum at C-124 | 30% Asbestos |
| 25. Gold linoleum at C-124 | 30% Asbestos |
| 26. Grey linoleum at basement hearing/sound testing | No Asbestos Detected |
| 27. Brown adhesive on grey linoleum at basement hearing/sound testing | No Asbestos Detected |
| 28. Grey linoleum at basement hearing/sound testing | No Asbestos Detected |
| 29. Brown adhesive on grey linoleum at basement hearing/sound testing | No Asbestos Detected |
| 30. 12” x 12” Brown/gold vinyl floor tile at stairwell by room 116 | 2% Asbestos |
| 31. Mastic on 12” x 12” brown/gold vinyl floor tile at stairwell by room 116 | 10% Asbestos |
| 32. 12” x 12” Dark brown/gold vinyl floor tile at G-5 hall closet | 2% Asbestos |
| 33. Mastic on 12” x 12” dark brown/gold vinyl floor tile at G-5 hall closet | 10% Asbestos |
| 34. 12” x 12” Dark brown/gold vinyl floor tile at main lobby | 2% Asbestos |
| 35. Mastic on 12” x 12” dark brown/gold vinyl floor tile at main lobby | 10% Asbestos |
| 36. Red sealant on duct at health office in wall | 2% Asbestos |
| 37. Damproofing on vertical steel column at C-121 | 10% Asbestos |
| 38. Black debris on top of acoustical tile at C-121 | No Asbestos Detected |
| 39. Damproofing on Styrofoam board debris at top of acoustical tile bathroom C-111 | No Asbestos Detected |
| 40. White window framing caulking at exterior rear | No Asbestos Detected |
| 41. White / red window framing caulking at exterior facing Hab-2 | No Asbestos Detected |
| 42. White window framing caulking at exterior facing Hab-2 | No Asbestos Detected |
| 43. Red window framing caulking interior of exterior window at courtyard 119 | No Asbestos Detected |
| 44. Red glaze at exterior rear | No Asbestos Detected |
| 45. Red glaze at exterior facing Hab-2 | 2% Asbestos |
| 46. Interior glazing for exterior window at basement room | 5% Asbestos |
| 47. Red/white framing caulking for door at exterior facing Hab-2 | No Asbestos Detected |
| 48. Red/white framing caulking for door at exterior facing nurse’s office | No Asbestos Detected |

**Polychlorinated Biphenyls (PCB’s)-Electrical Equipment and Light Fixtures:**
***Observations and Conclusions***
Visual inspection of various equipments such as light fixtures, thermostats, exit signs and switches was performed for the presence of PCB’s and mercury. Ballasts in light fixtures were assumed not to contain PCB’s since there were labels indicating that “No PCB’s” was found. Tubes in light fixtures, thermostats, signs and switches were assumed to contain mercury. It would be very costly to test those equipments and dismantling would be required to access. Therefore, the above equipments should be disposed in an EPA approved landfill as part of the demolition project.

**PCB’s in Caulking Material:**
***Observations and Conclusions***
Building caulking was assumed to contain PCB’s. PCB’s are manmade chemicals that were widely produced and distributed across the country from the 1950s to 1977 until the production of PCB’s was banned by the US Environmental Protection Agency (EPA) law which became effective in 1978. PCB’s are a class of chemicals made up of more than 200 different compounds. PCB’s are non-flammable, stable, and good insulators so they were widely used in a variety of products including: electrical transformers and capacitors, cable and wire coverings, sealants and caulking, and household products such as television sets and fluorescent light fixtures. Because of their chemical properties, PCB’s are not very soluble in water and they do not break down easily in the environment. PCB’s also do not readily evaporate into air but tend to remain as solids or thick liquids. Even though PCB’s have not been produced or used in the country for more than 30 years, they are still present in the environment in the air, soil, and water and in our food. EPA requires that all construction waste including caulking be disposed as PCB’s if PCB’s level exceed 50 mg/kg (ppm). An abatement plan might also be required.

**Lead Based Paint (LBP):**
***Observations and Conclusions***
All LBP activities performed, including waste disposal, should be in accordance with applicable Federal, State, or local laws, ordinances, codes or regulations governing evaluation and hazard reduction. These requirements can be found in OSHA 29 CFR 1926-Construction Industry Standards, 29 CFR 1926.62-Construction Industry Lead Standards, 29 CFR 1910.1200-Hazards Communication, 40 CFR 261-EPA Regulations. According to OSHA, any amount of LBP triggers compliance.

**Mercury in Rubber Flooring:**
***Observations and Conclusions:***
No rubber flooring exists in the school.

## 3.0 COST ESTIMATES:
The cost includes removal and disposal of all accessible ACM, other hazardous material and an allowance for removal of inaccessible or hidden ACM that may be found during renovation or demolition project.

| Location | Material | Approximate Quantity | Cost Estimate ($) |
|---|---|---|---|
| Barn 1: | Miscellaneous Hazardous Materials | Unknown | 2,000.00 |
| | Exterior Windows | 23 Total | 5,750.00 |
| Barn 2: | Flooring | 120 SF | 1,200.00 |
| | Sinks | 2 Total | 300.00 |
| | Oil Tanks | 2 Total | 7,500.00 |
| | Miscellaneous Hazardous Materials | Unknown | 2,500.00 |
| | Light Fixtures | 17 Total | 850.00 |
| Barn 3: | Oil Tanks | 2 Total | 7,500.00 |
| | Exterior Windows | 40 Total | 10,000.00 |
| | Slate/Cement Roof | 4,000 SF | 12,000.00 |
| | Miscellaneous Hazardous Materials | Unknown | 2,500.00 |
| | Light Fixtures | 40 Total | 2,000.00 |
| Pool: | Miscellaneous Hazardous Materials | Unknown | 2,000.00 |
| Nursery: | Flooring | 7,100 SF | 28,400.00 |
| | Interior Windows/Doors | 15 Total | 3,000.00 |
| | Sinks | 4 Total | 600.00 |
| | Tackboards/Glue | 30 Total | 3,000.00 |
| | Exterior Windows/Doors | 90 Total | 22,500.00 |
| | Hard Joint Insulation | 1 Total | 100.00 |
| | Hidden Hard Joint Insulation | Unknown | 5,000.00 |
| | Transite | 1,000 SF | 6,000.00 |
| | Miscellaneous Hazardous Materials | Unknown | 5,000.00 |
| | Light Fixtures | 60 Total | 3,000.00 |
| Hab 1: | Flooring | 19,000 SF | 76,000.00 |
| | Sinks | 7 Total | 1,400.00 |
| | Glue Tabs | 800 SF | 4,000.00 |
| | Interior Windows/Doors | 90 Total | 18,000.00 |
| | Red Duct Sealant | Unknown | 45,000.00 |
| | Black Panels with Glue | 1,500 SF | 9,000.00 |
| | Styrofoam Panels with Glue | 12,000 SF | 60,000.00 |
| | Exterior Windows/Doors | 130 Total | 32,500.00 |

| Location | Material | Approximate Quantity | Cost Estimate ($) |
|---|---|---|---|
| | Hard Joint Insulation | 100 Total | 3,000.00 |
| | Hidden Hard Joint Insulation | Unknown | 10,000.00 |
| | Miscellaneous Hazardous Materials | Unknown | 5,000.00 |
| | Light Fixtures | Unknown | 5,000.00 |
| Hab 2: | Flooring | 24,000 SF | 96,000.00 |
| | Sinks | 7 Total | 1,400.00 |
| | Wood Fire Doors | 2 Total | 500.00 |
| | Glue Tabs | 400 SF | 2,000.00 |
| | Interior Windows/Doors | 95 Total | 19,000.00 |
| | Red Duct Sealant | Unknown | 30,000.00 |
| | Styrofoam Panels with Glue | 12,000 SF | 60,000.00 |
| | Exterior Windows/Doors | 147 Total | 36,750.00 |
| | Hard Joint Insulation | 30 Total | 900.00 |
| | Hidden Hard Joint Insulation | Unknown | 10,000.00 |
| | Miscellaneous Hazardous Materials | Unknown | 15,000.00 |
| | Light Fixtures | Unknown | 5,000.00 |
| Administration: | Flooring | 14,000 SF | 56,000.00 |
| | Sinks | 4 Total | 800.00 |
| | Glue Tabs | 800 SF | 4,000.00 |
| | Interior Windows/Doors | 15 Total | 3,000.00 |
| | Red Duct Sealant | Unknown | 30,000.00 |
| | Exterior Windows/Doors | 120 Total | 30,000.00 |
| | Hidden Hard Joint Insulation | Unknown | 10,000.00 |
| | Miscellaneous Hazardous Materials | Unknown | 15,000.00 |
| | Light Fixtures | Unknown | 5,000.00 |
| Exterior | Roofing Material | Unknown | 45,000.00 |
| | Transite Sewer Pipes | Unknown[1] | 50,000.00 |
| | Damproofing/Flashing on Columns and Walls | 2,000 Tons[1] | 300,000.00 |
| | | **TOTAL:** | **$ 1,226,950.00** |

[1]: Part of total demolition.

## 4.0 DESCRIPTION OF SURVEY METHODS AND LABORATORY ANALYSES:

Asbestos samples were collected using a method that prevents fiber release. Homogeneous sample areas were determined by criteria outlined in EPA document 560/5-85-030a. Bulk material samples were analyzed using PLM and dispersion staining techniques with EPA method 600/M4-82-020.

## 5.0 LIMITATIONS AND CONDITIONS:

This report has been completed based on visual and physical observations made and information available at the time of the site visits, as well as an interview with the Owner's representatives. This report is intended to be used as a summary of available information on existing conditions with conclusions based on a reasonable and knowledgeable review of evidence found in accordance with normally accepted industry standards, state and federal protocols, and within the scope and budget established by the client. Any additional data obtained by further review must be reviewed by UEC and the conclusions presented herein may be modified accordingly.

This report and attachments, prepared for the exclusive use of Owner for use in an environmental evaluation of the subject site, are an integral part of the inspections and opinions should not be formulated without reading the report in its entirety. No part of this report may be altered, used, copied or relied upon without prior written permission from UEC, except that this report may be conveyed in its entirety to parties associated with Owner for this subject study.

Inspected By:

Leonard J. Busa
Asbestos Inspector

# Asbestos Identification Laboratory

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com
Email: mikemanning@asbestosidentificationlab.com


**Batch:** 35159

Lab Code: 200919-0

August 22, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** Admin/214 Lake Street, Shrewsbury, MA

**Date Sampled:** 2018-08-21
**Work Received:** 2018-08-22
**Work Analyzed:** 2018-08-22

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

Dear Ammar Dieb,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project .

The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

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- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Ammar Dieb for your business.

Michael Manning
Owner/Director

August 22, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** Admin/214 Lake Street, Shrewsbury, MA

**Date Sampled:** 2018-08-21
**Work Received:** 2018-08-22
**Work Analyzed:** 2018-08-22

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 1 / 390382 | Wall Plaster (WP) | G-6 | multi | Non-Fibrous 100 | None Detected |
| 2 / 390383 | WP | G-4 | multi | Non-Fibrous 100 | None Detected |
| 3 / 390384 | WP | 128 | multi | Non-Fibrous 100 | None Detected |
| 4 / 390385 | WP | C-123 | multi | Non-Fibrous 100 | None Detected |
| 5 / 390386 | WP | C-120 | multi | Non-Fibrous 100 | None Detected |
| 6 / 390387 | WP | C-123 | multi | Non-Fibrous 100 | None Detected |
| 7 / 390388 | WP | Hall by 118 | gray | Non-Fibrous 100 | None Detected |
| 8 / 390389 | Roof Deck | Hall by 118 | tan | Non-Fibrous 100 | None Detected |
| 9 / 390390 | Roof Deck | Bathroom C-111 | tan | Non-Fibrous 100 | None Detected |
| 10 / 390391 | Purple Sink DP | Regional Conference Rm | purple | Non-Fibrous 95 | Detected<br>Chrysotile 5 |
| 11 / 390392 | Bedding for Brick Floor | Main Lobby | gray | Non-Fibrous 100 | None Detected |
| 12 / 390393 | Bedding for Brick Floor | | gray | Non-Fibrous 100 | None Detected |
| 13 / 390394 | Glue Daub for 1x1 AT-I Attached to Clg Hatch | C-123 | brown | Non-Fibrous 100 | None Detected |
| 14 / 390395 | Glue Daub for 1x1 AT-I Attached to Clg Hatch | G-5 | brown | Non-Fibrous 100 | None Detected |

| FieldID<br>LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 15<br>390396 | 1x1 AT-I | G-5 | gray | Mineral Wool 20<br>Cellulose 70<br>Non-Fibrous 10 | None Detected |
| 16<br>390397 | AT-I | 116 | gray | Mineral Wool 30<br>Cellulose 60<br>Non-Fibrous 10 | None Detected |
| 17<br>390398 | AT-II (Fissures) | Hall by 117 | gray | Mineral Wool 30<br>Cellulose 60<br>Non-Fibrous 10 | None Detected |
| 18<br>390399 | AT-II | G-6 | gray | Mineral Wool 30<br>Cellulose 60<br>Non-Fibrous 10 | None Detected |
| 19<br>390400 | AT-III (Frosty) | GC-11 | gray | Mineral Wool 90<br>Non-Fibrous 10 | None Detected |
| 20<br>390401 | AT-III | GC-11 | gray | Mineral Wool 90<br>Non-Fibrous 10 | None Detected |
| 21<br>390402 | Glazing for Window in Wood Door | 109 | gray | Non-Fibrous 98 | **Detected**<br>**Chrysotile 2** |
| 22<br>390403 | Glazing for Window in Metal Door | Stairwell Door by 115 | gray | Non-Fibrous 98 | **Detected**<br>**Chrysotile 2** |
| 23<br>390404 | Glazing for Interior Window | Over MC DD by 109 | gray | Non-Fibrous 98 | **Detected**<br>**Chrysotile 2** |
| 24<br>390405 | Lino-I (Gold) | C-124 | multi | Non-Fibrous 70 | **Detected**<br>**Chrysotile 30** |
| 25<br>390406 | Lino-I | C-124 | multi | Non-Fibrous 70 | **Detected**<br>**Chrysotile 30** |
| 26<br>390407 | Lino-II (Grey) | Bsmt Hearing/Sound Testing | multi | Cellulose 40<br>Non-Fibrous 60 | None Detected |
| 27<br>390408 | NO SAMPLE | NO SAMPLE | | | Not Analyzed |
| 28<br>390409 | Lino-II | Bsmt Hearing/Sound Testing | multi | Cellulose 50<br>Non-Fibrous 50 | None Detected |
| 29<br>390410 | NO SAMPLE | NO SAMPLE | | | Not Analyzed |
| 30<br>390411 | 12" VT-I (Brown-Gold) | Stairwell by 116 | multi | Non-Fibrous 98 | **Detected**<br>**Chrysotile 2** |
| 31<br>390412 | Mastic #30 | Stairwell by 116 | black | Non-Fibrous 90 | **Detected**<br>**Chrysotile 10** |
| 32<br>390413 | 12" VT-II (DK Brown-Gold) | G-5 Hall Closet | multi | Non-Fibrous 98 | **Detected**<br>**Chrysotile 2** |

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 33 / 390414 | Mastic #32 | G-5 Hall Closet | black | Non-Fibrous 90 | Detected Chrysotile 10 |
| 34 / 390415 | 12" VT-II | Main Lobby | multi | Non-Fibrous 98 | Detected Chrysotile 2 |
| 35 / 390416 | Mastic #34 | Main Lobby | black | Non-Fibrous 90 | Detected Chrysotile 10 |
| 36 / 390417 | Red Sealant on Duct | Health Office in Wall | red | Non-Fibrous 98 | Detected Chrysotile 2 |
| 37 / 390418 | Damp Proofing on Verticle Steel Column | C-121 | black | Non-Fibrous 90 | Detected Chrysotile 10 |
| 38 / 390419 | Black Debris on Top of AT-I | C-121 | black | Cellulose 40<br>Non-Fibrous 60 | None Detected |
| 39 / 390420 | DP? on Styrofoam Board Debris, Top of AT-I | Bathrm C-111 | black | Cellulose 5<br>Non-Fibrous 95 | None Detected |
| 40 / 390421 | White Win FR | Rear, Exterior | white | Non-Fibrous 100 | None Detected |
| 41 / 390422 | White-Red Win FR | Facing Hab-2, Exterior | multi | Non-Fibrous 100 | None Detected |
| 42 / 390423 | White Win FR | Facing Hab-2 | multi | Non-Fibrous 100 | None Detected |
| 43 / 390424 | Red Win FR | Interior of Exterior Win, C'yd by 119 | brown | Non-Fibrous 100 | None Detected |
| 44 / 390425 | Red Glaze | Rear | brown | Non-Fibrous 100 | None Detected |
| 45 / 390426 | Red GL | Facing Hab-2 | multi | Non-Fibrous 98 | Detected Chrysotile 2 |
| 46 / 390427 | Interior GL for Exterior Win | Bsmt Rm | gray | Non-Fibrous 95 | Detected Chrysotile 5 |
| 47 / 390428 | Red-White FR for Door | Facing Hab-2 | multi | Non-Fibrous 100 | None Detected |
| 48 / 390429 | Red-White FR for Door | Facing Nursery | multi | Non-Fibrous 100 | None Detected |

Wednesday 22

Analyzed by: Michael Thomas

End of Report

**Batch:** 35159

# CHAIN OF CUSTODY

**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com

Town/City: Shrewsbury, MA Building Name Admin / 214 Lake Street

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 1 | | wall plaster (WP) | G-6 |
| 2 | | WP | G-4 |
| 3 | | WP | 128 |
| 4 | | WP | C-123 |
| 5 | | WP | C-120 |
| 6 | | WP | C-123 |
| 7 | | WP | hall by 118 |
| 8 | | roof deck | hall by 118 |
| 9 | | roof deck | Bathroom C-111 |
| 10 | | purple sink dp | Regional Conference rm |
| 11 | | Bedding for brick floor | main Lobby |
| 12 | | Bedding for brick floor | main Lobby |
| 13 | | glue daub for 1x1 AT-I | attached to elv hatch C-123 |
| 14 | | glue daub for 1x1 AT-I | attached to elv hatch G-5 |
| 15 | | 1.1 AT-I | G-5 |
| 16 | | AT-I | 116 |
| 17 | | AT-II (fissures) | hall by 117 |
| 18 | | AT-II | G-6 |
| 19 | | AT-III (Frosty) | GC-11 |
| 20 | | AT-III | GC-11 |

Reported By: [signature] Date: 8/21/18 Due Date: same day

Received By: [signature] Date: 8/22/18

# CHAIN OF CUSTODY

**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com

Town/City: Shrewsbury, MA Building Name Admin/ 214 Lake Street

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 21 | | glazing for window in wood door | 109 |
| 22 | | glazing for window in metal door | stairwell door by 115 |
| 23 | | glazing for interior window | over mezz by 109 |
| 24 | | Lino-I (Gold) | C-124 |
| 25 | | Lino-I | C-124 |
| 26 | | Lino-II (Grey) | Bsmt hearing/sound Testing |
| 27 | | Br adh #26 | |
| 28 | | Lino-II | |
| 29 | | Br adh #28 | |
| 30 | | 12" VT-I (Brown-Gold) | stairwell by 116 |
| 31 | | mastic #30 | " " |
| 32 | | 12" VT-II (Dk Brown-Gold) | G-5 hall closet |
| 33 | | mastic #32 | " " " |
| 34 | | 12" VT-II | main lobby |
| 35 | | mastic #34 | " " |
| 36 | | red sealant on duct | health office in wall |
| 37 | | damproofing on vertical | steel column C-121 |
| 38 | | Black debris on top of | AT-I C-121 |
| 39 | | dp ? on styrofoam board | debris, top of AT-I bottom C-111 |
| 40 | | white wind | rear Exterior |

Reported By: [signature] Date: 8-21-18 Due Date: Same day

Received By: _____ Date: _____

3o
3

# CHAIN OF CUSTODY


**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com


Town/City: Shrewsbury, Ma Building Name Admin / 214 Lake Street

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 41 | | white-red win fr | Facing Hab-2 EXTERIOR |
| 42 | | white win fr | Facing Hab-2 |
| 43 | | red win fr / interior of exterior win, cyd by 119 | |
| 44 | | red glazd | rear |
| 45 | | red gl | Facing Hab-2 |
| 46 | | interior gl for exterior win | Bsmt rm |
| 47 | | red-white fr for door | Facing Hab-2 |
| 48 | | red-white fr for door | Facing Nursery |
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Reported By: Lemuel Bass Date: 8-21-18 Due Date: SAME day

Received By: _____ Date: _____

# Asbestos Identification Laboratory

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com
Email: mikemanning@asbestosidentificationlab.com


**Batch:** 35007

Lab Code: 200919-0

August 17, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** 214 Lake St/Barn #1, Shrewsbury, MA

**Date Sampled:** 2018-08-16
**Work Received:** 2018-08-17
**Work Analyzed:** 2018-08-17

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

Dear Ammar Dieb,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project .

The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

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- NVLAP Lab Code: 200919-0
- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Ammar Dieb for your business.

Michael Manning
Owner/Director

August 17, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** 214 Lake St/Barn #1, Shrewsbury, MA

**Date Sampled:** 2018-08-16
**Work Received:** 2018-08-17
**Work Analyzed:** 2018-08-17

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 1 / 389479 | Window Gl | | gray | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 2 / 389480 | Win Gl | | white | Non-Fibrous 100 | None Detected |
| 3 / 389481 | Roof Shingle @ Low Roof | | black | Cellulose 40<br>Non-Fibrous 60 | None Detected |
| 4 / 389482 | Roof Shingle as Debris | On Ground (Front) | black | Cellulose 40<br>Non-Fibrous 60 | None Detected |
| 5 / 389483 | Roof Shingle as Debris | On Ground (Side) | black | Fiberglass 40<br>Non-Fibrous 60 | None Detected |

Friday 17 August
Analyzed by: Michael Thomas

End of Report

**Batch:** 35007

# CHAIN OF CUSTODY


**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com


2 → ~~24hr~~ SAME DAY ✓

Town/City: Shrewsbury, MA Building Name 214 Lake St / Barn #1

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 1 | | window gl | |
| 2 | | win gl | |
| 3 | | roof shingle @ low roof | |
| 4 | | roof shingle as debris | on ground (Front) |
| 5 | | roof shingle as debris | on ground (side) |
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Reported By: [signature] Date: 8/16/18 Due Date: ~~24hr~~ SAME DAY ✓

Received By: Elena Beatty Date: 8/17/18

# Asbestos Identification Laboratory

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com
Email: mikemanning@asbestosidentificationlab.com


**Batch:** 35009

Lab Code: 200919-0

August 17, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** 214 Lake St/Barn #2, Shrewsbury, MA

**Date Sampled:** 2018-08-16
**Work Received:** 2018-08-17
**Work Analyzed:** 2018-08-17

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

Dear Ammar Dieb,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project .

The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

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- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Ammar Dieb for your business.

Michael Manning
Owner/Director

August 17, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** 214 Lake St/Barn #2, Shrewsbury, MA

**Date Sampled:** 2018-08-16
**Work Received:** 2018-08-17
**Work Analyzed:** 2018-08-17

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 1 / 389488 | Sink Dp | Kitchen | black | Non-Fibrous 97 | Detected<br>Chrysotile 3 |
| 2 / 389489 | 9" Green VT | Office | green | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 3 / 389490 | Mastic #2 | Office | black | Cellulose 10<br>Non-Fibrous 90 | None Detected |
| 4 / 389491 | 9" Green VT | Bathrm | green | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 5 / 389492 | M #4 | Bathrm | black | Non-Fibrous 100 | None Detected |
| 6 / 389493 | Joint Compound (JC) | Over Boiler | white | Non-Fibrous 100 | None Detected |
| 7 / 389494 | JC | Over Boiler | white | Non-Fibrous 100 | None Detected |
| 8 / 389495 | Black in Wall Batt | From Exterior | multi | Fiberglass 10<br>Cellulose 80<br>Non-Fibrous 10 | None Detected |
| 9 / 389496 | Black in Clg Batt | Office | multi | Fiberglass 5<br>Cellulose 90<br>Non-Fibrous 5 | None Detected |
| 10 / 389497 | 1x1 AT | Office | brown | Cellulose 98<br>Non-Fibrous 2 | None Detected |
| 11 / 389498 | 1x1 AT | Office | brown | Cellulose 98<br>Non-Fibrous 2 | None Detected |
| 12 / 389499 | Blown-in Above AT | Office | multi | Mineral Wool 80<br>Cellulose 10<br>Non-Fibrous 10 | None Detected |
| 13 / 389500 | Blown-in Above AT | Office | multi | Mineral Wool 75<br>Cellulose 15<br>Non-Fibrous 10 | None Detected |
| 14 / 389501 | Roof Shingle | Exterior | black | Fiberglass 25<br>Non-Fibrous 75 | None Detected |

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 15 / 389502 | Roof Shingle | Exterior | black | Fiberglass 30<br>Non-Fibrous 70 | None Detected |
| 16 / 389503 | Icc: Wtr Assoc W #15 | Exterior | black | Cellulose 80<br>Non-Fibrous 20 | None Detected |
| 17 / 389504 | Icc: Wtr Assoc W #14 | Exterior | black | Cellulose 80<br>Non-Fibrous 20 | None Detected |
| 18 / 389505 | New Roofing | Exterior @ Rear Shed | black | Fiberglass 35<br>Non-Fibrous 65 | None Detected |
| 19 / 389506 | Susp. Mastic On Nail Head For #18 | Exterior @ Rear Shed | black | Non-Fibrous 80 | **Detected**<br>**Chrysotile 20** |
| 20 / 389507 | Susp. Mastic on Nail Head for New Roofing | Exterior @ Rear Shed | black | Non-Fibrous 90 | **Detected**<br>**Chrysotile 10** |
| 21 / 389508 | New Roofing | As Siding for Rear Shed | black | Cellulose 30<br>Non-Fibrous 70 | None Detected |
| 22 / 389509 | Old Roofing Intermixed w/ New Roofing | Rear Shed | black | Cellulose 50<br>Non-Fibrous 50 | None Detected |
| 23 / 389510 | Old Roofing Intermixed w/ New Roofing | Rear Shed | black | Cellulose 50<br>Non-Fibrous 50 | None Detected |

Friday 17 August

Analyzed by: Michael Thomas

End of Report

**Batch:** 35009

# CHAIN OF CUSTODY

~~24 hr~~ SAME DAY

1 of 2


**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com


Town/City: Shrewsbury, MA Building Name 214 Lake St / Barn #2

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 1 | | sink dp | Kitchen |
| 2 | | 9" Green VT | office |
| 3 | | mastic #2 | office |
| 4 | | 9" Green VT | bathrm |
| 5 | | (m) #4 | bathrm |
| 6 | | Joint Compound (JC) | over Boiler |
| 7 | | JC | over Boiler |
| 8 | | Black in wall batt | From exterior |
| 9 | | Black in clg batt | office |
| 10 | | 1x1 (AT) | office |
| 11 | | 1x1 (AT) | office |
| 12 | | Blown-in above (AT) | ↓ |
| 13 | | Blown-in above (AT) | ↓ |
| 14 | | roof shingle | exterior |
| 15 | | roof shingle | ↓ |
| 16 | | ice: WTC assoc w/ #15 | ↓ |
| 17 | | ice: WTC assoc w/ #14 | ↓ |
| 18 | | new? roofing | ~~rear shed~~ exterior @ rear shed |
| 19 | | susp mastic on nail head | for #18 |
| 20 | | susp mastic on nail head | for new roofing ↓ |

Reported By: [signature] Date: 8-16-18 Due Date: ~~24 hr~~ SAME DAY

Received By: Elena Bastis Date: 8/17/18

# CHAIN OF CUSTODY

2 of 2


**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com


Town/City: Shrewsbury, MA Building Name 214 Lake St / Barn #2

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 21 | | new roofing | AS siding for REAR shed |
| 22 | | old roofing intermixed w/ new roofing | REAR shed |
| 23 | | old roofing intermixed w/ new roofing | REAR shed |
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Reported By: [signature] Date: 8/16/18 Due Date: ~~24 hr~~ SAME DAY

Received By: Date:

# Asbestos Identification Laboratory

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com
Email: mikemanning@asbestosidentificationlab.com


**Batch:** 35003

Lab Code: 200919-0

August 17, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** 214 Lake St, Barn #3, Shrewsbury, MA

**Date Sampled:** 2018-08-16
**Work Received:** 2018-08-17
**Work Analyzed:** 2018-08-17

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

Dear Ammar Dieb,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project .

The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

- NVLAP Lab Code: 200919-0
- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Ammar Dieb for your business.

Michael Manning
Owner/Director

August 17, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** 214 Lake St, Barn #3, Shrewsbury, MA

**Date Sampled:** 2018-08-16
**Work Received:** 2018-08-17
**Work Analyzed:** 2018-08-17

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 1 / 389418 | Wall Plaster | Oil Tank Room Bsmt | multi | Hair 3<br>Non-Fibrous 97 | None Detected |
| 2 / 389419 | WP (As Debris) | Furnace Room Bsmt | gray | Hair 10<br>Non-Fibrous 90 | None Detected |
| 3 / 389420 | WP | Bay-1 Bsmt | multi | Hair 5<br>Non-Fibrous 95 | None Detected |
| 4 / 389421 | WP | Bay-2 Bsmt | multi | Hair 5<br>Non-Fibrous 95 | None Detected |
| 5 / 389422 | WP | Bay-3 Bsmt | multi | Hair 15<br>Non-Fibrous 85 | None Detected |
| 6 / 389423 | WP | WTR Heater Rm Bsmt | multi | Hair 3<br>Non-Fibrous 97 | None Detected |
| 7 / 389424 | Old Sheetrock Wall | Bay-1 Bsmt | gray | Cellulose 20<br>Non-Fibrous 80 | None Detected |
| 8 / 389425 | Old Sheetrock Wall | Bay-2 Bsmt | gray | Cellulose 10<br>Non-Fibrous 90 | None Detected |
| 9 / 389426 | Black in Clg Batt | Bay-1 Bsmt | multi | Cellulose 70<br>Non-Fibrous 30 | None Detected |
| 10 / 389427 | Window Glaze | Side @ Ramp Exterior | gray | Non-Fibrous 98 | **Detected**<br>**Chrysotile 2** |
| 11 / 389428 | Win Gl | Rear Exterior | gray | Non-Fibrous 98 | **Detected**<br>**Chrysotile 2** |
| 12 / 389429 | Win Gl | Front - Bsmt Exterior | gray | Non-Fibrous 98 | **Detected**<br>**Chrysotile 2** |
| 13 / 389430 | Win Gl For Exterior Door | Bsmt Entrance Exterior | gray | Non-Fibrous 98 | **Detected**<br>**Chrysotile 2** |
| 14 / 389431 | Paper Behind Wood Siding | Exterior | black | Cellulose 70<br>Non-Fibrous 30 | None Detected |

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 15 / 389432 | Paper Behind Wood Siding | Exterior | black | Cellulose 70<br>Non-Fibrous 30 | None Detected |
| 16 / 389433 | Standard Roof Shingle As Debris | Side Exterior | black | Cellulose 40<br>Non-Fibrous 60 | None Detected |
| 17 / 389434 | Standard Roof Shingle As Debris | Rear Exterior | black | Cellulose 40<br>Non-Fibrous 60 | None Detected |
| 18 / 389435 | Red Cement on Slate Roof Shingle as Debris | Side of Bldg Exterior | red | Non-Fibrous 95 | **Detected**<br>**Chrysotile 5** |
| 19 / 389436 | Assumed Red Cement as Debris Assumed Assoc. w/ Slate Shingle | Front of Bldg Exterior | red | Non-Fibrous 97 | **Detected**<br>**Chrysotile 3** |
| 20 / 389437 | Paper Under Hdwd Floor | 1st Fl Random | brown | Cellulose 95<br>Non-Fibrous 5 | None Detected |
| 21 / 389438 | Paper Under Hdwd Floor | 1st Fl Random | brown | Cellulose 95<br>Non-Fibrous 5 | None Detected |
| 22 / 389439 | WP | Bathroom 1st Fl | multi | Hair 10<br>Non-Fibrous 90 | None Detected |
| 23 / 389440 | WP | Main Floor Area 1st Fl | multi | Hair 2<br>Non-Fibrous 98 | None Detected |
| 24 / 389441 | Ceiling Plaster (CP) | Main Floor Area 1st Fl | multi | Hair 2<br>Non-Fibrous 98 | None Detected |
| 25 / 389442 | CP | Side Rm 1st Fl | multi | Hair 5<br>Non-Fibrous 95 | None Detected |
| 26 / 389443 | CP | Side Rm - 2 1st Floor | multi | Non-Fibrous 100 | None Detected |
| 27 / 389444 | Damproofing (Dp) on Stone Foundation | Exterior @ Asph. Ramp | black | Non-Fibrous 100 | None Detected |
| 28 / 389445 | Dp | Exterior @ Asph. Ramp | black | Non-Fibrous 100 | None Detected |

Friday 17 August

Analyzed by: Michael Thomas

End of Report

**Batch:** 35003

1 of 2

# CHAIN OF CUSTODY

2 → SAME day


**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com


Town/City: Shrewsbury, MA Building Name 214 Lake Street, Bldg #3

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 1 | | wall plaster (WP) (as debris) | oil tank room Bsmt |
| 2 | | WP (as debris) | Furnace room |
| 3 | | WP | Bay-1 |
| 4 | | WP | Bay-2 |
| 5 | | WP | Bay-3 |
| 6 | | WP | wtr heater rm |
| 7 | | old sheetrock wall | Bay-1 |
| 8 | | old sheetrock wall | Bay-2 |
| 9 | | Black in old Batt | Bay-1 |
| 10 | | window glaze | side ramp (exterior) |
| 11 | | win gl | rear |
| 12 | | win gl | Front - bsmt |
| 13 | | win gl for exterior door | basement door |
| 14 | | paper behind wood siding | |
| 15 | | paper behind wood siding | |
| 16 | | standard roof shingle as debris | side |
| 17 | | standard roof shingle as debris | rear |
| 18 | | red cement on slate roof shingle as debris | side of bldg |
| 19 | | assumed red cement as debris | assumed assoc. w/ slate shingle (front of bldg) |
| 20 | | paper under hdwd floor | 1st Fl random |

Reported By: [signature] Date: 8/16/18 Due Date: ~~[illegible]~~ SAME day

Received By: [signature] Date: 8/17/18

2 of 2

# CHAIN OF CUSTODY


| Universal Environmental Consultants |
|---|
| 12 Brewster Road |
| Framingham, MA 01702 |
| Tel: (508) 628-5486 - Fax: (508) 628-5488 |
| adieb@uec-env.com |


2 → [redacted] SAME day

Town/City: Shrewsbury, MA Building Name 214 Lake Street, Barn #3

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 21 | | paper underlayment floor | 1ST FL, random 1ST FL |
| 22 | | WP | bathroom |
| 23 | | WP | main floor area |
| 24 | | ceiling plaster (CP) | " " " |
| 25 | | CP | side rm |
| 26 | | CP | side rm - II |
| 27 | | damproofing (dp) on stone foundation | Exterior @ asph. ramp |
| 28 | | dp " " | " " " " |
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Reported By: [signature] Date: 8/16/18 Due Date: 24-hr

Received By: Date:

# Asbestos Identification Laboratory

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com
Email: mikemanning@asbestosidentificationlab.com


**Batch:** 35212

Lab Code: 200919-0

August 23, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** 214 Lake Street/Hab-1, Shrewsbury, MA

**Date Sampled:** 2018-08-23
**Work Received:** 2018-08-23
**Work Analyzed:** 2018-08-23

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

Dear Ammar Dieb,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project .

The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

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- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Ammar Dieb for your business.

Michael Manning
Owner/Director

August 23, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** 214 Lake Street/Hab-1, Shrewsbury, MA

**Date Sampled:** 2018-08-23
**Work Received:** 2018-08-23
**Work Analyzed:** 2018-08-23

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 1 / 390713 | Wall Plaster (WP) | Media Ctr, Bsmt | multi | Non-Fibrous 100 | None Detected |
| 2 / 390714 | WP | 1st Fl. Hall by 123 | multi | Non-Fibrous 100 | None Detected |
| 3 / 390715 | WP(From Column) | Bsmt Hall | multi | Non-Fibrous 100 | None Detected |
| 4 / 390716 | WP | Rm 127 | multi | Non-Fibrous 100 | None Detected |
| 5 / 390717 | WP | 1st Fl. Yellow Rm | multi | Non-Fibrous 100 | None Detected |
| 6 / 390718 | JC? on #5 | 1st Fl. Yellow Rm | gray | Non-Fibrous 100 | None Detected |
| 7 / 390719 | JC? on WP | 1st Fl. Yellow Rm | gray | Non-Fibrous 100 | None Detected |
| 8 / 390720 | WP | Large Open Room, Bsmt | gray | Non-Fibrous 100 | None Detected |
| 9 / 390721 | Ceiling Plaster | Rm 127 | multi | Non-Fibrous 100 | None Detected |
| 10 / 390722 | WP | Bsmt Office | multi | Non-Fibrous 100 | None Detected |
| 11 / 390723 | Roof Deck | Exit Hall by 1st Fl. Elevator | gray | Non-Fibrous 100 | None Detected |
| 12 / 390724 | Purple Sink dp | 1st Fl., Kitchen | purple | Non-Fibrous 85 | **Detected**<br>**Chrysotile 15** |
| 13 / 390725 | Black Sink dp | Boiler Rm. | black | Non-Fibrous 90 | **Detected**<br>**Chrysotile 10** |
| 14 / 390726 | 1x1 A1-I (Hash Mks) | Bsmt hall | gray | Mineral Wool 40<br>Cellulose 40<br>Non-Fibrous 20 | None Detected |

| FieldID<br>LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 15<br>390727 | Glue Tab For Foil/FG | Boiler Rm. | tan | Non-Fibrous 100 | None Detected |
| 16<br>390728 | Glue Tab | Boiler Rm. | tan | Non-Fibrous 100 | None Detected |
| 17<br>390729 | e Off FG | Boiler Rm. | gray | Non-Fibrous 60 | **Detected**<br>**Chrysotile 40** |
| 18<br>390730 | e Off FB | Boiler Rm. | gray | Non-Fibrous 75 | **Detected**<br>**Chrysotile 25** |
| 19<br>390731 | Gold Lino | Rm 122 | multi | Non-Fibrous 70 | **Detected**<br>**Chrysotile 30** |
| 20<br>390732 | Adhesive #19 | Rm 122 | yellow | Non-Fibrous 100 | None Detected |
| 21<br>390733 | Gold Lino | Bsmt, Media Ctr | multi | Non-Fibrous 70 | **Detected**<br>**Chrysotile 30** |
| 22<br>390734 | Adh #21 | Bsmt, Media Ctr | yellow | Non-Fibrous 100 | None Detected |
| 23<br>390735 | Gold Lino | Bsmt, Large Open Room | multi | Non-Fibrous 70 | **Detected**<br>**Chrysotile 30** |
| 24<br>390736 | Adh #23 | Bsmt, Large Open Room | yellow | Non-Fibrous 100 | None Detected |
| 25<br>390737 | Red Lino | Bsmt Hall | multi | Non-Fibrous 70 | **Detected**<br>**Chrysotile 30** |
| 26<br>390738 | Adh #25 | Bsmt Hall | yellow | Non-Fibrous 100 | None Detected |
| 27<br>390739 | Red Lino | | multi | Non-Fibrous 70 | **Detected**<br>**Chrysotile 30** |
| 28<br>390740 | Adh #27 (Residue Black?) | Hall by GC-6 | black | Non-Fibrous 95 | **Detected**<br>**Chrysotile 5** |
| 29<br>390741 | New Grey Lino | 1st Fl. Exercise Room | multi | Cellulose 30<br>Non-Fibrous 70 | None Detected |
| 30<br>390742 | Residue Black? Adh #29 | 1st Fl. Exercise Room | black | Non-Fibrous 100 | None Detected |
| 31<br>390743 | New Grey Lino | 1st Fl. Exercise Room | multi | Cellulose 30<br>Non-Fibrous 70 | None Detected |
| 32<br>390744 | Residue Black? Adh #31 | 1st Fl. Exercise Room | black | Non-Fibrous 100 | None Detected |

| FieldID<br>LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 33<br>390745 | Thick Blue-White Lino | 1st Fl. Tim-Out Room | multi | Non-Fibrous 70 | Detected<br>Chrysotile 30 |
| 34<br>390746 | Adh #33 | 1st Fl. Tim-Out Room | yellow | Non-Fibrous 100 | None Detected |
| 35<br>390747 | Thick Blue-White Lino | 1st Fl. Tim-Out Room | multi | Non-Fibrous 70 | Detected<br>Chrysotile 30 |
| 36<br>390748 | Adh #35 | 1st Fl. Tim-Out Room | yellow | Non-Fibrous 100 | None Detected |
| 37<br>390749 | Blown-in Insulation as Debris on Floor | 1st Fl. Kitchen | brown | Cellulose 100 | None Detected |
| 38<br>390750 | Mesh Backing for 1" Ceramic Floor | Rm by 123 | black | Non-Fibrous 100 | None Detected |
| 39<br>390751 | Red Duct Sealant | Boiler Room | red | Other 20<br>Non-Fibrous 80 | None Detected |
| 40<br>390752 | Red Duct Sealant | Boiler Room | red | Non-Fibrous 90 | Detected<br>Chrysotile 10 |
| 41<br>390753 | Win GL for Interior Win | Random @ Bsmt | gray | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 42<br>390754 | Win GL for Interior Win | Random @ Bsmt | gray | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 43<br>390755 | Win GL for Interior Win | Bsmt Hall @ DD Ass'y | gray | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 44<br>390756 | GL for Win in Metal Door | Bsmt Hall @ DD Ass'y | tan | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 45<br>390757 | Rough WP Over Exit Door | By Rm127 | gray | Non-Fibrous 100 | None Detected |
| 46<br>390758 | Interior Win GL for Exterior Win | 1st Fl. Exercise Rm (Exterior) | black | Non-Fibrous 80 | Detected<br>Chrysotile 20 |
| 47<br>390759 | Int. Win GL for Exercise Win | Bsmt, Media Ctr | black | Non-Fibrous 80 | Detected<br>Chrysotile 20 |
| 48<br>390760 | Red Win Fr. | Front | brown | Non-Fibrous 100 | None Detected |
| 49<br>390761 | Red/Brown Win Fr. | Front | brown | Non-Fibrous 100 | None Detected |
| 50<br>390762 | Brown/Red Glaze | Front | brown | Non-Fibrous 98 | Detected<br>Chrysotile 2 |

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 51 / 390763 | Brown/Red GL | Side | gray | Non-Fibrous 100 | None Detected |
| 52 / 390764 | Brown Door Fr. | Side | brown | Non-Fibrous 100 | **Detected Chrysotile < 1** |

Thursday 23 August

Analyzed by:

End of Report

**Batch:** 35212

1 of 3

# CHAIN OF CUSTODY


**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com


For Same day

Town/City: Shrewsbury, Ma Building Name 214 Lake Street / Hab-1

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 1 | | wall plaster (WP) | media ctr, Bsmt |
| 2 | | WP | 1st Fl hall by 123 |
| 3 | | WP (From column) | Bsmt hall |
| 4 | | WP | rm 127 |
| 5 | | WP | 1st Fl yellow rm |
| 6 | | JC? on #5 | ↓ ↓ |
| 7 | | JC? on WP | |
| 8 | | WP | Large open room, bsmt |
| 9 | | ceiling plaster | rm 127 |
| 10 | | WP | Bsmt office |
| 11 | | roof deck | exit hall by 1st Fl elevator |
| 12 | | purple sink dp | 1st Fl, kitchen |
| 13 | | Black sink dp | Boiler rm |
| 14 | | 1x1 AT-I (hash mks) | Bsmt hall |
| 15 | | glue tab for Foil/FG | duct insul. Boiler rm |
| 16 | | glue tab | " " |
| 17 | | (e) OFF FG | Boiler rm |
| 18 | | (e) OFF FG | " " |
| 19 | | Gold Cino | rm 122 |
| 20 | | adhesive #19 | rm 122 |

Reported By: [signature] Date: 8/22/18 Due Date: SAME day

Received By: [signature] Date: 8/23/18

# CHAIN OF CUSTODY

2 of 3


**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com


Town/City: Shrewsbury MA Building Name 214 Lake Street / Hab-1

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 21 | | Gold Lino | Bsmt, Media Ctr |
| 22 | | adh # 21 | " " " |
| 23 | | Gold Lino | Bsmt, Large Open room |
| 24 | | adh # 23 | " " " |
| 25 | | Red Lino | Boat hall |
| 26 | | adh # 25 | " " |
| 27 | | red Lino | |
| 28 | | adh # 27 (residue Black?) | hall by GC-C |
| 29 | | new grey Lino | 1ST FL EXERCISE room |
| 30 | | residue Black? adh # 29 | 1ST FL EXERCISE room |
| 31 | | New grey Lino | ↓ ↓ |
| 32 | | residue Black? adh # 31 | ↓ ↓ |
| 33 | | Thick Blue-white Lino | 1ST FL Time-out rm |
| 34 | | adh # 33 | ↓ ↓ |
| 35 | | Thick Blue-white Lino | ↓ ↓ |
| 36 | | adh # 35 | ↓ ↓ |
| 37 | | Blown-in insolation as debris on Floor | 1ST FL Kitchen |
| 38 | | mesh backing for 1" ceramic floor | rm by 123 |
| 39 | | red duct sealant | Boiler Room |
| 40 | | red duct sealant | " " |

Reported By: [signature] Date: 8/22/18 Due Date: same day

Received By: _____ Date: _____

3o 3

# CHAIN OF CUSTODY


**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com


Town/City: Shrewsbury MA Building Name 214 Lake Street / HAB-1

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 41 | | win gl for interior win | random @ Bsmt |
| 42 | | win gl for interior win | random @ Bsmt |
| 43 | | win gl for interior win | Bsmt hall @ dd ass'y |
| 44 | | gl for win in metal door | " " " " |
| 45 | | rough up over exit door | by rm 127 |
| 46 | | interior win gl for exterior win | 1st fl exercise rm (EXTERIOR) |
| 47 | | int. win gl for exterior win | Bsmt, media ctr |
| 48 | | red win fr | Front |
| 49 | | red/Brown win fr | Front |
| 50 | | Brown/red glaze | Front |
| 51 | | Brown/red gl | side |
| 52 | | Brown door fr | side |
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Reported By: [signature] Date: 8/22/18 Due Date: SAME day

Received By: _____ Date: _____

# Asbestos Identification Laboratory

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com
Email: mikemanning@asbestosidentificationlab.com


**Batch:** 35279

Lab Code: 200919-0

August 24, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** 214 Lake Street, HAB-2, Shrewsbury, MA

**Date Sampled:** 2018-08-23
**Work Received:** 2018-08-24
**Work Analyzed:** 2018-08-24

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

Dear Ammar Dieb,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project .

The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

- NVLAP Lab Code: 200919-0
- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Ammar Dieb for your business.

Michael Manning
Owner/Director

August 24, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** 214 Lake Street, HAB-2, Shrewsbury, MA

**Date Sampled:** 2018-08-23
**Work Received:** 2018-08-24
**Work Analyzed:** 2018-08-24

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 1 / 391218 | Black Sink Dp | Laundry Rm | black | Non-Fibrous 95 | Detected<br>Chrysotile 5 |
| 2 / 391219 | Brown Mastic for VBB | GC-2 | brown | Non-Fibrous 100 | None Detected |
| 3 / 391220 | Brown M for VBB | C-214 | brown | Non-Fibrous 100 | None Detected |
| 4 / 391221 | New Gray Lino | G8-C | multi | Cellulose 30<br>Non-Fibrous 70 | None Detected |
| 5 / 391222 | Adhesive #4 | G8-C | gray | Non-Fibrous 100 | None Detected |
| 6 / 391223 | New Grey Lino | G8-C | multi | Cellulose 30<br>Non-Fibrous 70 | None Detected |
| 7 / 391224 | Adh #6 | G8-C | brown | Non-Fibrous 100 | None Detected |
| 8 / 391225 | New Black Lino | Dental | multi | Cellulose 20<br>Non-Fibrous 80 | None Detected |
| 9 / 391226 | Adh #8 | Dental | gray | Non-Fibrous 100 | None Detected |
| 10 / 391227 | Old Red Lino | Hall by 220 | multi | Non-Fibrous 70 | Detected<br>Chrysotile 30 |
| 11 / 391228 | Adh #10 | Hall by 220 | yellow | Non-Fibrous 100 | None Detected |
| 12 / 391229 | Old Gold Lino | C-218 | multi | Non-Fibrous 70 | Detected<br>Chrysotile 30 |
| 13 / 391230 | Adh #12 | C-218 | yellow | Non-Fibrous 100 | None Detected |
| 14 / 391231 | 12" Brown Floor Tile | GC-1 | brown | Non-Fibrous 98 | Detected<br>Chrysotile 2 |

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 15 / 391232 | Mastic on #14 | GC-1 | black | Non-Fibrous 90 | Detected<br>Chrysotile 10 |
| 16 / 391233 | 12" Brown Floor Tile | Hall by GC-6 | brown | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 17 / 391234 | M #16 | Hall by GC-6 | black | Non-Fibrous 90 | Detected<br>Chrysotile 10 |
| 18 / 391235 | Glazing for Wood Door Window | Hall by Laundry | tan | Other 2<br>Non-Fibrous 98 | None Detected |
| 19 / 391236 | Gl for Interior Window | Dd Ass'y by C-211 | gray | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 20 / 391237 | Blown-in Insulation | In Wall Hatch, Rm C-216 | brown | Cellulose 90<br>Non-Fibrous 10 | None Detected |
| 21 / 391238 | Red Duct Sealant | Boiler Rm | red | Other 40<br>Non-Fibrous 60 | None Detected |
| 22 / 391239 | Red Duct Sealant | Boiler Rm | red | Other 40<br>Non-Fibrous 60 | None Detected |
| 23 / 391240 | Glue Tab for Foil Lined FG | Boiler Rm | yellow | Non-Fibrous 100 | None Detected |
| 24 / 391241 | 1x1 AT Fissured | Hall by C-205 | gray | Mineral Wool 40<br>Cellulose 40<br>Non-Fibrous 20 | None Detected |
| 25 / 391242 | 1x1 AT Fissured | Entrance Hall From Breezeway | gray | Mineral Wool 40<br>Cellulose 40<br>Non-Fibrous 20 | None Detected |
| 26 / 391243 | 1x1 AT Fissured | Entrance Hall From Breezeway | gray | Mineral Wool 40<br>Cellulose 40<br>Non-Fibrous 20 | None Detected |
| 27 / 391244 | 1x1 AT Fissured | Hall by C-213 | gray | Mineral Wool 40<br>Cellulose 40<br>Non-Fibrous 20 | None Detected |
| 28 / 391245 | Ceiling Plaster (CP) | C-223 | white | Non-Fibrous 100 | None Detected |
| 29 / 391246 | CP | Bsmt Exit Hall by Fexd Services | multi | Non-Fibrous 100 | None Detected |
| 30 / 391247 | CP | Bsmt Men's RM | multi | Non-Fibrous 100 | None Detected |
| 31 / 391248 | CP | C-217 | multi | Non-Fibrous 100 | None Detected |
| 32 / 391249 | CP | GC-15 | multi | Non-Fibrous 100 | None Detected |

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 33 / 391250 | Wall Plaster (WP) | (@ Column) C-211 | multi | Non-Fibrous 100 | None Detected |
| 34 / 391251 | WP | C-214 | multi | Non-Fibrous 100 | None Detected |
| 35 / 391252 | WP | C-209 | multi | Non-Fibrous 100 | None Detected |
| 36 / 391253 | Joint Compound (JC) on #35 | C-209 | white | Non-Fibrous 100 | None Detected |
| 37 / 391254 | JC on WP | C-209 | white | Non-Fibrous 100 | None Detected |
| 38 / 391255 | Red Glaze | Rear Exterior | brown | Non-Fibrous 100 | None Detected |
| 39 / 391256 | Red Glaze | Front Exterior | brown | Non-Fibrous 100 | None Detected |
| 40 / 391257 | Brown Win Fr | Front Exterior | brown | Fiberglass 2<br>Non-Fibrous 98 | None Detected |
| 41 / 391258 | White Door Fr | Rear Exterior | gray | Non-Fibrous 100 | None Detected |
| 42 / 391259 | White Win Fr | Rear Exterior | gray | Non-Fibrous 100 | None Detected |
| 43 / 391260 | Brown Door Fr | Side Exterior | brown | Non-Fibrous 100 | None Detected |
| 44 / 391261 | Interior Gl For Exterior Win | C-217 Exterior | black | Non-Fibrous 80 | **Detected**<br>**Chrysotile 20** |
| 45 / 391262 | Int. Gl. For Ext. Window | Bsmt-Dental Exterior | black | Non-Fibrous 80 | **Detected**<br>**Chrysotile 20** |
| 46 / 391263 | 12" Brown Floor Tile | Hall Outside Boiler Rm | red | Non-Fibrous 97 | **Detected**<br>**Chrysotile 3** |
| 47 / 391264 | M #46 | Hall Outside Boiler Rm | black | Non-Fibrous 90 | **Detected**<br>**Chrysotile 10** |
| 48 / 391265 | Glaze in Metal Door Window | Dental by Elevators | tan | Non-Fibrous 98 | **Detected**<br>**Chrysotile 2** |
| 49 / 391266 | Interior Window Gl | DD Ass'y by 211 | gray | Non-Fibrous 98 | **Detected**<br>**Chrysotile 2** |
| 50 / 391267 | Blown-in Insulation | Top of CP C-204 | brown | Cellulose 100 | None Detected |

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 51 / 391268 | Red Duct Sealant | Hall by C-204 | red | Non-Fibrous 95 | **Detected**<br>**Chrysotile 5** |
| 52 / 391269 | Exposed Glue Tab on Uninsulated Metal Duct | AC, Hall by C-204 | brown | Non-Fibrous 70 | **Detected**<br>**Chrysotile 30** |
| 53 / 391270 | Yellow Adhesive on Foil Wrapped FG Dust | AC, C-207 | yellow | Non-Fibrous 100 | None Detected |
| 54 / 391271 | Roof Drain e | AC, C-207 | gray | Mineral Wool 40<br>Non-Fibrous 60 | None Detected |
| 55 / 391272 | Roof Drain e Debris on Top of AT | Hall by C-204 | gray | Mineral Wool 40<br>Non-Fibrous 60 | None Detected |
| 56 / 391273 | Rd e Debris | Hall by C-204 | gray | Mineral Wool 40<br>Non-Fibrous 60 | None Detected |
| 57 / 391274 | Wood Fire Door Insul | Rm 209 | gray | Cellulose 70<br>Non-Fibrous 30 | None Detected |
| 58 / 391275 | Wood F.D. Insul | Rm 211 | gray | Cellulose 70<br>Non-Fibrous 30 | None Detected |
| 59 / 391276 | Glue Tab for Dark Styrofoam Clg Panel | Rm Across from GC-7 | brown | Non-Fibrous 70 | **Detected**<br>**Chrysotile 30** |
| 60 / 391277 | Red Adhesive on Dark Styrofoam Clg Panel | Rm Across from GC-7 | red | Non-Fibrous 70 | **Detected**<br>**Chrysotile 30** |
| 61 / 391278 | Red Adh of Dark Styrofoam Clg Panel | Rm Across from GC-7 | red | Non-Fibrous 70 | **Detected**<br>**Chrysotile 30** |
| 62 / 391279 | Door- Fram Caulk for Interior Door- Former Exterior Door | C-207 | tan | Non-Fibrous 100 | None Detected |

Friday 24 August

Analyzed by:

End of Report

**Batch:** 35279

# CHAIN OF CUSTODY

4

For Same day


**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com


Town/City: Shrewsbury, MA Building Name 214 LAKE STREET, HAB-2

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 1 | | Black sink dp | Laundry rm |
| 2 | | Brown mastic for VBB | GC-2 |
| 3 | | Brown (m) for VBB | C-214 |
| 4 | | New grey Lino | G8-C |
| 5 | | adhesive #4 | |
| 6 | | New grey Lino | |
| 7 | | adh #6 | |
| 8 | | New Blue Lino | Dental |
| 9 | | adh #8 | " |
| 10 | | old red Lino | hall by 220 |
| 11 | | adh #10 | " " |
| 12 | | old Gold Lino | C-218 |
| 13 | | adh #12 | C-218 |
| 14 | | 12" Brown Floor tile | GC-1 |
| 15 | | mastic #14 | GC-1 |
| 16 | | 12" Brown Floor tile | hall by GC-6 |
| 17 | | (m) #16 | hall by GC-6 |
| 18 | | glazing for wood door window | hall by Laundry |
| 19 | | gl for interior window | dd assy by C-211 |
| 20 | | Blown-in insulation | in wall hatch, rm C-216 |

Reported By: [signature] Date: 8/23/18 Due Date: same day

Received By: [signature] Date: 8/24/18

# CHAIN OF CUSTODY

**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com

Town/City: Shrewsbury, MA Building Name 214 Lake Street, HAB-2

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 21 | | red duct sealant | Boiler room |
| 22 | | red duct sealant | Boiler room |
| 23 | | glue tab for foil lined FG (DL) | Boiler room |
| 24 | | 1x1 [AT] fissured | hall by C-205 |
| 25 | | 1x1 [AT] fissured | entrance hall from breezeway |
| 26 | | 1x1 [AT] hashmarks | " " " |
| 27 | | 1x1 [AT] hashmarks | hall by C-213 |
| 28 | | ceiling plaster (CP) | C-223 |
| 29 | | CP | Bsmt exit hall by Food Services |
| 30 | | CP | Bsmt men's rm |
| 31 | | CP | C-217 |
| 32 | | CP | GC-15 |
| 33 | | wall plaster (WP) | (e column) C-211 |
| 34 | | WP | C-214 |
| 35 | | WP | C-209 |
| 36 | | joint compound (JC) on #35 | C-209 |
| 37 | | JC on WP | C-209 |
| 38 | | red glaze | rear exterior |
| 39 | | red glaze | Front |
| 40 | | Brown window fr. | Front |

Reported By: [signature] Date: 8-23-18 Due Date: SAME day

Received By: Date:

3c 4

# CHAIN OF CUSTODY


**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com


Town/City: Shrewsbury, MA Building Name 214 Lake Street, HAB-2

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 41 | | white door fr | rear EXTERIOR |
| 42 | | white win fr | rear |
| 43 | | Brown door fr | side |
| 44 | | interior gl for exterior win | C-217 |
| 45 | | int. gl. for ext. win | Bsmt - Dental |
| 46 | | 12" Brown Floor tile | hall outside Boiler rm |
| 47 | | (m) #46 | " " " |
| 48 | | glaze in metal door window | Dental by elevators |
| 49 | | interior window gl | Ht assy by 211 |
| 50 | | Blown-in insulation | Top of CP C-204 |
| 51 | | red door sealant | hall by C-204 |
| 52 | | glue tab exposed on uninsulated metal door, AC, hall by C-204 | |
| 53 | | yellow adhesive on foil wrapped FG door, AC, C-207 | |
| 54 | | roof drain (e) | AC, C-207 |
| 55 | | roof drain (e) debris on top of [A7] | hall by C-204 |
| 56 | | Red (e) debris " " | " " " " |
| 57 | | WOOD FILE door insul | rm 209 |
| 58 | | WOOD F.D. insul | rm 211 |
| 59 | | glue tab for dark styrofoam elg panel | rm across from GC-7 |
| 60 | | red adhesive on dark styrofoam elg panel | " " |

Reported By: [signature] Date: 8-23-18 Due Date: SAME day

Received By: Date:

# CHAIN OF CUSTODY

**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com

Town/City: Shrewsbury, MA Building Name 214 Lake St, Hab-2

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 61 | | red adh. of Dark styrofoam ceiling panel | on across from GC-7 |
| 62 | | door frame caulk for interior door - Former exterior door? | C-207 |
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Reported By: [signature] Date: 8/23/18 Due Date: Same day

Received By: Date:

# Asbestos Identification Laboratory

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com
Email: mikemanning@asbestosidentificationlab.com


**Batch:** 35005

Lab Code: 200919-0

August 17, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** 214 Lake St, The Nursery, Shrewsbury, MA

**Date Sampled:** 2018-08-16
**Work Received:** 2018-08-17
**Work Analyzed:** 2018-08-17

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

Dear Ammar Dieb,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project .

The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

- NVLAP Lab Code: 200919-0
- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Ammar Dieb for your business.

Michael Manning
Owner/Director

August 17, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** 214 Lake St, The Nursery, Shrewsbury, MA

**Date Sampled:** 2018-08-16
**Work Received:** 2018-08-17
**Work Analyzed:** 2018-08-17

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 1 / 389446 | 1x1 AT | Hall by Mech Rm | gray | Mineral Wool 40<br>Cellulose 40<br>Non-Fibrous 20 | None Detected |
| 2 / 389447 | 1x1 AT | Reception | gray | Mineral Wool 40<br>Cellulose 40<br>Non-Fibrous 20 | None Detected |
| 3 / 389448 | Purple Dp for Sink | Rm4 | purple | Non-Fibrous 90 | Detected<br>Chrysotile 10 |
| 4 / 389449 | Purple Dp for Sink | Rm-x | purple | Non-Fibrous 90 | Detected<br>Chrysotile 10 |
| 5 / 389450 | Brown-Gold 12" VT-I | Rm-4 | tan | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 6 / 389451 | Mastic #5 | Rm-4 | black | Non-Fibrous 90 | Detected<br>Chrysotile 10 |
| 7 / 389452 | VT-I | Rm by Wkshp Coordinator | tan | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 8 / 389453 | Mastic #7 | Rm by Wkshp Coordinator | black | Non-Fibrous 90 | Detected<br>Chrysotile 10 |
| 9 / 389454 | VT Under Dark Carpet | C'Rm by Fire Hose | tan | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 10 / 389455 | M #9 | C'Rm by Fire Hose | black | Non-Fibrous 90 | Detected<br>Chrysotile 10 |
| 11 / 389456 | Thick Cementitious Leveler #9 | C'Rm by Fire Hose | gray | Non-Fibrous 100 | None Detected |
| 15 / 389457 | VT Under DK Carpet | Reception | red | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 13 / 389458 | M #12 | Reception | black | Non-Fibrous 90 | Detected<br>Chrysotile 10 |
| 12 / 389459 | Soft Grey Leveler | Open Area Facing Reception | gray | Non-Fibrous 100 | None Detected |

| FieldID<br>LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 14<br>389460 | Carpet Glue #12 | Open Area Facing Reception | yellow | Non-Fibrous 100 | None Detected |
| 16<br>389461 | Mastic #15 | Reception | black | Non-Fibrous 90 | Detected<br>Chrysotile 10 |
| 17<br>389462 | Carpet Glue #15 | Reception | yellow | Non-Fibrous 100 | None Detected |
| 18<br>389463 | Glazing for Mesh Window in Wood Door | Rm-5 | tan | Non-Fibrous 95 | Detected<br>Chrysotile 5 |
| 19<br>389464 | Gl for Interior Mesh Window | Reception Area | gray | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 20<br>389465 | Gl for Int. Mesh Window | Recept. Area | gray | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 21<br>389466 | Window Gl | | gray | Non-Fibrous 100 | None Detected |
| 22<br>389467 | Window Gl | | gray | Non-Fibrous 100 | None Detected |
| 23<br>389468 | Window Gl | | gray | Non-Fibrous 100 | None Detected |
| 24<br>389469 | In Woodseams of Win System | | brown | Non-Fibrous 100 | None Detected |
| 25<br>389470 | Window Fram Caulk | | brown | Non-Fibrous 100 | None Detected |
| 26<br>389471 | Win Fr | | brown | Non-Fibrous 100 | None Detected |
| 27<br>389472 | Win Fr | | brown | Non-Fibrous 100 | None Detected |
| 28<br>389473 | Gl for Exterior Door | Wide Window Rear | gray | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 29<br>389474 | Gl for Exterior Door | Wide Window Front | gray | Non-Fibrous 98 | Detected<br>Chrysotile 2 |
| 30<br>389475 | Roof Shingle | | black | Fiberglass 20<br>Non-Fibrous 80 | None Detected |
| 31<br>389476 | Roof Shingle | | black | Fiberglass 20<br>Non-Fibrous 80 | None Detected |
| 32<br>389477 | Transite Wall | Roof Mechanical Room | gray | Non-Fibrous 90 | Detected<br>Chrysotile 10 |

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 33 / 389478 | E off FG | Wtr Htr Room | gray | Mineral Wool 60<br>Cellulose 2<br>Non-Fibrous 38 | None Detected |

Friday 17 August

End of Report



Analyzed by:

**Batch:** 35005

1 of 2

# CHAIN OF CUSTODY


**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com


Town/City: Shrewsbury, MA Building Name 214 Lake Street, The Nursery

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 1 | | 1x1 [AT] hall by mech | rm |
| 2 | | 1x1 [AT] | reception |
| 3 | | purple dp for sink | rm 4 |
| 4 | | purple dp for sink | rm-x |
| 5 | | Brown-Gold 12" VT-I | rm-4 |
| 6 | | mastic #5 | rm-4 |
| 7 | | VT-I | rm by Wkshp Coordinator |
| 8 | | mastic #7 | " " " " |
| 9 | | VT under Dark carpet | rm by Fire Hose |
| 10 | | (m) #9 | |
| 11 | | Thick cementitious Leveler #9 | |
| (15) | | VT under DK carpet | → reception |
| 13 | | (m) #12 | |
| (12) | | soft grey Leveler #12 | open area facing reception |
| (14) | | carpet glue #12 | |
| 16 | | mastic #15 | reception |
| 17 | | carpet glue #15 | reception |
| 18 | | glazing for mesh window in wood door | rm-5 |
| 19 | | gl for interior mesh window | reception area |
| 20 | | gl for int. mesh win | recept. area |

Reported By: [signature] Date: 8-16-18 Due Date: SAME day

Received By: Elena Blatto Date: 8/17/18

2
2

# CHAIN OF CUSTODY


**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com


Town/City: Shrewsbury, MA Building Name 214 Lake Street, The Nursery

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 21 | | window gl | |
| 22 | | win gl | |
| 23 | | win gl | |
| 24 | | in woodseams of win system | |
| 25 | | window frame caulk | |
| 26 | | win fr | |
| 27 | | win fr | |
| 28 | | gl for exterior door | wide window rear |
| 29 | | gl for ext. door | wide window front |
| 30 | | roof shingle | |
| 31 | | roof shingle | |
| 32 | | Transite wall | roof mechanical room |
| 33 | | (e) OFFEG | WTC htc room |
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Reported By: [signature] Date: 8/16/18 Due Date: SAME day

Received By: Date:

# Asbestos Identification Laboratory

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com
Email: mikemanning@asbestosidentificationlab.com


**Batch:** 35008

Lab Code: 200919-0

August 17, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** 214 Lake St, Pool Area, Shrewsbury, MA

**Date Sampled:** 2018-08-16
**Work Received:** 2018-08-17
**Work Analyzed:** 2018-08-17

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

Dear Ammar Dieb,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project .

The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

- NVLAP Lab Code: 200919-0
- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Ammar Dieb for your business.

Michael Manning
Owner/Director

August 17, 2018

Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project Number:**
**Project Name:** 214 Lake St, Pool Area, Shrewsbury, MA

**Date Sampled:** 2018-08-16
**Work Received:** 2018-08-17
**Work Analyzed:** 2018-08-17

**Analysis Method:** BULK PLM ANALYSIS EPA/600/R-93/116

| FieldID / LabID | Material | Location | Color | Non-Asbestos % | Asbestos % |
|---|---|---|---|---|---|
| 1 / 389484 | Roof Shingle, Small Shed | Pool Areas | black | Cellulose 20<br>Non-Fibrous 80 | None Detected |
| 2 / 389485 | Roof Shingle, Large Shed | Pool Areas | black | Cellulose 20<br>Non-Fibrous 80 | None Detected |
| 3 / 389486 | Homasote Wall Panel, Large Shed (Interior) | Pool Areas | brown | Cellulose 100 | None Detected |
| 4 / 389487 | Homasote Wall Panel, Large Shed (Interior) | Pool Areas | brown | Cellulose 100 | None Detected |

Friday 17 August
Analyzed by:

End of Report

**Batch:** 35008

# CHAIN OF CUSTODY

→ SAME day


**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com


Town/City: Shrewsbury, MA Building Name 214 Lake Street, Pool Area

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 1 | | roof shingle, small shed | Pool Areas |
| 2 | | roof shingle, Large shed | |
| 3 | | homosote wall panel, Large shed (interior) | |
| 4 | | homosote wall panel, Large shed (interior) | |
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Reported By: [signature] Date: 8/16/18 Due Date: SAME day

Received By: Elena Baxter Date: 8/17/18

131805516

# CHAIN OF CUSTODY

**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com

PLM
48-hour TAT

Town/City: Shrewsbury, MA Building Name Glavin Center

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 1 | | Black dampproofing | Nursery on foundation |
| 2 | | " " | " " |
| 3 | | " " | " " |
| 4 | | Black DP on steel beam | nursery exterior wall cut |
| 5 | | " " | " " |
| 6 | | Roof edge caulk | Nursery at metal edge roof |
| 7 | | flashing tar at wall | nursery roof |
| 8 | | Black tar on metal edge | nursery roof |
| 9 | | " " | " " |
| 10 | | Asphalt shingle | nursery roof |
| 11 | | Paper under Asphalt shingle | nursery roof |
| 12 | | " " | " " |
| 13 | | Black Dampproofing | Admin on Foundation |
| 14 | | " " | " " |
| 15 | | Asphalt shingle | Admin roof |
| 16 | | Paper under Asphalt shingle | " " |
| 17 | | Black tar on metal edge | Admin roof |
| 18 | | " " | " " |
| 19 | | Lightweight cement deck | Admin roof |
| 20 | | " " | " " |

Reported By: Jason Becotte Date: 8-21-18 Due Date:

Received By: Date: REC'D 16:45EDS
EMSL-BOSTON AUG 22 2018
WI

UNIVERSAL ENVIRONMENTAL CONSULTANTS

131805516

# CHAIN OF CUSTODY

**Universal Environmental Consultants**
12 Brewster Road
Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com

PLM

Town/City: Shrewsbury, MA Building Name Glavin Center

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 21 | | tar on vent penetration | Admin roof |
| 22 | | Pipe penetration caulk | Admin roof |
| 23 | | " " | " " |
| 24 | | old roofing tar paper | Admin roof |
| 25 | | edge caulk at wall | Covered walkway |
| 26 | | Asphalt shingle | Hab-1 roof |
| 27 | | Paper under Asphalt shingle | " " |
| 28 | | Pipe penetration caulk | Hab-1 roof |
| 29 | | " " | " " |
| 30 | | Black tar on metal edge | Hab-1 roof |
| 31 | | Lightweight cement deck | Hab-1 roof |
| 32 | | " " | |
| 33 | | old roof tar | Hab-1 roof |
| 34 | | Asphalt shingle | Hab-2 roof |
| 35 | | Paper under Asphalt shingle | " " |
| 36 | | Black tar on metal edge | Hab-2 roof |
| 37 | | " " | " " |
| 38 | | Flashing tar at wall | Hab-2 roof |
| 39 | | Light weight cement deck | Hab-2 roof |
| 40 | | " " | " " |

Reported By: Jason Becotte Date: 8-21-18 Due Date:

Received By: Date:

REC'D 16:45 EDS
EMSL-BOSTON AUG 22 2018

UNIVERSAL ENVIRONMENTAL CONSULTANTS

OrderID: 131805516

131805516

# CHAIN OF CUSTODY


**Universal Environmental Consultants**
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Framingham, MA 01702
Tel: (508) 628-5486 - Fax: (508) 628-5488
adieb@uec-env.com


PLM

Town/City: Shrewsbury, MA Building Name Glavin Center

| Sample | Result | Description of Material | Sample Location |
|---|---|---|---|
| 41 | | old tar roof | Hab-2 loading dock roof |
| 42 | | Asphalt shingle | Barn -1 rear shed roof |
| 43 | | " " | " " |
| 44 | | Paper under Asphalt shingle | " " |
| 45 | | " " | " " |
| 46 | | edge caulk at metal trim | Hab-1 roof |
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Reported By: Jason Becotte Date: 8-21-18 Due Date:

Received By: Date: REC'D 16:45 EST EMSL-BOSTON AUG 22 2018

UNIVERSAL ENVIRONMENTAL CONSULTANTS

# EMSL Analytical, Inc.

**5 Constitution Way, Unit A Woburn, MA 01801**

Tel/Fax: (781) 933-8411 / (781) 933-8412

http://www.EMSL.com / bostonlab@emsl.com


**EMSL Order:** 131805516
**Customer ID:** UEC63
**Customer PO:**
**Project ID:**

**Attention:** Ammar Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

**Project:** Glavin Center / Shrewsbury, MA

**Phone:** (617) 984-9772
**Fax:** (508) 628-5488
**Received Date:** 08/22/2018 4:45 PM
**Analysis Date:** 08/24/2018
**Collected Date:** 08/21/2018

## *Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy*

| Sample | Description | Appearance | Non-Asbestos % Fibrous | Non-Asbestos % Non-Fibrous | Asbestos % Type |
|---|---|---|---|---|---|
| 1 *131805516-0001* | Nursery on Foundation - Black Dampproofing | Black Non-Fibrous Homogeneous | | 90% Non-fibrous (Other) | 10% Chrysotile |
| 2 *131805516-0002* | Nursery on Foundation - Black Dampproofing | Black Non-Fibrous Homogeneous | | 90% Non-fibrous (Other) | 10% Chrysotile |
| 3 *131805516-0003* | Nursery on Foundation - Black Dampproofing | Black Non-Fibrous Homogeneous | | 90% Non-fibrous (Other) | 10% Chrysotile |
| 4 *131805516-0004* | Nursery Exterior Wall Cut - Black DP on Steel Beam | Black Non-Fibrous Homogeneous | | 90% Non-fibrous (Other) | 10% Chrysotile |
| 5 *131805516-0005* | Nursery Exterior Wall Cut - Black DP on Steel Beam | Black Non-Fibrous Homogeneous | | 90% Non-fibrous (Other) | 10% Chrysotile |
| 6 *131805516-0006* | Nursery at Metal Edge Roof - Roof Edge Caulk | Brown Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 7 *131805516-0007* | Nursery Roof - Flashing Tar At Wall | Black Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 8 *131805516-0008* | Nursery Roof - Black Tar on Metal Edge | Black Non-Fibrous Homogeneous | | 90% Non-fibrous (Other) | 10% Chrysotile |
| 9 *131805516-0009* | Nursery Roof - Black Tar on Metal Edge | Black Non-Fibrous Homogeneous | | 90% Non-fibrous (Other) | 10% Chrysotile |
| 10 *131805516-0010* | Nursery Roof - Asphalt Shingle | White/Black Fibrous Homogeneous | 10% Glass | 90% Non-fibrous (Other) | None Detected |
| 11 *131805516-0011* | Nursery Roof - Paper Under Asphalt Shingle | Black Fibrous Homogeneous | 10% Glass | 90% Non-fibrous (Other) | None Detected |
| 12 *131805516-0012* | Nursery Roof - Paper Under Asphalt Shingle | Black Fibrous Homogeneous | 10% Glass | 90% Non-fibrous (Other) | None Detected |
| 13 *131805516-0013* | Admin on Foundation - Black Dampproofing | Black Non-Fibrous Homogeneous | | 90% Non-fibrous (Other) | 10% Chrysotile |
| 14 *131805516-0014* | Admin on Foundation - Black Dampproofing | Black Non-Fibrous Homogeneous | | 90% Non-fibrous (Other) | 10% Chrysotile |
| 15 *131805516-0015* | Admin Roof - Asphalt Shingle | White/Black Fibrous Homogeneous | 10% Glass | 90% Non-fibrous (Other) | None Detected |
| 16 *131805516-0016* | Admin Roof - Paper Under Asphalt Shingle | Black Fibrous Homogeneous | 80% Cellulose | 20% Non-fibrous (Other) | None Detected |

Initial report from: 08/24/2018 16:58:50

**EMSL Analytical, Inc.**
5 Constitution Way, Unit A Woburn, MA 01801
Tel/Fax: (781) 933-8411 / (781) 933-8412
http://www.EMSL.com / bostonlab@emsl.com

**EMSL Order:** 131805516
**Customer ID:** UEC63
**Customer PO:**
**Project ID:**

## *Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy*

| | | | Non-Asbestos | | Asbestos |
|---|---|---|---|---|---|
| **Sample** | **Description** | **Appearance** | **% Fibrous** | **% Non-Fibrous** | **% Type** |
| 17 *131805516-0017* | Admin Roof - Black Tar on Metal Edge | Black Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 18 *131805516-0018* | Admin Roof - Black Tar on Metal Edge | Black Non-Fibrous Homogeneous | | 90% Non-fibrous (Other) | 10% Chrysotile |
| 19 *131805516-0019* | Admin Roof - Lightweight Cement Deck | Gray Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 20 *131805516-0020* | Admin Roof - Lightweight Cement Deck | Gray Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 21 *131805516-0021* | Admin Roof - Tar on Vent Penetration | Black Fibrous Homogeneous | 10% Cellulose | 90% Non-fibrous (Other) | None Detected |
| 22 *131805516-0022* | Admin Roof - Pipe Penetration Caulk | Clear Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 23 *131805516-0023* | Admin Roof - Pipe Penetration Caulk | Clear Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 24 *131805516-0024* | Admin Roof - Old Roofing Tar Paper | Black Fibrous Homogeneous | 60% Cellulose | 40% Non-fibrous (Other) | None Detected |
| 25 *131805516-0025* | Covered Walkway - Edge Caulk at Wall | White Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 26 *131805516-0026* | Hab-1 Roof - Asphalt Shingle | White/Black Fibrous Homogeneous | 10% Glass | 90% Non-fibrous (Other) | None Detected |
| 27 *131805516-0027* | Hab-1 Roof - Paper Under Asphalt Shingle | Black Fibrous Homogeneous | 80% Cellulose | 20% Non-fibrous (Other) | None Detected |
| 28 *131805516-0028* | Hab-1 Roof - Pipe Penetration Caulk | Clear Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 29 *131805516-0029* | Hab-1 Roof - Pipe Penetration Caulk | Clear Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 30 *131805516-0030* | Hab-1 Roof - Black Tar on Metal Edge | Black Non-Fibrous Homogeneous | | 90% Non-fibrous (Other) | 10% Chrysotile |
| 31 *131805516-0031* | Hab-1 Roof - Lightweight Cement Deck | Gray Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 32 *131805516-0032* | Hab-1 Roof - Lightweight Cement Deck | Gray Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 33 *131805516-0033* | Hab-1 Roof - Old Roof Tar | Black Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 34 *131805516-0034* | Hab-2 Roof - Asphalt Shingle | White/Black Fibrous Homogeneous | 10% Glass | 90% Non-fibrous (Other) | None Detected |
| 35 *131805516-0035* | Hab-2 Roof - Paper Under Asphalt Shingle | Black Fibrous Homogeneous | 80% Cellulose | 20% Non-fibrous (Other) | None Detected |

Initial report from: 08/24/2018 16:58:50

**EMSL Analytical, Inc.**
**5 Constitution Way, Unit A Woburn, MA 01801**
Tel/Fax: (781) 933-8411 / (781) 933-8412
http://www.EMSL.com / bostonlab@emsl.com

**EMSL Order:** 131805516
**Customer ID:** UEC63
**Customer PO:**
**Project ID:**

## *Test Report: Asbestos Analysis of Bulk Materials via EPA 600/R-93/116 Method using Polarized Light Microscopy*

| | | | Non-Asbestos | | Asbestos |
|---|---|---|---|---|---|
| **Sample** | **Description** | **Appearance** | **% Fibrous** | **% Non-Fibrous** | **% Type** |
| 36 *131805516-0036* | Hab-2 Roof - Black Tar on Metal Edge | Black Non-Fibrous Homogeneous | | 95% Non-fibrous (Other) | 5% Chrysotile |
| 37 *131805516-0037* | Hab-2 Roof - Black Tar on Metal Edge | Black Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 38 *131805516-0038* | Hab-2 Roof - Flashing Tar at Wall | Black Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 39 *131805516-0039* | Hab-2 Roof - Lightweight Cement Deck | Gray Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 40 *131805516-0040* | Hab-2 Roof - Lightweight Cement Deck | Gray Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |
| 41 *131805516-0041* | Hab-2 Loading Dock Roof - Old Tar Roof | Black Fibrous Homogeneous | 10% Cellulose | 90% Non-fibrous (Other) | None Detected |
| 42 *131805516-0042* | Barn-1 Rear Shed Roof - Asphalt Shingle | Black Fibrous Homogeneous | 10% Glass | 90% Non-fibrous (Other) | None Detected |
| 43 *131805516-0043* | Barn-1 Rear Shed Roof - Asphalt Shingle | Black Fibrous Homogeneous | 10% Glass | 90% Non-fibrous (Other) | None Detected |
| 44 *131805516-0044* | Barn-1 Rear Shed Roof - Paper Under Asphalt Shingle | Black Fibrous Homogeneous | 80% Cellulose | 20% Non-fibrous (Other) | None Detected |
| 45 *131805516-0045* | Barn-1 Rear Shed Roof - Paper Under Asphalt Shingle | Black Fibrous Homogeneous | 80% Cellulose | 20% Non-fibrous (Other) | None Detected |
| 46 *131805516-0046* | Hab-1 Roof - Edge Caulk at Metal Trim | Gray Non-Fibrous Homogeneous | | 100% Non-fibrous (Other) | None Detected |

Analyst(s)
*Kevin Pine (46)*

Steve Grise, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method"), but augmented with procedures outlined in the 1993 ("final") version of the method. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. All samples received in acceptable condition unless otherwise noted. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. EMSL recommends gravimetric reduction for all non-friable organically bound materials prior to analysis. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Woburn, MA NVLAP Lab Code 101147-0, CT PH-0315, MA AA000188, RI AAL-139, VT AL998919, Maine Bulk Asbestos LB-0039

Initial report from: 08/24/2018 16:58:50

Lord Associates, Inc.
*Environmental Consulting & Licensed Site Professional Services*

1506 Providence Highway - Suite 30
Norwood, MA 02062-4647

Voice: 781.255.5554
Fax: 781.255.5535
www.lordenv.com

September 6, 2018

Ammar M. Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

RE: Arsenic Analysis Results for Soil Samples
Portion of 214 Lake Street
Shrewsbury, MA.

Dear Ammar,

Pursuant to your request, Lord Associates, Inc. (LAI) has prepared the following summary of soil sampling results from the 214 Lake Street project in Shrewsbury, Massachusetts.

*Background*

LAI completed the sampling and analysis of eight soil samples from the site in April 2018. Soil samples were collected from the top 12" of soil. As reported in the April 17, 2018 Soil Sampling and Analysis Report, arsenic was detected in the eight soil samples at concentrations ranging from 8.92 milligrams per kilogram (mg/kg) to 47.4 mg/kg. Five of the eight soil samples displayed arsenic concentrations above the potentially applicable MADEP standard of 20 mg/kg. However, it was determined that the arsenic was of natural origin, and thus exempt from MADEP notification. Additional soil sampling and analysis has been completed to further characterize arsenic concentrations in soil at the site.

*Method*

The locations of the samples were selected based on geotechnical considerations determined by Lahlaf Geotechnical Consulting, Inc. (LGCI). A series of exploratory test pits and test borings were completed by LGCI in July and August of 2018. The drilling and excavating services were provided by Northern Drill Services and Hoffman Environmental Services, respectively. Boring logs, geotechnical evaluations and a Site Plan are to be provided to the client by LGCI.

LAI selected representative sub-samples from the geotechnical soil samples for total arsenic analyses by a state-certified laboratory (Alpha Analytical, Inc.). Based on those results, additional samples, representative of the major soil types at the site, including topsoil, fill and sand/gravel soil, were submitted for arsenic analysis. Sub-samples were removed from the drillers jars or plastic bags and placed in laboratory prepared glass jars for transport to the analytical laboratory. The samples were analyzed for total solids and arsenic via EPA Methods 3050B and 6010C.

*Results*

The results of the testing for arsenic were compared to Massachusetts residential cleanup standards ("S-1/GW-2") as wells as the Comm -97-001 landfill parameter to allow for a wider range of disposal option selection. As shown on Table 1, arsenic was detected at concentrations ranging from 6.4 to 55.9 mg/kg. Thirty of the forty samples had concentrations greater than the applicable standard of 20 mg/kg. The average concentrations of arsenic were 18.3 mg/kg in shallow topsoil, 26.8 mg/kg in the underlying "fill" material and 22.5 mg/kg in the natural sand and gravel. Two of the forty samples exceeded the 40 mg/kg Massachusetts landfill limit.

*Opinion*

Based on concentration ranges, site location and history, we are of the opinion that the source of the elevated arsenic is natural rock formations. The lack of a discernable vertical or horizontal distribution corroborates this opinion. As such, these concentrations are exempt from MADEP notification pursuant to the Massachusetts Contingency Plan (MCP) regulations (310 CMR 40.0317(22). Nevertheless, MADEP guidance and policy (WSC#-13-500) dictates that the soil be managed appropriately to limit exposure potential. Therefore, the following soil management recommendations are offered.

*Recommendations*

To limit exposure potential in proposed development areas where human activity is likely to be greater than other areas of the property such as playgrounds, athletic fields, and gardens, it is recommended that this naturally-occurring soil be either:

- buried at a depth at least three feet below surface grade with "clean" fill less than 20 mg/kg;
- located under permanent structures or pavement; or
- covered with filter fabric or other effective membrane under a minimum of 12 inches of "clean" topsoil (i.e., <20 mg/kg), mulch, or subgrade material for athletic field turf.

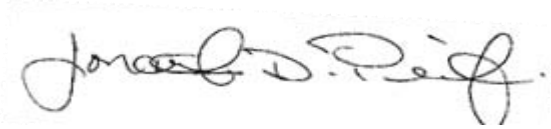
At other areas of the proposed development less accessible such as roadways or narrow strips between walkways, it will be acceptable to use these excavated soils as sub-grade fill under the design's landscaping, assuming appropriate measures are taken to mitigate erosion.

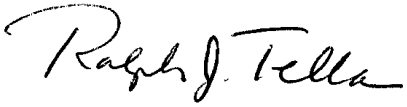
Off-site disposal options are restricted to "like" sites (as defined by MADEP WSC#13-500) or landfills that are permitted to accept soils as characterized. MADEP notification is not required to transport the soil for disposal. A standard Material Shipping Record may be used to document the material transport. We recommend you provide the prospective disposal facility with a copy of these results for their approval. We also recommend the use of Best Management Practices to control excess dust during excavation activities.

We would be pleased to assist you with the dust monitoring or in the selection of a disposal facility and/or to assist in the application process if needed. To do this we would require an estimate of the total cubic yardage and schedule for disposal.

Please contact me if you have any questions.

Sincerely,
*LORD ASSOCIATES, INC.*





Jonathan Puliafico, PG
Senior Project Manager

Ralph Tella, LSP CHMM
President

Attached:
Table 1 Soil Results Summary
Copy of Laboratory Results

Lord Associates, Inc.

*Environmental Consulting & Licensed Site Professional Services*

**Table 1**

Arsenic Analysis Results

Glavin Site, 214 Lake Street, Shrewsbury , MA

| Boring/ Test Pit | Depth | Arsenic Concentration (mg/kg) | | |
|---|---|---|---|---|
| | | Topsoil | Fill | Sand/ Gravel |
| B-1 | S-1, Bottom 16" | | 26.3 | |
| | S-4, 6'-8' | | 20.9 | |
| B-3 | S-2, 2'-4' | | 22.4 | |
| B-4 | S-1, Top 9" | 11.1 | | |
| | S-1, Bottom 13" | | 22.7 | |
| B-5 | S-1, 0'-2' | 13.9 | | |
| | S-2, 2'-4' | | | 28.4 |
| B-7 | S-1, Top 4" | 19.0 | | |
| | S-1, Bottom 15" | | | 32.2 |
| | S-2 2'-4' | | | 6.4 |
| B-8 | S-1, Top 8" | 20.2 | | |
| | S-1, Bottom 10" | | 15.4 | |
| | S-7 20'-22' | | | 11.5 |
| B-9 | S-5, 9'-11' | | 23.2 | |
| B-10 | S-1, Top 6" | 16.8 | | |
| | S-1, Bottom 7" | | 28.6 | |
| | S-2 2'-4' | | 22.5 | |
| B-11 | S-1, Top 12" | 24.0 | | |
| | S-1, Bottom 8" | | 29.6 | |
| B-13 | S-1, Top 6" | 22.2 | | |
| | S-1, Bottom 6" | | 21.7 | |
| | S-2 2'-4' | | 23.6 | |
| B-14 | S-1, Top 6" | 15.0 | | |
| | S-1, Bottom 9" | | 26.8 | |
| | S-4 6'-8' | | | 29.2 |
| | S-6 14'-16' | | | 26.3 |
| B-15 | S-1, 0'-2' | 21.8 | | |
| B-16 | S-1, Top 6" | 16.5 | | |
| | S-1, Bottom 11" | | 26.7 | |
| | S-2 2'-4' | | 17.6 | |
| B-17 | S-1, Top 6" | 21.1 | | |
| | S-1, Bottom 7" | | 29.6 | |
| | S-2 2'-4' | | 20.8 | |
| B-18 | S-1, Bottom 9" | | 51.8 | |
| TP-3 | 0.4'-2.5' | | 23.5 | |
| TP-5 | 0.4'-1.5' | | 31.7 | |
| | 1.5'-2.0' | | 55.9 | |

| Boring/ Test Pit | Depth | Arsenic Concentration (mg/kg) | | |
|---|---|---|---|---|
| | | Topsoil | Organic Fill | Subsoil |
| TP-6 | 0.3'-1.5' | | 15.5 | |
| | 1.5'-2.5' | | | 27.7 |
| TP-7 | 0.7'-1.5' | | | 18.5 |

Soil descriptions from Draft LGCI Boring Logs and Test Pit Logs, Proposed Beal Early Childhood Center

mg/kg: Miligrams per kilogram

Concentrations above MADEP S-1 Reportable Concentration of 20 mg/kg shown highlighted yellow

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L1832651 |
| Client: | Lord Associates, Inc.<br>1506 Providence Highway - Suite 30<br>Norwood, MA 02062 |
| ATTN: | Jon Puliafico |
| Phone: | (781) 255-5554 |
| Project Name: | UEC GLAVIN |
| Project Number: | 2629 |
| Report Date: | 08/30/18 |

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Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L1832651-01 | B-1 S-1 BOT 16" | SOIL | SHREWSBURY | 08/15/18 10:15 | 08/20/18 |
| L1832651-02 | B-1 S-4 6'-8' | SOIL | SHREWSBURY | 08/15/18 10:30 | 08/20/18 |
| L1832651-03 | B-3 S-2 2'-4' | SOIL | SHREWSBURY | 08/15/18 10:40 | 08/20/18 |
| L1832651-04 | B-4 S-1 TOP 9" | SOIL | SHREWSBURY | 08/15/18 10:50 | 08/20/18 |
| L1832651-05 | B-4 S-1 BOT 13" | SOIL | SHREWSBURY | 08/15/18 11:05 | 08/20/18 |
| L1832651-06 | B-5 S-1 0'-2' | SOIL | SHREWSBURY | 08/15/18 11:10 | 08/20/18 |
| L1832651-07 | B-5 S-2 2'-4' | SOIL | SHREWSBURY | 08/15/18 11:20 | 08/20/18 |
| L1832651-08 | B-7 S-1 TOP 4" | SOIL | SHREWSBURY | 08/15/18 11:30 | 08/20/18 |
| L1832651-09 | B-7 S-1 BOT 15" | SOIL | SHREWSBURY | 08/15/18 11:50 | 08/20/18 |
| L1832651-10 | B-7 S-2 2'-4' | SOIL | SHREWSBURY | 08/15/18 12:15 | 08/20/18 |
| L1832651-11 | B-8 S-1 TOP 8" | SOIL | SHREWSBURY | 08/15/18 12:30 | 08/20/18 |
| L1832651-12 | B-8 S-1 BOT 10" | SOIL | SHREWSBURY | 08/15/18 12:40 | 08/20/18 |
| L1832651-13 | B-8 S-7 20'-22' | SOIL | SHREWSBURY | 08/15/18 12:50 | 08/20/18 |
| L1832651-14 | B-9 S-5 9'-11' | SOIL | SHREWSBURY | 08/15/18 13:00 | 08/20/18 |
| L1832651-15 | B-10 S-1 TOP 6" | SOIL | SHREWSBURY | 08/15/18 13:20 | 08/20/18 |
| L1832651-16 | B-10 S-1 BOT 7" | SOIL | SHREWSBURY | 08/15/18 13:40 | 08/20/18 |
| L1832651-17 | B-10 S-2 2'-4' | SOIL | SHREWSBURY | 08/15/18 13:50 | 08/20/18 |
| L1832651-18 | B-11 S-1 TOP 12" | SOIL | SHREWSBURY | 08/15/18 14:05 | 08/20/18 |
| L1832651-19 | B-11 S-1 BOT 8" | SOIL | SHREWSBURY | 08/15/18 14:15 | 08/20/18 |
| L1832651-20 | B-13 S-1 TOP 6" | SOIL | SHREWSBURY | 08/15/18 14:25 | 08/20/18 |
| L1832651-21 | B-13 S-1 BOT 6" | SOIL | SHREWSBURY | 08/15/18 14:30 | 08/20/18 |
| L1832651-22 | B-13 S-2 2'-4' | SOIL | SHREWSBURY | 08/15/18 14:35 | 08/20/18 |
| L1832651-23 | B-14 S-1 TOP 6" | SOIL | SHREWSBURY | 08/15/18 14:55 | 08/20/18 |
| L1832651-24 | B-14 S-1 BOT 9" | SOIL | SHREWSBURY | 08/15/18 15:05 | 08/20/18 |

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L1832651-25 | B-14 S-4 6'-8' | SOIL | SHREWSBURY | 08/15/18 15:15 | 08/20/18 |
| L1832651-26 | B-14 S-6 14'-16' | SOIL | SHREWSBURY | 08/15/18 15:20 | 08/20/18 |
| L1832651-27 | B-15 S-1 0'-2' | SOIL | SHREWSBURY | 08/15/18 15:30 | 08/20/18 |
| L1832651-28 | B-16 S-1 TOP 6" | SOIL | SHREWSBURY | 08/15/18 15:45 | 08/20/18 |
| L1832651-29 | B-16 S-1 BOT 11" | SOIL | SHREWSBURY | 08/15/18 16:00 | 08/20/18 |
| L1832651-30 | B-16 S-2 2'-4' | SOIL | SHREWSBURY | 08/15/18 16:15 | 08/20/18 |
| L1832651-31 | B-17 S-1 TOP 6" | SOIL | SHREWSBURY | 08/15/18 16:20 | 08/20/18 |
| L1832651-32 | B-17 S-1 BOT 7" | SOIL | SHREWSBURY | 08/15/18 16:25 | 08/20/18 |
| L1832651-33 | B-17 S-2 2'-4' | SOIL | SHREWSBURY | 08/15/18 16:35 | 08/20/18 |
| L1832651-34 | B-18 S-1 BOT 9" | SOIL | SHREWSBURY | 08/15/18 16:45 | 08/20/18 |
| L1832651-35 | TP-3 0.4'-2.5' | SOIL | SHREWSBURY | 08/15/18 16:50 | 08/20/18 |
| L1832651-36 | TP-5 0.4'-1.5' | SOIL | SHREWSBURY | 08/15/18 17:00 | 08/20/18 |
| L1832651-37 | TP-5 1.5'-2.0' | SOIL | SHREWSBURY | 08/15/18 17:05 | 08/20/18 |
| L1832651-38 | TP-6 0.3'-1.5' | SOIL | SHREWSBURY | 08/15/18 17:15 | 08/20/18 |
| L1832651-39 | TP-6 1.5'-2.5' | SOIL | SHREWSBURY | 08/15/18 17:20 | 08/20/18 |
| L1832651-40 | TP-7 0.7'-1.5' | SOIL | SHREWSBURY | 08/15/18 17:30 | 08/20/18 |

**Project Name:** UEC GLAVIN **Lab Number:** L1832651

**Project Number:** 2629 **Report Date:** 08/30/18

## MADEP MCP Response Action Analytical Report Certification

**This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.**

| **An affirmative response to questions A through F is required for "Presumptive Certainty" status** | | |
|---|---|---|
| A | Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times? | YES |
| B | Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed? | YES |
| C | Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances? | YES |
| D | Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?" | YES |
| E a. | VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications). | N/A |
| E b. | APH and TO-15 Methods only: Was the complete analyte list reported for each method? | N/A |
| F | Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)? | YES |

| **A response to questions G, H and I is required for "Presumptive Certainty" status** | | |
|---|---|---|
| G | Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)? | YES |
| H | Were all QC performance standards specified in the CAM protocol(s) achieved? | NO |
| I | Were results reported for the complete analyte list specified in the selected CAM protocol(s)? | NO |

**For any questions answered "No", please refer to the case narrative section on the following page(s).**

**Please note that sample matrix information is located in the Sample Results section of this report.**

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

**Project Name:** UEC GLAVIN **Lab Number:** L1832651
**Project Number:** 2629 **Report Date:** 08/30/18

**Case Narrative (continued)**

MCP Related Narratives

Sample Receipt

L1832651-39: The collection date and time on the chain of custody was 15-AUG-18 17:20; however, the collection date/time on the container label was 15-AUG-18 17:15. At the client's request, the collection date/time is reported as 15-AUG-18 17:20.

In reference to question H:

A Matrix Spike was not submitted for the analysis of Total Metals.

Total Metals

In reference to question I:

All samples were analyzed for a subset of MCP analytes per client request.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Melissa Cripps

Title: Technical Director/Representative Date: 08/30/18

# METALS

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-01
Client ID: B-1 S-1 BOT 16"
Sample Location: SHREWSBURY
Date Collected: 08/15/18 10:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 94%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 26.3 | | mg/kg | 0.412 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:48 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-02
Client ID: B-1 S-4 6'-8'
Sample Location: SHREWSBURY
Date Collected: 08/15/18 10:30
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 95%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 20.9 | | mg/kg | 0.415 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:52 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-03
Client ID: B-3 S-2 2'-4'
Sample Location: SHREWSBURY
Date Collected: 08/15/18 10:40
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 93%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 22.4 | | mg/kg | 0.413 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:56 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-04
Client ID: B-4 S-1 TOP 9"
Sample Location: SHREWSBURY
Date Collected: 08/15/18 10:50
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 76%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 11.1 | | mg/kg | 0.515 | -- | 1 | 08/29/18 13:10 | 08/29/18 18:01 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-05
Client ID: B-4 S-1 BOT 13"
Sample Location: SHREWSBURY
Date Collected: 08/15/18 11:05
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 92%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 22.7 | | mg/kg | 0.429 | -- | 1 | 08/29/18 13:10 | 08/29/18 18:18 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-06
Client ID: B-5 S-1 0'-2'
Sample Location: SHREWSBURY
Date Collected: 08/15/18 11:10
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 86%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 13.9 | | mg/kg | 0.443 | -- | 1 | 08/29/18 13:10 | 08/29/18 18:22 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-07
Client ID: B-5 S-2 2'-4'
Sample Location: SHREWSBURY
Date Collected: 08/15/18 11:20
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 89%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 28.4 | | mg/kg | 0.449 | -- | 1 | 08/29/18 13:10 | 08/29/18 18:26 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-08
Client ID: B-7 S-1 TOP 4"
Sample Location: SHREWSBURY
Date Collected: 08/15/18 11:30
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 89%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 19.0 | | mg/kg | 0.439 | -- | 1 | 08/29/18 13:10 | 08/29/18 18:31 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-09
Client ID: B-7 S-1 BOT 15"
Sample Location: SHREWSBURY
Date Collected: 08/15/18 11:50
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 88%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 33.2 | | mg/kg | 0.433 | -- | 1 | 08/29/18 13:10 | 08/29/18 18:35 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-10
Client ID: B-7 S-2 2'-4'
Sample Location: SHREWSBURY
Date Collected: 08/15/18 12:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 90%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 6.44 | | mg/kg | 0.439 | -- | 1 | 08/29/18 13:10 | 08/29/18 18:39 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-11
Client ID: B-8 S-1 TOP 8"
Sample Location: SHREWSBURY
Date Collected: 08/15/18 12:30
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 87%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 20.2 | | mg/kg | 0.440 | -- | 1 | 08/29/18 13:10 | 08/29/18 18:44 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-12
Client ID: B-8 S-1 BOT 10"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 12:40
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 91%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 15.4 | | mg/kg | 0.436 | -- | 1 | 08/29/18 13:10 | 08/29/18 18:48 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-13
Client ID: B-8 S-7 20'-22'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 12:50
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 90%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 11.5 | | mg/kg | 0.432 | -- | 1 | 08/29/18 13:10 | 08/29/18 18:53 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-14
Client ID: B-9 S-5 9'-11'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 13:00
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 90%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 23.3 | | mg/kg | 0.425 | -- | 1 | 08/29/18 13:10 | 08/29/18 19:14 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-15
Client ID: B-10 S-1 TOP 6"
Sample Location: SHREWSBURY
Date Collected: 08/15/18 13:20
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 77%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 16.8 | | mg/kg | 0.506 | -- | 1 | 08/29/18 13:10 | 08/29/18 19:18 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-16
Client ID: B-10 S-1 BOT 7"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 13:40
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 94%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 28.6 | | mg/kg | 0.406 | -- | 1 | 08/29/18 13:10 | 08/29/18 19:22 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-17
Client ID: B-10 S-2 2'-4'
Sample Location: SHREWSBURY
Date Collected: 08/15/18 13:50
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 91%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 22.5 | | mg/kg | 0.424 | -- | 1 | 08/29/18 13:10 | 08/29/18 19:27 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-18
Client ID: B-11 S-1 TOP 12"
Sample Location: SHREWSBURY
Date Collected: 08/15/18 14:05
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 87%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 24.0 | | mg/kg | 0.433 | -- | 1 | 08/29/18 13:10 | 08/29/18 19:31 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-19
Client ID: B-11 S-1 BOT 8"
Sample Location: SHREWSBURY
Date Collected: 08/15/18 14:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 92%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 29.6 | | mg/kg | 0.423 | -- | 1 | 08/29/18 13:10 | 08/30/18 00:47 | EPA 3050B | 97,6010D | AB |

| | | | |
|---|---|---|---|
| **Project Name:** | UEC GLAVIN | **Lab Number:** | L1832651 |
| **Project Number:** | 2629 | **Report Date:** | 08/30/18 |

**SAMPLE RESULTS**

| | | | |
|---|---|---|---|
| Lab ID: | L1832651-20 | Date Collected: | 08/15/18 14:25 |
| Client ID: | B-13 S-1 TOP 6" | Date Received: | 08/20/18 |
| Sample Location: | SHREWSBURY | Field Prep: | Not Specified |
| Sample Depth: | | | |
| Matrix: | Soil | | |
| Percent Solids: | 83% | | |

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MCP Total Metals - Mansfield Lab | | | | | | | | | | | |
| Arsenic, Total | 22.2 | | mg/kg | 0.478 | -- | 1 | 08/29/18 13:10 | 08/30/18 01:07 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-21
Client ID: B-13 S-1 BOT 6"
Sample Location: SHREWSBURY
Date Collected: 08/15/18 14:30
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 90%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 21.7 | | mg/kg | 0.427 | -- | 1 | 08/29/18 13:10 | 08/30/18 01:13 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-22
Client ID: B-13 S-2 2'-4'
Sample Location: SHREWSBURY
Date Collected: 08/15/18 14:35
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 90%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 23.6 | | mg/kg | 0.432 | -- | 1 | 08/29/18 13:10 | 08/30/18 01:18 | EPA 3050B | 97,6010D | AB |

| | | | |
|---|---|---|---|
| **Project Name:** | UEC GLAVIN | **Lab Number:** | L1832651 |
| **Project Number:** | 2629 | **Report Date:** | 08/30/18 |

**SAMPLE RESULTS**

| | | | |
|---|---|---|---|
| Lab ID: | L1832651-23 | Date Collected: | 08/15/18 14:55 |
| Client ID: | B-14 S-1 TOP 6" | Date Received: | 08/20/18 |
| Sample Location: | SHREWSBURY | Field Prep: | Not Specified |
| Sample Depth: | | | |
| Matrix: | Soil | | |
| Percent Solids: | 86% | | |

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MCP Total Metals - Mansfield Lab | | | | | | | | | | | |
| Arsenic, Total | 15.0 | | mg/kg | 0.462 | -- | 1 | 08/29/18 13:10 | 08/30/18 01:23 | EPA 3050B | 97,6010D | AB |

| | | | |
|---|---|---|---|
| **Project Name:** | UEC GLAVIN | **Lab Number:** | L1832651 |
| **Project Number:** | 2629 | **Report Date:** | 08/30/18 |

**SAMPLE RESULTS**

| | | | |
|---|---|---|---|
| Lab ID: | L1832651-24 | Date Collected: | 08/15/18 15:05 |
| Client ID: | B-14 S-1 BOT 9" | Date Received: | 08/20/18 |
| Sample Location: | SHREWSBURY | Field Prep: | Not Specified |
| Sample Depth: | | | |
| Matrix: | Soil | | |
| Percent Solids: | 83% | | |

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MCP Total Metals - Mansfield Lab | | | | | | | | | | | |
| Arsenic, Total | 26.8 | | mg/kg | 0.478 | -- | 1 | 08/29/18 13:10 | 08/30/18 01:28 | EPA 3050B | 97,6010D | AB |

| | | | |
|---|---|---|---|
| **Project Name:** | UEC GLAVIN | **Lab Number:** | L1832651 |
| **Project Number:** | 2629 | **Report Date:** | 08/30/18 |

**SAMPLE RESULTS**

| | | | |
|---|---|---|---|
| Lab ID: | L1832651-25 | Date Collected: | 08/15/18 15:15 |
| Client ID: | B-14 S-4 6'-8' | Date Received: | 08/20/18 |
| Sample Location: | SHREWSBURY | Field Prep: | Not Specified |
| Sample Depth: | | | |
| Matrix: | Soil | | |
| Percent Solids: | 89% | | |

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MCP Total Metals - Mansfield Lab | | | | | | | | | | | |
| Arsenic, Total | 29.2 | | mg/kg | 0.438 | -- | 1 | 08/29/18 13:10 | 08/30/18 01:33 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-26
Client ID: B-14 S-6 14'-16'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 15:20
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 91%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 26.3 | | mg/kg | 0.437 | -- | 1 | 08/29/18 13:10 | 08/30/18 01:39 | EPA 3050B | 97,6010D | AB |

| | | | |
|---|---|---|---|
| **Project Name:** | UEC GLAVIN | **Lab Number:** | L1832651 |
| **Project Number:** | 2629 | **Report Date:** | 08/30/18 |

**SAMPLE RESULTS**

| | | | |
|---|---|---|---|
| Lab ID: | L1832651-27 | Date Collected: | 08/15/18 15:30 |
| Client ID: | B-15 S-1 0'-2' | Date Received: | 08/20/18 |
| Sample Location: | SHREWSBURY | Field Prep: | Not Specified |
| Sample Depth: | | | |
| Matrix: | Soil | | |
| Percent Solids: | 82% | | |

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MCP Total Metals - Mansfield Lab | | | | | | | | | | | |
| Arsenic, Total | 21.8 | | mg/kg | 0.470 | -- | 1 | 08/29/18 13:10 | 08/30/18 01:44 | EPA 3050B | 97,6010D | AB |

| | | | |
|---|---|---|---|
| **Project Name:** | UEC GLAVIN | **Lab Number:** | L1832651 |
| **Project Number:** | 2629 | **Report Date:** | 08/30/18 |

**SAMPLE RESULTS**

| | | | |
|---|---|---|---|
| Lab ID: | L1832651-28 | Date Collected: | 08/15/18 15:45 |
| Client ID: | B-16 S-1 TOP 6" | Date Received: | 08/20/18 |
| Sample Location: | SHREWSBURY | Field Prep: | Not Specified |
| Sample Depth: | | | |
| Matrix: | Soil | | |
| Percent Solids: | 84% | | |

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MCP Total Metals - Mansfield Lab | | | | | | | | | | | |
| Arsenic, Total | 16.5 | | mg/kg | 0.461 | -- | 1 | 08/29/18 13:10 | 08/30/18 01:49 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-29
Client ID: B-16 S-1 BOT 11"
Sample Location: SHREWSBURY
Date Collected: 08/15/18 16:00
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 94%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 26.7 | | mg/kg | 0.405 | -- | 1 | 08/29/18 13:10 | 08/30/18 02:09 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-30
Client ID: B-16 S-2 2'-4'
Sample Location: SHREWSBURY
Date Collected: 08/15/18 16:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 90%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 17.6 | | mg/kg | 0.428 | -- | 1 | 08/29/18 13:10 | 08/30/18 02:15 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-31
Client ID: B-17 S-1 TOP 6"
Sample Location: SHREWSBURY
Date Collected: 08/15/18 16:20
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 75%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 21.1 | | mg/kg | 0.505 | -- | 1 | 08/29/18 13:10 | 08/30/18 02:25 | EPA 3050B | 97,6010D | AB |

| | | | |
|---|---|---|---|
| **Project Name:** | UEC GLAVIN | **Lab Number:** | L1832651 |
| **Project Number:** | 2629 | **Report Date:** | 08/30/18 |

**SAMPLE RESULTS**

| | | | |
|---|---|---|---|
| Lab ID: | L1832651-32 | Date Collected: | 08/15/18 16:25 |
| Client ID: | B-17 S-1 BOT 7" | Date Received: | 08/20/18 |
| Sample Location: | SHREWSBURY | Field Prep: | Not Specified |
| Sample Depth: | | | |
| Matrix: | Soil | | |
| Percent Solids: | 94% | | |

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MCP Total Metals - Mansfield Lab | | | | | | | | | | | |
| Arsenic, Total | 29.6 | | mg/kg | 0.418 | -- | 1 | 08/29/18 13:10 | 08/30/18 02:30 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-33
Client ID: B-17 S-2 2'-4'
Sample Location: SHREWSBURY
Date Collected: 08/15/18 16:35
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 90%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 20.8 | | mg/kg | 0.435 | -- | 1 | 08/29/18 13:10 | 08/30/18 02:35 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-34
Client ID: B-18 S-1 BOT 9"
Sample Location: SHREWSBURY
Date Collected: 08/15/18 16:45
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 96%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 51.8 | | mg/kg | 0.409 | -- | 1 | 08/29/18 13:10 | 08/30/18 02:41 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-35
Client ID: TP-3 0.4'-2.5'
Sample Location: SHREWSBURY
Date Collected: 08/15/18 16:50
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 91%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 23.5 | | mg/kg | 0.427 | -- | 1 | 08/29/18 13:10 | 08/30/18 02:46 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-36
Client ID: TP-5 0.4'-1.5'
Sample Location: SHREWSBURY
Date Collected: 08/15/18 17:00
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 92%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 31.7 | | mg/kg | 0.422 | -- | 1 | 08/29/18 13:10 | 08/30/18 02:51 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-37
Client ID: TP-5 1.5'-2.0'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 17:05
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 97%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 55.9 | | mg/kg | 0.408 | -- | 1 | 08/29/18 13:10 | 08/30/18 03:12 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832651
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-38
Client ID: TP-6 0.3'-1.5'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 17:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 89%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 15.5 | | mg/kg | 0.432 | -- | 1 | 08/29/18 13:10 | 08/30/18 03:17 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-39
Client ID: TP-6 1.5'-2.5'
Sample Location: SHREWSBURY
Date Collected: 08/15/18 17:20
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 86%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 27.7 | | mg/kg | 0.447 | -- | 1 | 08/30/18 08:00 | 08/30/18 10:21 | EPA 3050B | 97,6010D | PE |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-40
Client ID: TP-7 0.7'-1.5'
Sample Location: SHREWSBURY
Date Collected: 08/15/18 17:30
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 87%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Arsenic, Total | 18.5 | | mg/kg | 0.441 | -- | 1 | 08/30/18 08:00 | 08/30/18 10:26 | EPA 3050B | 97,6010D | PE |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832651
**Report Date:** 08/30/18

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| MCP Total Metals - Mansfield Lab for sample(s): 01-18 Batch: WG1151757-1 | | | | | | | | | | |
| Arsenic, Total | ND | | mg/kg | 0.400 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:27 | 97,6010D | AB |

**Prep Information**

Digestion Method: EPA 3050B

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| MCP Total Metals - Mansfield Lab for sample(s): 19-38 Batch: WG1151783-1 | | | | | | | | | | |
| Arsenic, Total | ND | | mg/kg | 0.400 | -- | 1 | 08/29/18 13:10 | 08/30/18 00:07 | 97,6010D | AB |

**Prep Information**

Digestion Method: EPA 3050B

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| MCP Total Metals - Mansfield Lab for sample(s): 39-40 Batch: WG1152057-1 | | | | | | | | | | |
| Arsenic, Total | ND | | mg/kg | 0.400 | -- | 1 | 08/30/18 08:00 | 08/30/18 10:08 | 97,6010D | PE |

**Prep Information**

Digestion Method: EPA 3050B

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| MCP Total Metals - Mansfield Lab Associated sample(s): 01-18 Batch: WG1151757-2 WG1151757-3 SRM Lot Number: D102-540 | | | | | | | | |
| Arsenic, Total | 92 | | 92 | | 83-117 | 0 | | 30 |
| MCP Total Metals - Mansfield Lab Associated sample(s): 19-38 Batch: WG1151783-2 WG1151783-3 SRM Lot Number: D098-540 | | | | | | | | |
| Arsenic, Total | 87 | | 87 | | 83-117 | 0 | | 30 |
| MCP Total Metals - Mansfield Lab Associated sample(s): 39-40 Batch: WG1152057-2 WG1152057-3 SRM Lot Number: D102-540 | | | | | | | | |
| Arsenic, Total | 90 | | 89 | | 83-117 | 1 | | 30 |

# INORGANICS
# &
# MISCELLANEOUS

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-01
Client ID: B-1 S-1 BOT 16"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 10:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 94.2 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-02
Client ID: B-1 S-4 6'-8'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 10:30
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 94.9 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-03
Client ID: B-3 S-2 2'-4'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 10:40
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 93.1 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-04
Client ID: B-4 S-1 TOP 9"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 10:50
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 76.4 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-05
Client ID: B-4 S-1 BOT 13"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 11:05
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 92.3 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-06
Client ID: B-5 S-1 0'-2'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 11:10
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 86.1 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-07
Client ID: B-5 S-2 2'-4'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 11:20
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 88.8 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-08
Client ID: B-7 S-1 TOP 4"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 11:30
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 89.3 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-09
Client ID: B-7 S-1 BOT 15"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 11:50
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 88.4 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-10
Client ID: B-7 S-2 2'-4'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 12:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 89.8 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-11
Client ID: B-8 S-1 TOP 8"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 12:30
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| **General Chemistry - Westborough Lab** | | | | | | | | | | |
| Solids, Total | 87.0 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-12
Client ID: B-8 S-1 BOT 10"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 12:40
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 90.6 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-13
Client ID: B-8 S-7 20'-22'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 12:50
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 90.3 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-14
Client ID: B-9 S-5 9'-11'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 13:00
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 89.6 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-15
Client ID: B-10 S-1 TOP 6"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 13:20
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 76.5 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-16
Client ID: B-10 S-1 BOT 7"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 13:40
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 94.2 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-17
Client ID: B-10 S-2 2'-4'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 13:50
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 91.0 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-18
Client ID: B-11 S-1 TOP 12"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 14:05
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 86.5 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-19
Client ID: B-11 S-1 BOT 8"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 14:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 92.2 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-20
Client ID: B-13 S-1 TOP 6"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 14:25
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 82.7 | | % | 0.100 | NA | 1 | - | 08/21/18 01:50 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-21
Client ID: B-13 S-1 BOT 6"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 14:30
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 89.9 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-22
Client ID: B-13 S-2 2'-4'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 14:35
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 90.2 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-23
Client ID: B-14 S-1 TOP 6"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 14:55
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 85.9 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-24
Client ID: B-14 S-1 BOT 9"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 15:05
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 83.2 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-25
Client ID: B-14 S-4 6'-8'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 15:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 89.2 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-26
Client ID: B-14 S-6 14'-16'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 15:20
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 90.8 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-27
Client ID: B-15 S-1 0'-2'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 15:30
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 82.2 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-28
Client ID: B-16 S-1 TOP 6"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 15:45
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 84.0 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-29
Client ID: B-16 S-1 BOT 11"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 16:00
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 94.0 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-30
Client ID: B-16 S-2 2'-4'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 16:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 90.1 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-31
Client ID: B-17 S-1 TOP 6"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 16:20
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 74.9 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-32
Client ID: B-17 S-1 BOT 7"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 16:25
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 94.0 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-33
Client ID: B-17 S-2 2'-4'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 16:35
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 90.2 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-34
Client ID: B-18 S-1 BOT 9"
Sample Location: SHREWSBURY

Date Collected: 08/15/18 16:45
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 96.2 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-35
Client ID: TP-3 0.4'-2.5'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 16:50
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 91.3 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-36
Client ID: TP-5 0.4'-1.5'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 17:00
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 91.9 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-37
Client ID: TP-5 1.5'-2.0'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 17:05
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 96.6 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-38
Client ID: TP-6 0.3'-1.5'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 17:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 88.6 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-39
Client ID: TP-6 1.5'-2.5'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 17:20
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 86.1 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832651-40
Client ID: TP-7 0.7'-1.5'
Sample Location: SHREWSBURY

Date Collected: 08/15/18 17:30
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab | | | | | | | | | | |
| Solids, Total | 87.1 | | % | 0.100 | NA | 1 | - | 08/21/18 01:17 | 121,2540G | FN |

# Lab Duplicate Analysis

***Batch Quality Control***

**Project Name:** UEC GLAVIN

**Project Number:** 2629

***Lab Number:*** L1832651

***Report Date:*** 08/30/18

| Parameter | Native Sample | Duplicate Sample | Units | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab Associated sample(s): 01-20 QC Batch ID: WG1148625-1 QC Sample: L1832651-01 Client ID: B-1 S-1 BOT 16" | | | | | | |
| Solids, Total | 94.2 | 93.3 | % | 1 | | 20 |
| General Chemistry - Westborough Lab Associated sample(s): 21-40 QC Batch ID: WG1148626-1 QC Sample: L1832651-21 Client ID: B-13 S-1 BOT 6" | | | | | | |
| Solids, Total | 89.9 | 87.3 | % | 3 | | 20 |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L1832651-01A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-02A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-03A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-04A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-05A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-06A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-07A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-08A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-09A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-10A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-11A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-12A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-13A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-14A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-15A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-16A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-17A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-18A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-19A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-20A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-21A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-22A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-23A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |

*Values in parentheses indicate holding time in days

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832651
**Report Date:** 08/30/18

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L1832651-24A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-25A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-26A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-27A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-28A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-29A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-30A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-31A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-32A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-33A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-34A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-35A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-36A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-37A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-38A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-39A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |
| L1832651-40A | Glass 120ml/4oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-AS-6010T-10(180),TS(7) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | UEC GLAVIN | **Lab Number:** | L1832651 |
| **Project Number:** | 2629 | **Report Date:** | 08/30/18 |

# GLOSSARY

### *Acronyms*

| | |
|---|---|
| EDL | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME). |
| EMPC | - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration. |
| EPA | - Environmental Protection Agency. |
| LCS | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LCSD | - Laboratory Control Sample Duplicate: Refer to LCS. |
| LFB | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| MDL | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| MS | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. |
| MSD | - Matrix Spike Sample Duplicate: Refer to MS. |
| NA | - Not Applicable. |
| NC | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit. |
| NDPA/DPA | - N-Nitrosodiphenylamine/Diphenylamine. |
| NI | - Not Ignitable. |
| NP | - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil. |
| RL | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| RPD | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples. |
| STLP | - Semi-dynamic Tank Leaching Procedure per EPA Method 1315. |
| TEF | - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD. |
| TEQ | - Toxic Equivalent: The measure of a sample¿s toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values. |
| TIC | - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations. |

### *Footnotes*

| | |
|---|---|
| 1 | - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method. |

### *Terms*

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

*Report Format:* Data Usability Report

| | | | |
|---|---|---|---|
| **Project Name:** | UEC GLAVIN | **Lab Number:** | L1832651 |
| **Project Number:** | 2629 | **Report Date:** | 08/30/18 |

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensation Product".

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**J** - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

**ND** - Not detected at the reporting limit (RL) for the sample.

*Report Format:* Data Usability Report

| | | | |
|---|---|---|---|
| **Project Name:** | UEC GLAVIN | **Lab Number:** | L1832651 |
| **Project Number:** | 2629 | **Report Date:** | 08/30/18 |

## REFERENCES


97 EPA Test Methods (SW-846) with QC Requirements & Performance Standards for the Analysis of EPA SW-846 Methods under the Massachusetts Contingency Plan, WSC-CAM-IIA, IIB, IIIA, IIIB, IIIC, IIID, VA, VB, VC, VIA, VIB, VIIIA and VIIIB, July 2010.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.


## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624:** m/p-xylene, o-xylene
**EPA 8260C:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270D:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**EPA 300:** DW: Bromide
**EPA 6860:** SCM: Perchlorate
**EPA 9010:** NPW and SCM: Amenable Cyanide Distillation
**SM4500**: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS
**EPA 8082A:** NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
**EPA 332**: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.**
**EPA 624**: Volatile Halocarbons & Aromatics,
**EPA 608**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625**: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Be, Cd, Cr, Cu, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# CHAIN OF CUSTODY

PAGE 1 OF 4

Date Rec'd in Lab: 8/20/18

ALPHA Job #: L1832651

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

**Project Information**

Project Name: UEC Glavin
Project Location: Shrewsbury
Project #: 2629
Project Manager: Jon Puliafico
ALPHA Quote #:

**Report Information - Data Deliverables**

☒ ADEx ☒ EMAIL

**Billing Information**

☐ Same as Client info PO #:

**Client Information**

Client: Lord Associates
Address: Norwood
Phone:
Email: jpuliafico@lordenv.com

**Regulatory Requirements & Project Information Requirements**

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

**Turn-Around Time**

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due:

Additional Project Information:

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; Arsenic

SAMPLE INFO: Filtration ☐ Field ☐ Lab to do; Preservation ☐ Lab to do

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler Initials | Arsenic | Sample Comments | Total # Bottles |
|---|---|---|---|---|---|---|---|---|
| 32651-01 | B-1 S-1 Bot 16" | 8-15-18 | 10:15A | S | JP | X | | 1 |
| 02 | B-1 S-4 6'-8' | | 10:30 | | | X | | 1 |
| 03 | B-3 S-2 2'-4' | | 10:40 | | | X | | 1 |
| 04 | B-4 S-1 Top 9" | | 10:50 | | | X | | 1 |
| 05 | B-4 S-1 Bot 13" | | 11:05 | | | X | | 1 |
| 06 | B-5 S-1 0'-2' | | 11:10 | | | X | | 1 |
| 07 | B-5 S-2 2'-4' | | 11:20 | | | X | | 1 |
| 08 | B-7 S-1 Top 4" | | 11:30 | | | X | | 1 |
| 09 | B-7 S-1 Bot 15" | | 11:50 | | | X | | 1 |
| 10 | B-7 S-2 2'-4' | | 12:15 | | | X | | 1 |
| | | | | | Container Type | A | | |
| | | | | | Preservative | A | | |

Container Type: P= Plastic, A= Amber glass, V= Vial, G= Glass, B= Bacteria cup, C= Cube, O= Other, E= Encore, D= BOD Bottle

Preservative: A= None, B= HCl, C= $HNO_3$, D= $H_2SO_4$, E= NaOH, F= MeOH, G= $NaHSO_4$, H= $Na_2S_2O_3$, I= Ascorbic Acid, J= $NH_4Cl$, K= Zn Acetate, O= Other

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| [signature] | 8/17/18 5:00 | [signature] AAL | 8/20/18 1310 |
| [signature] | 8/20/18 1720 | [signature] | 8/20 17:20 |

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

# CHAIN OF CUSTODY

PAGE 2 OF 4

Date Rec'd in Lab: 8/20/18

ALPHA Job #: L1832651

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

**Project Information**

Project Name: UEC Glavin
Project Location: Shrewsbury
Project #: 2629
Project Manager: Jon Puliafico
ALPHA Quote #:

**Report Information - Data Deliverables**

☒ ADEx ☒ EMAIL

**Billing Information**

☐ Same as Client info PO #:

**Client Information**

Client: Lord Associates
Address: Norwood
Phone:
Email: jpuliafico@lordenv.com

**Regulatory Requirements & Project Information Requirements**

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

**Turn-Around Time**

☒ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due:

Additional Project Information:

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; Arsenic

SAMPLE INFO: Filtration ☐ Field ☐ Lab to do; Preservation ☐ Lab to do

| ALPHA Lab ID (Lab Use Only) | Sample ID | | | Collection Date | Collection Time | Sample Matrix | Sampler Initials | Arsenic | Sample Comments | Total # Bottles |
|---|---|---|---|---|---|---|---|---|---|---|
| 32651-11 | B-8 | S-1 | Top 8" | 8-15-18 | 12:30 | S | JP | X | | 1 |
| 12 | B-8 | S-1 | Bot 10" | | 12:40 | | | X | | 1 |
| 13 | B-8 | S-7 | 20'-22' | | 12:50 | | | X | | 1 |
| 14 | B-9 | S-5 | 9'-11' | | 1:00 | | | X | | 1 |
| 15 | B-10 | S-1 | Top 6" | | 1:20 | | | X | | 1 |
| 16 | B-10 | S-1 | Bot 7" | | 1:40 | | | X | | 1 |
| 17 | B-10 | S-2 | 2'-4' | | 1:50 | | | X | | 1 |
| 18 | B-11 | S-1 | Top 12" | | 2:05 | | | X | | 1 |
| 19 | B-11 | S-1 | Bot 8" | | 2:15 | | | X | | 1 |
| 20 | B-13 | S-1 | Top 6" | | 2:25 | | | X | | 1 |
| | | | | | | | Container Type | A | | |
| | | | | | | | Preservative | A | | |

*Container Type*: P= Plastic; A= Amber glass; V= Vial; G= Glass; B= Bacteria cup; C= Cube; O= Other; E= Encore; D= BOD Bottle

*Preservative*: A= None; B= HCl; C= $HNO_3$; D= $H_2SO_4$; E= NaOH; F= MeOH; G= $NaHSO_4$; H= $Na_2S_2O_3$; I= Ascorbic Acid; J= $NH_4Cl$; K= Zn Acetate; O= Other

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| [signature] | 8/17/18 5:00 | [signature] ALPHA | 8/20/18 13:10 |
| [signature] | 8/20/18 1720 | [signature] | 8/20 1720 |

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

# CHAIN OF CUSTODY

PAGE 3 OF 4

Date Rec'd in Lab: 8/20/18

ALPHA Job #: L1832651

ALPHA ANALYTICAL
8 Walkup Drive
Westboro, MA 01581
Tel: 508-898-9220
320 Forbes Blvd
Mansfield, MA 02048
Tel: 508-822-9300

**Client Information**

Client: Lord Associates

Address: Norwood

Phone:

Email: jpuliafico@lordenv.com

Additional Project Information:

**Project Information**

Project Name: UEC Glavin

Project Location: Shrewsbury

Project #: 2629

Project Manager: Jon Puliafico

ALPHA Quote #:

**Turn-Around Time**

☒ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due:

**Report Information - Data Deliverables**

☒ ADEx ☒ EMAIL

**Billing Information**

☐ Same as Client info PO #:

**Regulatory Requirements & Project Information Requirements**

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; Arsenic

SAMPLE INFO: Filtration ☐ Field ☐ Lab to do; Preservation ☐ Lab to do

| ALPHA Lab ID (Lab Use Only) | Sample ID | | | Collection Date | Collection Time | Sample Matrix | Sampler Initials | Arsenic | Sample Comments | Total # Bottles |
|---|---|---|---|---|---|---|---|---|---|---|
| 32661-21 | B-13 | S-1 | Bot 6" | 8/15/18 | 2:30 | S | JP | X | | 1 |
| 22 | B-13 | S-2 | 2'-4' | | 2:35 | | | X | | 1 |
| 23 | B-14 | S-1 | Top 6" | | 2:55 | | | X | | 1 |
| 24 | B-14 | S-1 | Bot 9" | | 3:05 | | | X | | 1 |
| 25 | B-14 | S-4 | 6'-8' | | 3:15 | | | X | | 1 |
| 26 | B-14 | S-6 | 14'-16' | | 3:20 | | | X | | 1 |
| 27 | B-15 | S-1 | 0'-2' | | 3:30 | | | X | | 1 |
| 28 | B-16 | S-1 | Top 6" | | 3:45 | | | X | | 1 |
| 29 | B-16 | S-1 | Bot 11" | | 4:00 | | | X | | 1 |
| 30 | B-16 | S-2 | 2'-4' | | 4:15 | | | X | | 1 |
| | | | | | | | Container Type | A | | |
| | | | | | | | Preservative | A | | |

**Container Type**: P= Plastic; A= Amber glass; V= Vial; G= Glass; B= Bacteria cup; C= Cube; O= Other; E= Encore; D= BOD Bottle

**Preservative**: A= None; B= HCl; C= $HNO_3$; D= $H_2SO_4$; E= NaOH; F= MeOH; G= $NaHSO_4$; H= $Na_2S_2O_3$; I= Ascorbic Acid; J= $NH_4Cl$; K= Zn Acetate; O= Other

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| [signature] | 8/17/18 5:00 | [signature] AAL | 8/20/18 13:10 |
| [signature] | 8/20/18 1720 | [signature] | 8/20 1720 |

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

# CHAIN OF CUSTODY

PAGE 4 OF 4

Date Rec'd in Lab: 8/20/18

ALPHA Job #: L1832651

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

**Client Information**

Client: Lord Associates

Address: Norwood

Phone:

Email: jpulitalizo@lordcorp.com

**Project Information**

Project Name: UEC Glavin

Project Location: Shrewsbury

Project #: 2629

Project Manager: Jon Pulitalizo

ALPHA Quote #:

**Turn-Around Time**

☒ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due:

**Report Information - Data Deliverables**

☒ ADEx ☒ EMAIL

**Billing Information**

☐ Same as Client info PO #:

**Regulatory Requirements & Project Information Requirements**

☐ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods
☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)
☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)
☐ Yes ☐ No NPDES RGP
☐ Other State /Fed Program _____ Criteria _____

Additional Project Information:

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; Asbestos

SAMPLE INFO: Filtration ☐ Field ☐ Lab to do; Preservation ☐ Lab to do

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler Initials | Asbestos | Sample Comments | Total # Bottles |
|---|---|---|---|---|---|---|---|---|
| 32651-31 | B-17 S-1 Top 6" | 8-15-18 | 4:20 | S | JP | X | | 1 |
| 32 | B-17 S-1 Bot 7" | ↓ | 4:25 | ↓ | ↓ | X | | 1 |
| 33 | B-17 S-2 2'-4' | | 4:35 | | | X | | 1 |
| 34 | B-18 S-1 Bot 9" | | 4:45 | | | X | | 1 |
| 35 36 | TP-3 0.4'-2.5' | | 4:50 | | | X | | 1 |
| 36 37 | TP-5 0.4'-1.5' | | 5:00 | | | X | | 1 |
| 37 38 | TP-5 1.5'-2.0' | | 5:05 | | | X | | 1 |
| 38 39 | TP-6 0.3'-1.5' | | 5:15 | | | X | | 1 |
| 39 | TP-6 1.5'-2.5' | | 5:20 | | | X | | 1 |
| 40 | TP-7 0.7'-1.5' | ↓ | 5:30p | ↓ | ↓ | X | | 1 |
| | | | | | Container Type | A | | |
| | | | | | Preservative | A | | |

Jun 8-20-18

**Container Type**: P= Plastic, A= Amber glass, V= Vial, G= Glass, B= Bacteria cup, C= Cube, O= Other, E= Encore, D= BOD Bottle

**Preservative**: A= None, B= HCl, C= $HNO_3$, D= $H_2SO_4$, E= NaOH, F= MeOH, G= $NaHSO_4$, H= $Na_2S_2O_3$, I= Ascorbic Acid, J= $NH_4Cl$, K= Zn Acetate, O= Other

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| [signature] 8/20/18 | 8/20/18 5:00p 1720 | [signature] AAL 8/20/18 | 8/20/18 1310 1720 |

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

Lord Associates, Inc.
*Environmental Consulting & Licensed Site Professional Services*

1506 Providence Highway - Suite 30
Norwood, MA 02062-4647

Voice: 781.255.5554
Fax: 781.255.5535
www.lordenv.com

September 6, 2018

Ammar M. Dieb
Universal Environmental Consultants
12 Brewster Road
Framingham, MA 01702

RE: COMM-97 Soil Analysis Results
Portion of 214 Lake Street
Shrewsbury, MA.

Dear Ammar,

Pursuant to your request, Lord Associates, Inc. (LAI) has prepared the following summary of soil sampling results from the 214 Lake Street project in Shrewsbury, Massachusetts.

*Background*

LAI completed the sampling and analysis of eight soil samples from the site in April 2018. Soil samples were collected from the top 12" of soil. As reported in the April 17, 2018 Soil Sampling and Analysis Report, arsenic was detected in the eight soil samples at concentrations ranging from 8.92 milligrams per kilogram (mg/kg) to 47.4 mg/kg. Five of the eight soil samples displayed arsenic concentrations above the potentially applicable MADEP standard of 20 mg/kg. However, it was determined that the arsenic was of natural origin, and thus exempt from MADEP notification. Additional soil sampling and analysis has been completed for disposal characterization to address the potential for off-site disposal of soil from the site.

To further characterize soil at the site an additional forty (40) soil samples from the site were submitted for arsenic analysis. The locations of the samples were selected based on geotechnical considerations determined by Lahlaf Geotechnical Consulting, Inc. (LGCI). A series of exploratory test pits and test borings were completed by LGCI in July and August of 2018. Boring logs, geotechnical evaluations and a Site Plan were to be provided to the client by LGCI. The results of those arsenic analyses were reported under separate cover. The purpose of this report is to provide the results of the disposal characterization.

*Method*

LAI selected soil sub-samples representative of the topsoil and fill for COMM-97-001 disposal characterization. Two composite soil samples, one composite for the topsoil and one composite for the fill material, were submitted to a state-certified laboratory (Alpha Analytical, Inc.) in Westboro, MA for disposal characterization parameters in accordance with MA COMM-97-001 Policy: Reuse & Disposal of Contaminated Soil at Massachusetts Landfills plus MCP 14 metals.

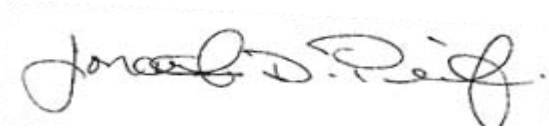
*Results*

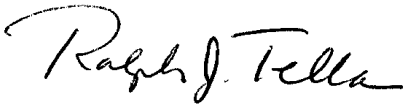
The results of the testing were compared to the Massachusetts Lined and Unlined Landfill Acceptance Criteria and the MADEP Reportable Concentrations. As shown on Table 1, arsenic was detected in both composite samples at concentrations of 28.4 mg/kg in the Topsoil composite and 21.7 mg/kg in the Fill composite. These concentrations are entirely consistent with previous findings considered to be of natural origin and exempt from MADEP notification requirements.

There were no standards exceeded for other metals detected or volatile, semi-volatile organic compounds, PCBs, or total petroleum hydrocarbons detected above the laboratory reporting limits. A copy of the original laboratory report is attached.

Please contact us at your convenience with any questions.

Sincerely,
*LORD ASSOCIATES, INC.*





Jonathan Puliafico, PG
Senior Project Manager

Ralph Tella, LSP CHMM
President

Attached:
Table 1 Soil Results Summary
Copy of Laboratory Results

Lord Associates, Inc.

*Environmental Consulting & Licensed Site Professional Services*

# TABLE 1 - COMM-97 Analysis
# Glavin Project- 214 Lake Street, Shreswbury, MA

| LOCATION | | | | | | FILL COMP | | TOPSOIL COMP | |
|---|---|---|---|---|---|---|---|---|---|
| SAMPLING DATE | | | | | | 8/15/2018 | | 8/15/2018 | |
| | MADEP Standards | | | | | | | | |
| | MA-LLAND | MA-ULAND | RCS-1 | RCS-2 | Units | Results | Qual | Results | Qual |
| **General Chemistry** | | | | | | | | | |
| Specific Conductance @ 25 C | 8000 | | | | umhos/cm | 23 | | 38 | |
| Solids, Total | | | | | % | 90.3 | | 82.9 | |
| | | | | | | | | | |
| **MCP Polychlorinated Biphenyls** | | | | | | | | | |
| Aroclor 1016 | | | 1 | | mg/kg | 0.0362 | U | 0.0396 | U |
| Aroclor 1221 | | | 1 | 4 | mg/kg | 0.0362 | U | 0.0396 | U |
| Aroclor 1232 | | | 1 | 4 | mg/kg | 0.0362 | U | 0.0396 | U |
| Aroclor 1242 | | | 1 | 4 | mg/kg | 0.0362 | U | 0.0396 | U |
| Aroclor 1248 | | | 1 | 4 | mg/kg | 0.0362 | U | 0.0396 | U |
| Aroclor 1254 | | | 1 | 4 | mg/kg | 0.0362 | U | 0.0396 | U |
| Aroclor 1260 | | | 1 | 4 | mg/kg | 0.0362 | U | 0.0396 | U |
| Aroclor 1262 | | | 1 | 4 | mg/kg | 0.0362 | U | 0.0396 | U |
| Aroclor 1268 | | | 1 | 4 | mg/kg | 0.0362 | U | 0.0396 | U |
| PCBs, Total | | | 1 | 4 | mg/kg | 0.0362 | U | 0.0396 | U |
| | | | | | | | | | |
| **MCP Semivolatile Organics** | | | | 4 | | | | | |
| Acenaphthene | | | 4 | | mg/kg | 0.14 | U | 0.16 | U |
| 1,2,4-Trichlorobenzene | | | 2 | 3000 | mg/kg | 0.18 | U | 0.2 | U |
| Hexachlorobenzene | | | 0.7 | 6 | mg/kg | 0.11 | U | 0.12 | U |
| Bis(2-chloroethyl)ether | | | 0.7 | 0.8 | mg/kg | 0.16 | U | 0.18 | U |
| 2-Chloronaphthalene | | | 1000 | 0.7 | mg/kg | 0.18 | U | 0.2 | U |
| 1,2-Dichlorobenzene | | | 9 | 10000 | mg/kg | 0.18 | U | 0.2 | U |
| 1,3-Dichlorobenzene | | | 3 | 100 | mg/kg | 0.18 | U | 0.2 | U |
| 1,4-Dichlorobenzene | | | 0.7 | 200 | mg/kg | 0.18 | U | 0.2 | U |
| 3,3'-Dichlorobenzidine | | | 3 | 1 | mg/kg | 0.18 | U | 0.2 | U |
| 2,4-Dinitrotoluene | | | 0.7 | 20 | mg/kg | 0.18 | U | 0.2 | U |
| 2,6-Dinitrotoluene | | | 100 | 10 | mg/kg | 0.18 | U | 0.2 | U |
| Azobenzene | | | 50 | 1000 | mg/kg | 0.18 | U | 0.2 | U |
| Fluoranthene | | | 1000 | 500 | mg/kg | 0.11 | U | 0.22 | |
| 4-Bromophenyl phenyl ether | | | 100 | 3000 | mg/kg | 0.18 | U | 0.2 | U |
| Bis(2-chloroisopropyl)ether | | | 0.7 | 1000 | mg/kg | 0.22 | U | 0.24 | U |
| Bis(2-chloroethoxy)methane | | | 500 | 0.7 | mg/kg | 0.2 | U | 0.21 | U |
| Hexachlorobutadiene | | | 30 | 5000 | mg/kg | 0.18 | U | 0.2 | U |
| Hexachloroethane | | | 0.7 | 100 | mg/kg | 0.14 | U | 0.16 | U |
| Isophorone | | | 100 | 3 | mg/kg | 0.16 | U | 0.18 | U |
| Naphthalene | | | 4 | 1000 | mg/kg | 0.18 | U | 0.2 | U |
| Nitrobenzene | | | 500 | 20 | mg/kg | 0.16 | U | 0.18 | U |
| Bis(2-ethylhexyl)phthalate | | | 90 | 5000 | mg/kg | 0.18 | U | 0.31 | |
| Butyl benzyl phthalate | | | 100 | 600 | mg/kg | 0.18 | U | 0.2 | U |
| Di-n-butylphthalate | | | 50 | 1000 | mg/kg | 0.18 | U | 0.2 | U |
| Di-n-octylphthalate | | | 1000 | 500 | mg/kg | 0.18 | U | 0.2 | U |

Lord Associates, Inc.

*Environmental Consulting & Licensed Site Professional Services*

# TABLE 1 - COMM-97 Analysis
# Glavin Project- 214 Lake Street, Shreswbury, MA

| LOCATION | | | | | | FILL COMP | | TOPSOIL COMP | |
|---|---|---|---|---|---|---|---|---|---|
| SAMPLING DATE | | | | | | 8/15/2018 | | 8/15/2018 | |
| | MADEP Standards | | | | | | | | |
| | MA-LLAND | MA-ULAND | RCS-1 | RCS-2 | Units | Results | Qual | Results | Qual |
| Diethyl phthalate | | | 10 | 10000 | mg/kg | 0.18 | U | 0.2 | U |
| Dimethyl phthalate | | | 0.7 | 200 | mg/kg | 0.18 | U | 0.2 | U |
| Benzo(a)anthracene | | | 7 | 50 | mg/kg | 0.11 | U | 0.12 | U |
| Benzo(a)pyrene | | | 2 | 40 | mg/kg | 0.14 | U | 0.16 | U |
| Benzo(b)fluoranthene | | | 7 | 7 | mg/kg | 0.11 | U | 0.17 | |
| Benzo(k)fluoranthene | | | 70 | 40 | mg/kg | 0.11 | U | 0.12 | U |
| Chrysene | | | 70 | 400 | mg/kg | 0.11 | U | 0.14 | |
| Acenaphthylene | | | 1 | 400 | mg/kg | 0.14 | U | 0.16 | U |
| Anthracene | | | 1000 | 10 | mg/kg | 0.11 | U | 0.12 | U |
| Benzo(ghi)perylene | | | 1000 | 3000 | mg/kg | 0.14 | U | 0.16 | U |
| Fluorene | | | 1000 | 3000 | mg/kg | 0.18 | U | 0.2 | U |
| Phenanthrene | | | 10 | 3000 | mg/kg | 0.11 | U | 0.13 | |
| Dibenzo(a,h)anthracene | | | 0.7 | 1000 | mg/kg | 0.11 | U | 0.12 | U |
| Indeno(1,2,3-cd)pyrene | | | 7 | 4 | mg/kg | 0.14 | U | 0.16 | U |
| Pyrene | | | 1000 | 40 | mg/kg | 0.11 | U | 0.23 | |
| Aniline | | | 1000 | 3000 | mg/kg | 0.22 | U | 0.24 | U |
| 4-Chloroaniline | | | 1 | 10000 | mg/kg | 0.18 | U | 0.2 | U |
| Dibenzofuran | | | 100 | 3 | mg/kg | 0.18 | U | 0.2 | U |
| 2-Methylnaphthalene | | | 0.7 | 1000 | mg/kg | 0.22 | U | 0.24 | U |
| Acetophenone | | | 1000 | 80 | mg/kg | 0.18 | U | 0.2 | U |
| 2,4,6-Trichlorophenol | | | 0.7 | 10000 | mg/kg | 0.11 | U | 0.12 | U |
| 2-Chlorophenol | | | 0.7 | 20 | mg/kg | 0.18 | U | 0.2 | U |
| 2,4-Dichlorophenol | | | 0.7 | 100 | mg/kg | 0.16 | U | 0.18 | U |
| 2,4-Dimethylphenol | | | 0.7 | 40 | mg/kg | 0.18 | U | 0.2 | U |
| 2-Nitrophenol | | | 100 | 100 | mg/kg | 0.39 | U | 0.42 | U |
| 4-Nitrophenol | | | 100 | 1000 | mg/kg | 0.25 | U | 0.27 | U |
| 2,4-Dinitrophenol | | | 3 | 1000 | mg/kg | 0.87 | U | 0.94 | U |
| Pentachlorophenol | | | 3 | 50 | mg/kg | 0.36 | U | 0.39 | U |
| Phenol | | | 1 | 10 | mg/kg | 0.18 | U | 0.2 | U |
| 2-Methylphenol | | | 500 | 20 | mg/kg | 0.18 | U | 0.2 | U |
| 3-Methylphenol/4-Methylphenol | | | 500 | 5000 | mg/kg | 0.26 | U | 0.28 | U |
| 2,4,5-Trichlorophenol | | | 4 | 5000 | mg/kg | 0.18 | U | 0.2 | U |
| | | | | | | | | | |
| **MCP Total Metals** | | | | 600 | | | | | |
| Antimony, Total | | | 20 | | mg/kg | 2.13 | U | 2.35 | U |
| Arsenic, Total | 40 | 40 | 20 | 30 | mg/kg | 28.4 | | 21.7 | |
| Barium, Total | | | 1000 | 20 | mg/kg | 41.9 | | 34.9 | |
| Beryllium, Total | | | 90 | 3000 | mg/kg | 0.404 | | 0.386 | |
| Cadmium, Total | 80 | 30 | 70 | 200 | mg/kg | 0.426 | U | 0.471 | U |
| Chromium, Total | 1000 | 1000 | 100 | 100 | mg/kg | 19.4 | | 16.4 | |
| Lead, Total | 2000 | 1000 | 200 | 200 | mg/kg | 6.86 | | 19.4 | |
| Mercury, Total | 10 | 10 | 20 | 600 | mg/kg | 0.069 | U | 0.076 | U |
| Nickel, Total | | | 600 | 30 | mg/kg | 17 | | 14 | |
| Selenium, Total | | | 400 | 1000 | mg/kg | 2.13 | U | 2.35 | U |
| Silver, Total | | | 100 | 700 | mg/kg | 0.426 | U | 0.471 | U |
| Thallium, Total | | | 8 | 200 | mg/kg | 2.13 | U | 2.35 | U |
| Vanadium, Total | | | 400 | 60 | mg/kg | 21.8 | | 18.6 | |
| Zinc, Total | | | 1000 | 700 | mg/kg | 33 | | 35.5 | |
| | | | | | | | | | |

Lord Associates, Inc.

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# TABLE 1 - COMM-97 Analysis
# Glavin Project- 214 Lake Street, Shreswbury, MA

| LOCATION | | | | | | FILL COMP | | TOPSOIL COMP | |
|---|---|---|---|---|---|---|---|---|---|
| SAMPLING DATE | | | | | | 8/15/2018 | | 8/15/2018 | |
| | MADEP Standards | | | | | | | | |
| | MA-LLAND | MA-ULAND | RCS-1 | RCS-2 | Units | Results | Qual | Results | Qual |
| **MCP Volatile Organics by 5035 High** | | | | 3000 | | | | | |
| Methylene chloride | | | 0.1 | | mg/kg | 0.24 | U | 0.53 | U |
| 1,1-Dichloroethane | | | 0.4 | 4 | mg/kg | 0.048 | U | 0.11 | U |
| Chloroform | | | 0.2 | 9 | mg/kg | 0.073 | U | 0.16 | U |
| Carbon tetrachloride | | | 5 | 0.2 | mg/kg | 0.048 | U | 0.11 | U |
| 1,2-Dichloropropane | | | 0.1 | 5 | mg/kg | 0.048 | U | 0.11 | U |
| Dibromochloromethane | | | 0.005 | 0.1 | mg/kg | 0.048 | U | 0.11 | U |
| 1,1,2-Trichloroethane | | | 0.1 | 0.03 | mg/kg | 0.048 | U | 0.11 | U |
| Tetrachloroethene | | | 1 | 2 | mg/kg | 0.024 | U | 0.053 | U |
| Chlorobenzene | | | 1 | 10 | mg/kg | 0.024 | U | 0.053 | U |
| Trichlorofluoromethane | | | 1000 | 3 | mg/kg | 0.19 | U | 0.43 | U |
| 1,2-Dichloroethane | | | 0.1 | 10000 | mg/kg | 0.048 | U | 0.11 | U |
| 1,1,1-Trichloroethane | | | 30 | 0.1 | mg/kg | 0.024 | U | 0.053 | U |
| Bromodichloromethane | | | 0.1 | 600 | mg/kg | 0.024 | U | 0.053 | U |
| trans-1,3-Dichloropropene | | | 0.01 | 0.1 | mg/kg | 0.048 | U | 0.11 | U |
| cis-1,3-Dichloropropene | | | 0.01 | 0.4 | mg/kg | 0.024 | U | 0.053 | U |
| 1,3-Dichloropropene, Total | | | 0.01 | 0.4 | mg/kg | 0.024 | U | 0.053 | U |
| 1,1-Dichloropropene | | | | 0.4 | mg/kg | 0.024 | U | 0.053 | U |
| Bromoform | | | 0.1 | | mg/kg | 0.19 | U | 0.43 | U |
| 1,1,2,2-Tetrachloroethane | | | 0.005 | 1 | mg/kg | 0.024 | U | 0.053 | U |
| Benzene | | | 2 | 0.02 | mg/kg | 0.024 | U | 0.053 | U |
| Toluene | | | 30 | 200 | mg/kg | 0.048 | U | 0.11 | U |
| Ethylbenzene | | | 40 | 1000 | mg/kg | 0.048 | U | 0.11 | U |
| Chloromethane | | | 100 | 1000 | mg/kg | 0.19 | U | 0.43 | U |
| Bromomethane | | | 0.5 | 1000 | mg/kg | 0.097 | U | 0.21 | U |
| Vinyl chloride | | | 0.7 | 0.5 | mg/kg | 0.048 | U | 0.11 | U |
| Chloroethane | | | 100 | 0.7 | mg/kg | 0.097 | U | 0.21 | U |
| 1,1-Dichloroethene | | | 3 | 1000 | mg/kg | 0.048 | U | 0.11 | U |
| trans-1,2-Dichloroethene | | | 1 | 40 | mg/kg | 0.073 | U | 0.16 | U |
| Trichloroethene | | | 0.3 | 1 | mg/kg | 0.024 | U | 0.053 | U |
| 1,2-Dichlorobenzene | | | 9 | 0.3 | mg/kg | 0.097 | U | 0.21 | U |
| 1,3-Dichlorobenzene | | | 3 | 100 | mg/kg | 0.097 | U | 0.21 | U |
| 1,4-Dichlorobenzene | | | 0.7 | 200 | mg/kg | 0.097 | U | 0.21 | U |
| Methyl tert butyl ether | | | 0.1 | 1 | mg/kg | 0.097 | U | 0.21 | U |
| p/m-Xylene | | | 100 | 100 | mg/kg | 0.097 | U | 0.21 | U |
| o-Xylene | | | 100 | 100 | mg/kg | 0.048 | U | 0.11 | U |
| Xylenes, Total | | | 100 | 100 | mg/kg | 0.048 | U | 0.11 | U |
| cis-1,2-Dichloroethene | | | 0.1 | 100 | mg/kg | 0.048 | U | 0.11 | U |
| 1,2-Dichloroethene, Total | | | | 0.1 | mg/kg | 0.048 | U | 0.11 | U |
| Dibromomethane | | | 500 | | mg/kg | 0.097 | U | 0.21 | U |
| 1,2,3-Trichloropropane | | | 100 | 5000 | mg/kg | 0.097 | U | 0.21 | U |
| Styrene | | | 3 | 1000 | mg/kg | 0.048 | U | 0.11 | U |
| Dichlorodifluoromethane | | | 1000 | 4 | mg/kg | 0.48 | U | 1.1 | U |
| Acetone | | | 6 | 10000 | mg/kg | 0.48 | U | 1.1 | U |
| Carbon disulfide | | | 100 | 50 | mg/kg | 0.48 | U | 1.1 | U |
| Methyl ethyl ketone | | | 4 | 1000 | mg/kg | 0.48 | U | 1.1 | U |
| Methyl isobutyl ketone | | | 0.4 | 50 | mg/kg | 0.48 | U | 1.1 | U |
| 2-Hexanone | | | 100 | 50 | mg/kg | 0.48 | U | 1.1 | U |
| Bromochloromethane | | | | 1000 | mg/kg | 0.097 | U | 0.21 | U |
| Tetrahydrofuran | | | 500 | | mg/kg | 0.19 | U | 0.43 | U |
| 2,2-Dichloropropane | | | | 5000 | mg/kg | 0.097 | U | 0.21 | U |
| 1,2-Dibromoethane | | | 0.1 | | mg/kg | 0.048 | U | 0.11 | U |
| 1,3-Dichloropropane | | | 500 | 0.1 | mg/kg | 0.097 | U | 0.21 | U |
| 1,1,1,2-Tetrachloroethane | | | 0.1 | 5000 | mg/kg | 0.024 | U | 0.053 | U |

Lord Associates, Inc.

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# TABLE 1 - COMM-97 Analysis
# Glavin Project- 214 Lake Street, Shreswbury, MA

| LOCATION | | | | | | FILL COMP | | TOPSOIL COMP | |
|---|---|---|---|---|---|---|---|---|---|
| SAMPLING DATE | | | | | | 8/15/2018 | | 8/15/2018 | |
| | MADEP Standards | | | | | | | | |
| | MA-LLAND | MA-ULAND | RCS-1 | RCS-2 | Units | Results | Qual | Results | Qual |
| Bromobenzene | | | 100 | 0.1 | mg/kg | 0.097 | U | 0.21 | U |
| n-Butylbenzene | | | | 1000 | mg/kg | 0.048 | U | 0.11 | U |
| sec-Butylbenzene | | | | | mg/kg | 0.048 | U | 0.11 | U |
| tert-Butylbenzene | | | 100 | | mg/kg | 0.097 | U | 0.21 | U |
| o-Chlorotoluene | | | 100 | 1000 | mg/kg | 0.097 | U | 0.21 | U |
| p-Chlorotoluene | | | | 1000 | mg/kg | 0.097 | U | 0.21 | U |
| 1,2-Dibromo-3-chloropropane | | | 10 | | mg/kg | 0.14 | U | 0.32 | U |
| Hexachlorobutadiene | | | 30 | 100 | mg/kg | 0.19 | U | 0.43 | U |
| Isopropylbenzene | | | 1000 | 100 | mg/kg | 0.048 | U | 0.11 | U |
| p-Isopropyltoluene | | | 100 | 10000 | mg/kg | 0.048 | U | 0.11 | U |
| Naphthalene | | | 4 | 1000 | mg/kg | 0.19 | U | 0.43 | U |
| n-Propylbenzene | | | 100 | 20 | mg/kg | 0.048 | U | 0.11 | U |
| 1,2,3-Trichlorobenzene | | | | 1000 | mg/kg | 0.097 | U | 0.21 | U |
| 1,2,4-Trichlorobenzene | | | 2 | | mg/kg | 0.097 | U | 0.21 | U |
| 1,3,5-Trimethylbenzene | | | 10 | 6 | mg/kg | 0.097 | U | 0.21 | U |
| 1,2,4-Trimethylbenzene | | | 1000 | 100 | mg/kg | 0.097 | U | 0.21 | U |
| Diethyl ether | | | 100 | 10000 | mg/kg | 0.097 | U | 0.21 | U |
| Diisopropyl Ether | | | 100 | 1000 | mg/kg | 0.097 | U | 0.21 | U |
| Ethyl-Tert-Butyl-Ether | | | | 1000 | mg/kg | 0.097 | U | 0.21 | U |
| Tertiary-Amyl Methyl Ether | | | | | mg/kg | 0.097 | U | 0.21 | U |
| 1,4-Dioxane | | | 0.2 | | mg/kg | 4.8 | U | 11 | U |
| | | | | | | | | | |
| **Petroleum Hydrocarbon Quantitation** | | | | 6 | | | | | |
| TPH | 5000 | 2500 | 1000 | | mg/kg | 36.6 | U | 70.1 | |

Notes:
MA-LLAND: Lined Landfill Limits current as of August, 1997
MA-ULAND: UnLined Landfill Limits current as of August, 1997
RCS-1: MCP 2014 RCS-1 Reportable Concentrations Criteria effective April 25, 2014.
RCS-2: MCP 2014 RCS-2 Reportable Concentrations Criteria effective April 25, 2014.
mg/kg: Milligrams per kilogram
laboratory detection limits above MADEP standard(s) are shown highlighted gray
Detected analyte (Arsenic) above MADEP Standard is shown highlighted yellow

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L1832649 |
| Client: | Lord Associates, Inc.<br>1506 Providence Highway - Suite 30<br>Norwood, MA 02062 |
| ATTN: | Jon Puliafico |
| Phone: | (781) 255-5554 |
| Project Name: | UEC GLAVIN |
| Project Number: | 2629 |
| Report Date: | 08/30/18 |

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Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0574), IL (200077), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #P330-17-00196).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L1832649-01 | TOPSOIL COMP | SOIL | SHREWSBURY | 08/15/18 06:00 | 08/20/18 |
| L1832649-02 | FILL COMP | SOIL | SHREWSBURY | 08/15/18 06:15 | 08/20/18 |

**Project Name:** UEC GLAVIN **Lab Number:** L1832649

**Project Number:** 2629 **Report Date:** 08/30/18

## MADEP MCP Response Action Analytical Report Certification

**This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.**

| **An affirmative response to questions A through F is required for "Presumptive Certainty" status** | | |
|---|---|---|
| A | Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times? | YES |
| B | Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed? | YES |
| C | Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances? | YES |
| D | Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?" | YES |
| E a. | VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications). | N/A |
| E b. | APH and TO-15 Methods only: Was the complete analyte list reported for each method? | N/A |
| F | Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)? | YES |

| **A response to questions G, H and I is required for "Presumptive Certainty" status** | | |
|---|---|---|
| G | Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)? | NO |
| H | Were all QC performance standards specified in the CAM protocol(s) achieved? | NO |
| I | Were results reported for the complete analyte list specified in the selected CAM protocol(s)? | YES |

**For any questions answered "No", please refer to the case narrative section on the following page(s).**

**Please note that sample matrix information is located in the Sample Results section of this report.**

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. All specific QC information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Client Services at 800-624-9220 with any questions.

**Project Name:** UEC GLAVIN **Lab Number:** L1832649
**Project Number:** 2629 **Report Date:** 08/30/18

**Case Narrative (continued)**

MCP Related Narratives

Sample Receipt

In reference to question H:

A Matrix Spike was not submitted for the analysis of Total Metals.

Volatile Organics

In reference to question G:

One or more of the target analytes did not achieve the requested CAM reporting limits.

In reference to question H:

The initial calibration, associated with L1832649-01 and -02, did not meet the method required minimum response factor on the lowest calibration standard for trichloroethene (0.1978), 2-butanone (0.0660), 4-methyl-2-pentanone (0.0786), and 1,4-dioxane (0.0012), as well as the average response factor for acetone, 2-butanone, 4-methyl-2-pentanone, and 1,4-dioxane.

The continuing calibration standards, associated with L1832649-01 and -02, are outside the acceptance criteria for several compounds; however, they are within overall method allowances. Copies of the continuing calibration standards are included as an addendum to this report.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Lisa Westerlind

Title: Technical Director/Representative Date: 08/30/18

# ORGANICS

# VOLATILES

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-01
Client ID: TOPSOIL COMP
Sample Location: SHREWSBURY

Date Collected: 08/15/18 06:00
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 97,8260C
Analytical Date: 08/26/18 16:09
Analyst: JC
Percent Solids: 83%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor |
|---|---|---|---|---|---|---|
| MCP Volatile Organics by 5035 High - Westborough Lab | | | | | | |
| Methylene chloride | ND | | ug/kg | 530 | -- | 1 |
| 1,1-Dichloroethane | ND | | ug/kg | 110 | -- | 1 |
| Chloroform | ND | | ug/kg | 160 | -- | 1 |
| Carbon tetrachloride | ND | | ug/kg | 110 | -- | 1 |
| 1,2-Dichloropropane | ND | | ug/kg | 110 | -- | 1 |
| Dibromochloromethane | ND | | ug/kg | 110 | -- | 1 |
| 1,1,2-Trichloroethane | ND | | ug/kg | 110 | -- | 1 |
| Tetrachloroethene | ND | | ug/kg | 53 | -- | 1 |
| Chlorobenzene | ND | | ug/kg | 53 | -- | 1 |
| Trichlorofluoromethane | ND | | ug/kg | 430 | -- | 1 |
| 1,2-Dichloroethane | ND | | ug/kg | 110 | -- | 1 |
| 1,1,1-Trichloroethane | ND | | ug/kg | 53 | -- | 1 |
| Bromodichloromethane | ND | | ug/kg | 53 | -- | 1 |
| trans-1,3-Dichloropropene | ND | | ug/kg | 110 | -- | 1 |
| cis-1,3-Dichloropropene | ND | | ug/kg | 53 | -- | 1 |
| 1,3-Dichloropropene, Total | ND | | ug/kg | 53 | -- | 1 |
| 1,1-Dichloropropene | ND | | ug/kg | 53 | -- | 1 |
| Bromoform | ND | | ug/kg | 430 | -- | 1 |
| 1,1,2,2-Tetrachloroethane | ND | | ug/kg | 53 | -- | 1 |
| Benzene | ND | | ug/kg | 53 | -- | 1 |
| Toluene | ND | | ug/kg | 110 | -- | 1 |
| Ethylbenzene | ND | | ug/kg | 110 | -- | 1 |
| Chloromethane | ND | | ug/kg | 430 | -- | 1 |
| Bromomethane | ND | | ug/kg | 210 | -- | 1 |
| Vinyl chloride | ND | | ug/kg | 110 | -- | 1 |
| Chloroethane | ND | | ug/kg | 210 | -- | 1 |
| 1,1-Dichloroethene | ND | | ug/kg | 110 | -- | 1 |
| trans-1,2-Dichloroethene | ND | | ug/kg | 160 | -- | 1 |

**Project Name:** UEC GLAVIN **Lab Number:** L1832649

**Project Number:** 2629 **Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-01 Date Collected: 08/15/18 06:00

Client ID: TOPSOIL COMP Date Received: 08/20/18

Sample Location: SHREWSBURY Field Prep: Not Specified

Sample Depth:

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor |
|---|---|---|---|---|---|---|
| MCP Volatile Organics by 5035 High - Westborough Lab | | | | | | |
| Trichloroethene | ND | | ug/kg | 53 | -- | 1 |
| 1,2-Dichlorobenzene | ND | | ug/kg | 210 | -- | 1 |
| 1,3-Dichlorobenzene | ND | | ug/kg | 210 | -- | 1 |
| 1,4-Dichlorobenzene | ND | | ug/kg | 210 | -- | 1 |
| Methyl tert butyl ether | ND | | ug/kg | 210 | -- | 1 |
| p/m-Xylene | ND | | ug/kg | 210 | -- | 1 |
| o-Xylene | ND | | ug/kg | 110 | -- | 1 |
| Xylenes, Total | ND | | ug/kg | 110 | -- | 1 |
| cis-1,2-Dichloroethene | ND | | ug/kg | 110 | -- | 1 |
| 1,2-Dichloroethene, Total | ND | | ug/kg | 110 | -- | 1 |
| Dibromomethane | ND | | ug/kg | 210 | -- | 1 |
| 1,2,3-Trichloropropane | ND | | ug/kg | 210 | -- | 1 |
| Styrene | ND | | ug/kg | 110 | -- | 1 |
| Dichlorodifluoromethane | ND | | ug/kg | 1100 | -- | 1 |
| Acetone | ND | | ug/kg | 1100 | -- | 1 |
| Carbon disulfide | ND | | ug/kg | 1100 | -- | 1 |
| Methyl ethyl ketone | ND | | ug/kg | 1100 | -- | 1 |
| Methyl isobutyl ketone | ND | | ug/kg | 1100 | -- | 1 |
| 2-Hexanone | ND | | ug/kg | 1100 | -- | 1 |
| Bromochloromethane | ND | | ug/kg | 210 | -- | 1 |
| Tetrahydrofuran | ND | | ug/kg | 430 | -- | 1 |
| 2,2-Dichloropropane | ND | | ug/kg | 210 | -- | 1 |
| 1,2-Dibromoethane | ND | | ug/kg | 110 | -- | 1 |
| 1,3-Dichloropropane | ND | | ug/kg | 210 | -- | 1 |
| 1,1,1,2-Tetrachloroethane | ND | | ug/kg | 53 | -- | 1 |
| Bromobenzene | ND | | ug/kg | 210 | -- | 1 |
| n-Butylbenzene | ND | | ug/kg | 110 | -- | 1 |
| sec-Butylbenzene | ND | | ug/kg | 110 | -- | 1 |
| tert-Butylbenzene | ND | | ug/kg | 210 | -- | 1 |
| o-Chlorotoluene | ND | | ug/kg | 210 | -- | 1 |
| p-Chlorotoluene | ND | | ug/kg | 210 | -- | 1 |
| 1,2-Dibromo-3-chloropropane | ND | | ug/kg | 320 | -- | 1 |
| Hexachlorobutadiene | ND | | ug/kg | 430 | -- | 1 |
| Isopropylbenzene | ND | | ug/kg | 110 | -- | 1 |
| p-Isopropyltoluene | ND | | ug/kg | 110 | -- | 1 |
| Naphthalene | ND | | ug/kg | 430 | -- | 1 |
| n-Propylbenzene | ND | | ug/kg | 110 | -- | 1 |

**Project Name:** UEC GLAVIN
**Lab Number:** L1832649
**Project Number:** 2629
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-01
Client ID: TOPSOIL COMP
Sample Location: SHREWSBURY

Date Collected: 08/15/18 06:00
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor |
|---|---|---|---|---|---|---|
| MCP Volatile Organics by 5035 High - Westborough Lab | | | | | | |
| 1,2,3-Trichlorobenzene | ND | | ug/kg | 210 | -- | 1 |
| 1,2,4-Trichlorobenzene | ND | | ug/kg | 210 | -- | 1 |
| 1,3,5-Trimethylbenzene | ND | | ug/kg | 210 | -- | 1 |
| 1,2,4-Trimethylbenzene | ND | | ug/kg | 210 | -- | 1 |
| Diethyl ether | ND | | ug/kg | 210 | -- | 1 |
| Diisopropyl Ether | ND | | ug/kg | 210 | -- | 1 |
| Ethyl-Tert-Butyl-Ether | ND | | ug/kg | 210 | -- | 1 |
| Tertiary-Amyl Methyl Ether | ND | | ug/kg | 210 | -- | 1 |
| 1,4-Dioxane | ND | | ug/kg | 11000 | -- | 1 |

| Surrogate | % Recovery | Qualifier | Acceptance Criteria |
|---|---|---|---|
| 1,2-Dichloroethane-d4 | 97 | | 70-130 |
| Toluene-d8 | 98 | | 70-130 |
| 4-Bromofluorobenzene | 98 | | 70-130 |
| Dibromofluoromethane | 95 | | 70-130 |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-02
Client ID: FILL COMP
Sample Location: SHREWSBURY

Date Collected: 08/15/18 06:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 97,8260C
Analytical Date: 08/25/18 14:06
Analyst: AD
Percent Solids: 90%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor |
|---|---|---|---|---|---|---|
| MCP Volatile Organics by 5035 High - Westborough Lab | | | | | | |
| Methylene chloride | ND | | ug/kg | 240 | -- | 1 |
| 1,1-Dichloroethane | ND | | ug/kg | 48 | -- | 1 |
| Chloroform | ND | | ug/kg | 73 | -- | 1 |
| Carbon tetrachloride | ND | | ug/kg | 48 | -- | 1 |
| 1,2-Dichloropropane | ND | | ug/kg | 48 | -- | 1 |
| Dibromochloromethane | ND | | ug/kg | 48 | -- | 1 |
| 1,1,2-Trichloroethane | ND | | ug/kg | 48 | -- | 1 |
| Tetrachloroethene | ND | | ug/kg | 24 | -- | 1 |
| Chlorobenzene | ND | | ug/kg | 24 | -- | 1 |
| Trichlorofluoromethane | ND | | ug/kg | 190 | -- | 1 |
| 1,2-Dichloroethane | ND | | ug/kg | 48 | -- | 1 |
| 1,1,1-Trichloroethane | ND | | ug/kg | 24 | -- | 1 |
| Bromodichloromethane | ND | | ug/kg | 24 | -- | 1 |
| trans-1,3-Dichloropropene | ND | | ug/kg | 48 | -- | 1 |
| cis-1,3-Dichloropropene | ND | | ug/kg | 24 | -- | 1 |
| 1,3-Dichloropropene, Total | ND | | ug/kg | 24 | -- | 1 |
| 1,1-Dichloropropene | ND | | ug/kg | 24 | -- | 1 |
| Bromoform | ND | | ug/kg | 190 | -- | 1 |
| 1,1,2,2-Tetrachloroethane | ND | | ug/kg | 24 | -- | 1 |
| Benzene | ND | | ug/kg | 24 | -- | 1 |
| Toluene | ND | | ug/kg | 48 | -- | 1 |
| Ethylbenzene | ND | | ug/kg | 48 | -- | 1 |
| Chloromethane | ND | | ug/kg | 190 | -- | 1 |
| Bromomethane | ND | | ug/kg | 97 | -- | 1 |
| Vinyl chloride | ND | | ug/kg | 48 | -- | 1 |
| Chloroethane | ND | | ug/kg | 97 | -- | 1 |
| 1,1-Dichloroethene | ND | | ug/kg | 48 | -- | 1 |
| trans-1,2-Dichloroethene | ND | | ug/kg | 73 | -- | 1 |

**Project Name:** UEC GLAVIN **Lab Number:** L1832649

**Project Number:** 2629 **Report Date:** 08/30/18

**SAMPLE RESULTS**

Lab ID: L1832649-02 Date Collected: 08/15/18 06:15

Client ID: FILL COMP Date Received: 08/20/18

Sample Location: SHREWSBURY Field Prep: Not Specified

Sample Depth:

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor |
|---|---|---|---|---|---|---|
| MCP Volatile Organics by 5035 High - Westborough Lab | | | | | | |
| Trichloroethene | ND | | ug/kg | 24 | -- | 1 |
| 1,2-Dichlorobenzene | ND | | ug/kg | 97 | -- | 1 |
| 1,3-Dichlorobenzene | ND | | ug/kg | 97 | -- | 1 |
| 1,4-Dichlorobenzene | ND | | ug/kg | 97 | -- | 1 |
| Methyl tert butyl ether | ND | | ug/kg | 97 | -- | 1 |
| p/m-Xylene | ND | | ug/kg | 97 | -- | 1 |
| o-Xylene | ND | | ug/kg | 48 | -- | 1 |
| Xylenes, Total | ND | | ug/kg | 48 | -- | 1 |
| cis-1,2-Dichloroethene | ND | | ug/kg | 48 | -- | 1 |
| 1,2-Dichloroethene, Total | ND | | ug/kg | 48 | -- | 1 |
| Dibromomethane | ND | | ug/kg | 97 | -- | 1 |
| 1,2,3-Trichloropropane | ND | | ug/kg | 97 | -- | 1 |
| Styrene | ND | | ug/kg | 48 | -- | 1 |
| Dichlorodifluoromethane | ND | | ug/kg | 480 | -- | 1 |
| Acetone | ND | | ug/kg | 480 | -- | 1 |
| Carbon disulfide | ND | | ug/kg | 480 | -- | 1 |
| Methyl ethyl ketone | ND | | ug/kg | 480 | -- | 1 |
| Methyl isobutyl ketone | ND | | ug/kg | 480 | -- | 1 |
| 2-Hexanone | ND | | ug/kg | 480 | -- | 1 |
| Bromochloromethane | ND | | ug/kg | 97 | -- | 1 |
| Tetrahydrofuran | ND | | ug/kg | 190 | -- | 1 |
| 2,2-Dichloropropane | ND | | ug/kg | 97 | -- | 1 |
| 1,2-Dibromoethane | ND | | ug/kg | 48 | -- | 1 |
| 1,3-Dichloropropane | ND | | ug/kg | 97 | -- | 1 |
| 1,1,1,2-Tetrachloroethane | ND | | ug/kg | 24 | -- | 1 |
| Bromobenzene | ND | | ug/kg | 97 | -- | 1 |
| n-Butylbenzene | ND | | ug/kg | 48 | -- | 1 |
| sec-Butylbenzene | ND | | ug/kg | 48 | -- | 1 |
| tert-Butylbenzene | ND | | ug/kg | 97 | -- | 1 |
| o-Chlorotoluene | ND | | ug/kg | 97 | -- | 1 |
| p-Chlorotoluene | ND | | ug/kg | 97 | -- | 1 |
| 1,2-Dibromo-3-chloropropane | ND | | ug/kg | 140 | -- | 1 |
| Hexachlorobutadiene | ND | | ug/kg | 190 | -- | 1 |
| Isopropylbenzene | ND | | ug/kg | 48 | -- | 1 |
| p-Isopropyltoluene | ND | | ug/kg | 48 | -- | 1 |
| Naphthalene | ND | | ug/kg | 190 | -- | 1 |
| n-Propylbenzene | ND | | ug/kg | 48 | -- | 1 |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-02
Client ID: FILL COMP
Sample Location: SHREWSBURY

Date Collected: 08/15/18 06:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor |
|---|---|---|---|---|---|---|
| MCP Volatile Organics by 5035 High - Westborough Lab | | | | | | |
| 1,2,3-Trichlorobenzene | ND | | ug/kg | 97 | -- | 1 |
| 1,2,4-Trichlorobenzene | ND | | ug/kg | 97 | -- | 1 |
| 1,3,5-Trimethylbenzene | ND | | ug/kg | 97 | -- | 1 |
| 1,2,4-Trimethylbenzene | ND | | ug/kg | 97 | -- | 1 |
| Diethyl ether | ND | | ug/kg | 97 | -- | 1 |
| Diisopropyl Ether | ND | | ug/kg | 97 | -- | 1 |
| Ethyl-Tert-Butyl-Ether | ND | | ug/kg | 97 | -- | 1 |
| Tertiary-Amyl Methyl Ether | ND | | ug/kg | 97 | -- | 1 |
| 1,4-Dioxane | ND | | ug/kg | 4800 | -- | 1 |

| Surrogate | % Recovery | Qualifier | Acceptance Criteria |
|---|---|---|---|
| 1,2-Dichloroethane-d4 | 103 | | 70-130 |
| Toluene-d8 | 100 | | 70-130 |
| 4-Bromofluorobenzene | 99 | | 70-130 |
| Dibromofluoromethane | 97 | | 70-130 |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

# Method Blank Analysis
## Batch Quality Control

Analytical Method: 97,8260C
Analytical Date: 08/25/18 09:46
Analyst: MKS

| Parameter | Result | Qualifier | Units | RL | MDL |
|---|---|---|---|---|---|
| MCP Volatile Organics by 8260/5035 - Westborough Lab for sample(s): 02 Batch: WG1150852-5 | | | | | |
| Methylene chloride | ND | | ug/kg | 250 | -- |
| 1,1-Dichloroethane | ND | | ug/kg | 50 | -- |
| Chloroform | ND | | ug/kg | 75 | -- |
| Carbon tetrachloride | ND | | ug/kg | 50 | -- |
| 1,2-Dichloropropane | ND | | ug/kg | 50 | -- |
| Dibromochloromethane | ND | | ug/kg | 50 | -- |
| 1,1,2-Trichloroethane | ND | | ug/kg | 50 | -- |
| Tetrachloroethene | ND | | ug/kg | 25 | -- |
| Chlorobenzene | ND | | ug/kg | 25 | -- |
| Trichlorofluoromethane | ND | | ug/kg | 200 | -- |
| 1,2-Dichloroethane | ND | | ug/kg | 50 | -- |
| 1,1,1-Trichloroethane | ND | | ug/kg | 25 | -- |
| Bromodichloromethane | ND | | ug/kg | 25 | -- |
| trans-1,3-Dichloropropene | ND | | ug/kg | 50 | -- |
| cis-1,3-Dichloropropene | ND | | ug/kg | 25 | -- |
| 1,3-Dichloropropene, Total | ND | | ug/kg | 25 | -- |
| 1,1-Dichloropropene | ND | | ug/kg | 25 | -- |
| Bromoform | ND | | ug/kg | 200 | -- |
| 1,1,2,2-Tetrachloroethane | ND | | ug/kg | 25 | -- |
| Benzene | ND | | ug/kg | 25 | -- |
| Toluene | ND | | ug/kg | 50 | -- |
| Ethylbenzene | ND | | ug/kg | 50 | -- |
| Chloromethane | ND | | ug/kg | 200 | -- |
| Bromomethane | ND | | ug/kg | 100 | -- |
| Vinyl chloride | ND | | ug/kg | 50 | -- |
| Chloroethane | ND | | ug/kg | 100 | -- |
| 1,1-Dichloroethene | ND | | ug/kg | 50 | -- |
| trans-1,2-Dichloroethene | ND | | ug/kg | 75 | -- |
| Trichloroethene | ND | | ug/kg | 25 | -- |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

# Method Blank Analysis
## Batch Quality Control

Analytical Method: 97,8260C
Analytical Date: 08/25/18 09:46
Analyst: MKS

| Parameter | Result | Qualifier | Units | RL | MDL |
|---|---|---|---|---|---|
| MCP Volatile Organics by 8260/5035 - Westborough Lab for sample(s): 02 Batch: WG1150852-5 | | | | | |
| 1,2-Dichlorobenzene | ND | | ug/kg | 100 | -- |
| 1,3-Dichlorobenzene | ND | | ug/kg | 100 | -- |
| 1,4-Dichlorobenzene | ND | | ug/kg | 100 | -- |
| Methyl tert butyl ether | ND | | ug/kg | 100 | -- |
| p/m-Xylene | ND | | ug/kg | 100 | -- |
| o-Xylene | ND | | ug/kg | 50 | -- |
| Xylenes, Total | ND | | ug/kg | 50 | -- |
| cis-1,2-Dichloroethene | ND | | ug/kg | 50 | -- |
| 1,2-Dichloroethene, Total | ND | | ug/kg | 50 | -- |
| Dibromomethane | ND | | ug/kg | 100 | -- |
| 1,2,3-Trichloropropane | ND | | ug/kg | 100 | -- |
| Styrene | ND | | ug/kg | 50 | -- |
| Dichlorodifluoromethane | ND | | ug/kg | 500 | -- |
| Acetone | ND | | ug/kg | 500 | -- |
| Carbon disulfide | ND | | ug/kg | 500 | -- |
| Methyl ethyl ketone | ND | | ug/kg | 500 | -- |
| Methyl isobutyl ketone | ND | | ug/kg | 500 | -- |
| 2-Hexanone | ND | | ug/kg | 500 | -- |
| Bromochloromethane | ND | | ug/kg | 100 | -- |
| Tetrahydrofuran | ND | | ug/kg | 200 | -- |
| 2,2-Dichloropropane | ND | | ug/kg | 100 | -- |
| 1,2-Dibromoethane | ND | | ug/kg | 50 | -- |
| 1,3-Dichloropropane | ND | | ug/kg | 100 | -- |
| 1,1,1,2-Tetrachloroethane | ND | | ug/kg | 25 | -- |
| Bromobenzene | ND | | ug/kg | 100 | -- |
| n-Butylbenzene | ND | | ug/kg | 50 | -- |
| sec-Butylbenzene | ND | | ug/kg | 50 | -- |
| tert-Butylbenzene | ND | | ug/kg | 100 | -- |
| o-Chlorotoluene | ND | | ug/kg | 100 | -- |

**Project Name:** UEC GLAVIN **Lab Number:** L1832649

**Project Number:** 2629 **Report Date:** 08/30/18

# Method Blank Analysis
## Batch Quality Control

Analytical Method: 97,8260C
Analytical Date: 08/25/18 09:46
Analyst: MKS

| Parameter | Result | Qualifier | Units | RL | MDL |
|---|---|---|---|---|---|
| MCP Volatile Organics by 8260/5035 - Westborough Lab for sample(s): 02 Batch: WG1150852-5 | | | | | |
| p-Chlorotoluene | ND | | ug/kg | 100 | -- |
| 1,2-Dibromo-3-chloropropane | ND | | ug/kg | 150 | -- |
| Hexachlorobutadiene | ND | | ug/kg | 200 | -- |
| Isopropylbenzene | ND | | ug/kg | 50 | -- |
| p-Isopropyltoluene | ND | | ug/kg | 50 | -- |
| Naphthalene | ND | | ug/kg | 200 | -- |
| n-Propylbenzene | ND | | ug/kg | 50 | -- |
| 1,2,3-Trichlorobenzene | ND | | ug/kg | 100 | -- |
| 1,2,4-Trichlorobenzene | ND | | ug/kg | 100 | -- |
| 1,3,5-Trimethylbenzene | ND | | ug/kg | 100 | -- |
| 1,2,4-Trimethylbenzene | ND | | ug/kg | 100 | -- |
| Diethyl ether | ND | | ug/kg | 100 | -- |
| Diisopropyl Ether | ND | | ug/kg | 100 | -- |
| Ethyl-Tert-Butyl-Ether | ND | | ug/kg | 100 | -- |
| Tertiary-Amyl Methyl Ether | ND | | ug/kg | 100 | -- |
| 1,4-Dioxane | ND | | ug/kg | 5000 | -- |
| 2-Chloroethylvinyl ether | ND | | ug/kg | 1000 | -- |
| Halothane | ND | | ug/kg | 500 | -- |
| Ethyl Acetate | ND | | ug/kg | 500 | -- |
| Freon-113 | ND | | ug/kg | 200 | -- |
| Vinyl acetate | ND | | ug/kg | 500 | -- |

| Surrogate | %Recovery | Qualifier | Acceptance Criteria |
|---|---|---|---|
| 1,2-Dichloroethane-d4 | 99 | | 70-130 |
| Toluene-d8 | 99 | | 70-130 |
| 4-Bromofluorobenzene | 98 | | 70-130 |
| Dibromofluoromethane | 95 | | 70-130 |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

# Method Blank Analysis
## Batch Quality Control

Analytical Method: 97,8260C
Analytical Date: 08/26/18 11:13
Analyst: AD

| Parameter | Result | Qualifier | Units | RL | MDL |
|---|---|---|---|---|---|
| MCP Volatile Organics by 5035 High - Westborough Lab for sample(s): 01 Batch: WG1150980-5 | | | | | |
| Methylene chloride | ND | | ug/kg | 250 | -- |
| 1,1-Dichloroethane | ND | | ug/kg | 50 | -- |
| Chloroform | ND | | ug/kg | 75 | -- |
| Carbon tetrachloride | ND | | ug/kg | 50 | -- |
| 1,2-Dichloropropane | ND | | ug/kg | 50 | -- |
| Dibromochloromethane | ND | | ug/kg | 50 | -- |
| 1,1,2-Trichloroethane | ND | | ug/kg | 50 | -- |
| Tetrachloroethene | ND | | ug/kg | 25 | -- |
| Chlorobenzene | ND | | ug/kg | 25 | -- |
| Trichlorofluoromethane | ND | | ug/kg | 200 | -- |
| 1,2-Dichloroethane | ND | | ug/kg | 50 | -- |
| 1,1,1-Trichloroethane | ND | | ug/kg | 25 | -- |
| Bromodichloromethane | ND | | ug/kg | 25 | -- |
| trans-1,3-Dichloropropene | ND | | ug/kg | 50 | -- |
| cis-1,3-Dichloropropene | ND | | ug/kg | 25 | -- |
| 1,3-Dichloropropene, Total | ND | | ug/kg | 25 | -- |
| 1,1-Dichloropropene | ND | | ug/kg | 25 | -- |
| Bromoform | ND | | ug/kg | 200 | -- |
| 1,1,2,2-Tetrachloroethane | ND | | ug/kg | 25 | -- |
| Benzene | ND | | ug/kg | 25 | -- |
| Toluene | ND | | ug/kg | 50 | -- |
| Ethylbenzene | ND | | ug/kg | 50 | -- |
| Chloromethane | ND | | ug/kg | 200 | -- |
| Bromomethane | ND | | ug/kg | 100 | -- |
| Vinyl chloride | ND | | ug/kg | 50 | -- |
| Chloroethane | ND | | ug/kg | 100 | -- |
| 1,1-Dichloroethene | ND | | ug/kg | 50 | -- |
| trans-1,2-Dichloroethene | ND | | ug/kg | 75 | -- |
| Trichloroethene | ND | | ug/kg | 25 | -- |

**Project Name:** UEC GLAVIN **Lab Number:** L1832649

**Project Number:** 2629 **Report Date:** 08/30/18

# Method Blank Analysis
## Batch Quality Control

Analytical Method: 97,8260C
Analytical Date: 08/26/18 11:13
Analyst: AD

| Parameter | Result | Qualifier | Units | RL | MDL |
|---|---|---|---|---|---|
| MCP Volatile Organics by 5035 High - Westborough Lab for sample(s): 01 Batch: WG1150980-5 | | | | | |
| 1,2-Dichlorobenzene | ND | | ug/kg | 100 | -- |
| 1,3-Dichlorobenzene | ND | | ug/kg | 100 | -- |
| 1,4-Dichlorobenzene | ND | | ug/kg | 100 | -- |
| Methyl tert butyl ether | ND | | ug/kg | 100 | -- |
| p/m-Xylene | ND | | ug/kg | 100 | -- |
| o-Xylene | ND | | ug/kg | 50 | -- |
| Xylenes, Total | ND | | ug/kg | 50 | -- |
| cis-1,2-Dichloroethene | ND | | ug/kg | 50 | -- |
| 1,2-Dichloroethene, Total | ND | | ug/kg | 50 | -- |
| Dibromomethane | ND | | ug/kg | 100 | -- |
| 1,2,3-Trichloropropane | ND | | ug/kg | 100 | -- |
| Styrene | ND | | ug/kg | 50 | -- |
| Dichlorodifluoromethane | ND | | ug/kg | 500 | -- |
| Acetone | ND | | ug/kg | 500 | -- |
| Carbon disulfide | ND | | ug/kg | 500 | -- |
| Methyl ethyl ketone | ND | | ug/kg | 500 | -- |
| Methyl isobutyl ketone | ND | | ug/kg | 500 | -- |
| 2-Hexanone | ND | | ug/kg | 500 | -- |
| Bromochloromethane | ND | | ug/kg | 100 | -- |
| Tetrahydrofuran | ND | | ug/kg | 200 | -- |
| 2,2-Dichloropropane | ND | | ug/kg | 100 | -- |
| 1,2-Dibromoethane | ND | | ug/kg | 50 | -- |
| 1,3-Dichloropropane | ND | | ug/kg | 100 | -- |
| 1,1,1,2-Tetrachloroethane | ND | | ug/kg | 25 | -- |
| Bromobenzene | ND | | ug/kg | 100 | -- |
| n-Butylbenzene | ND | | ug/kg | 50 | -- |
| sec-Butylbenzene | ND | | ug/kg | 50 | -- |
| tert-Butylbenzene | ND | | ug/kg | 100 | -- |
| o-Chlorotoluene | ND | | ug/kg | 100 | -- |

**Project Name:** UEC GLAVIN **Lab Number:** L1832649

**Project Number:** 2629 **Report Date:** 08/30/18

# Method Blank Analysis
## Batch Quality Control

Analytical Method: 97,8260C
Analytical Date: 08/26/18 11:13
Analyst: AD

| Parameter | Result | Qualifier | Units | RL | MDL |
|---|---|---|---|---|---|
| MCP Volatile Organics by 5035 High - Westborough Lab for sample(s): 01 Batch: WG1150980-5 | | | | | |
| p-Chlorotoluene | ND | | ug/kg | 100 | -- |
| 1,2-Dibromo-3-chloropropane | ND | | ug/kg | 150 | -- |
| Hexachlorobutadiene | ND | | ug/kg | 200 | -- |
| Isopropylbenzene | ND | | ug/kg | 50 | -- |
| p-Isopropyltoluene | ND | | ug/kg | 50 | -- |
| Naphthalene | ND | | ug/kg | 200 | -- |
| n-Propylbenzene | ND | | ug/kg | 50 | -- |
| 1,2,3-Trichlorobenzene | ND | | ug/kg | 100 | -- |
| 1,2,4-Trichlorobenzene | ND | | ug/kg | 100 | -- |
| 1,3,5-Trimethylbenzene | ND | | ug/kg | 100 | -- |
| 1,2,4-Trimethylbenzene | ND | | ug/kg | 100 | -- |
| Diethyl ether | ND | | ug/kg | 100 | -- |
| Diisopropyl Ether | ND | | ug/kg | 100 | -- |
| Ethyl-Tert-Butyl-Ether | ND | | ug/kg | 100 | -- |
| Tertiary-Amyl Methyl Ether | ND | | ug/kg | 100 | -- |
| 1,4-Dioxane | ND | | ug/kg | 5000 | -- |
| 2-Chloroethylvinyl ether | ND | | ug/kg | 1000 | -- |
| Halothane | ND | | ug/kg | 500 | -- |
| Ethyl Acetate | ND | | ug/kg | 500 | -- |
| Freon-113 | ND | | ug/kg | 200 | -- |
| Vinyl acetate | ND | | ug/kg | 500 | -- |

| Surrogate | %Recovery | Qualifier | Acceptance Criteria |
|---|---|---|---|
| 1,2-Dichloroethane-d4 | 99 | | 70-130 |
| Toluene-d8 | 100 | | 70-130 |
| 4-Bromofluorobenzene | 99 | | 70-130 |
| Dibromofluoromethane | 95 | | 70-130 |

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| MCP Volatile Organics by 8260/5035 - Westborough Lab Associated sample(s): 02 Batch: WG1150852-3 WG1150852-4 | | | | | | | | |
| Methylene chloride | 83 | | 81 | | 70-130 | 2 | | 20 |
| 1,1-Dichloroethane | 90 | | 89 | | 70-130 | 1 | | 20 |
| Chloroform | 92 | | 91 | | 70-130 | 1 | | 20 |
| Carbon tetrachloride | 84 | | 84 | | 70-130 | 0 | | 20 |
| 1,2-Dichloropropane | 95 | | 94 | | 70-130 | 1 | | 20 |
| Dibromochloromethane | 97 | | 94 | | 70-130 | 3 | | 20 |
| 1,1,2-Trichloroethane | 101 | | 98 | | 70-130 | 3 | | 20 |
| Tetrachloroethene | 87 | | 86 | | 70-130 | 1 | | 20 |
| Chlorobenzene | 90 | | 90 | | 70-130 | 0 | | 20 |
| Trichlorofluoromethane | 80 | | 79 | | 70-130 | 1 | | 20 |
| 1,2-Dichloroethane | 95 | | 93 | | 70-130 | 2 | | 20 |
| 1,1,1-Trichloroethane | 87 | | 86 | | 70-130 | 1 | | 20 |
| Bromodichloromethane | 96 | | 95 | | 70-130 | 1 | | 20 |
| trans-1,3-Dichloropropene | 92 | | 90 | | 70-130 | 2 | | 20 |
| cis-1,3-Dichloropropene | 98 | | 97 | | 70-130 | 1 | | 20 |
| 1,1-Dichloropropene | 88 | | 86 | | 70-130 | 2 | | 20 |
| Bromoform | 95 | | 93 | | 70-130 | 2 | | 20 |
| 1,1,2,2-Tetrachloroethane | 101 | | 96 | | 70-130 | 5 | | 20 |
| Benzene | 89 | | 88 | | 70-130 | 1 | | 20 |
| Toluene | 89 | | 88 | | 70-130 | 1 | | 20 |
| Ethylbenzene | 89 | | 88 | | 70-130 | 1 | | 20 |
| Chloromethane | 86 | | 82 | | 70-130 | 5 | | 20 |
| Bromomethane | 89 | | 86 | | 70-130 | 3 | | 20 |

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| MCP Volatile Organics by 8260/5035 - Westborough Lab Associated sample(s): 02 Batch: WG1150852-3 WG1150852-4 | | | | | | | | |
| Vinyl chloride | 83 | | 81 | | 70-130 | 2 | | 20 |
| Chloroethane | 89 | | 86 | | 70-130 | 3 | | 20 |
| 1,1-Dichloroethene | 80 | | 79 | | 70-130 | 1 | | 20 |
| trans-1,2-Dichloroethene | 86 | | 85 | | 70-130 | 1 | | 20 |
| Trichloroethene | 89 | | 89 | | 70-130 | 0 | | 20 |
| 1,2-Dichlorobenzene | 93 | | 92 | | 70-130 | 1 | | 20 |
| 1,3-Dichlorobenzene | 92 | | 91 | | 70-130 | 1 | | 20 |
| 1,4-Dichlorobenzene | 92 | | 90 | | 70-130 | 2 | | 20 |
| Methyl tert butyl ether | 91 | | 89 | | 70-130 | 2 | | 20 |
| p/m-Xylene | 90 | | 89 | | 70-130 | 1 | | 20 |
| o-Xylene | 91 | | 90 | | 70-130 | 1 | | 20 |
| cis-1,2-Dichloroethene | 89 | | 89 | | 70-130 | 0 | | 20 |
| Dibromomethane | 98 | | 95 | | 70-130 | 3 | | 20 |
| 1,2,3-Trichloropropane | 99 | | 96 | | 70-130 | 3 | | 20 |
| Styrene | 90 | | 88 | | 70-130 | 2 | | 20 |
| Dichlorodifluoromethane | 74 | | 72 | | 70-130 | 3 | | 20 |
| Acetone | 94 | | 82 | | 70-130 | 14 | | 20 |
| Carbon disulfide | 79 | | 77 | | 70-130 | 3 | | 20 |
| Methyl ethyl ketone | 79 | | 76 | | 70-130 | 4 | | 20 |
| Methyl isobutyl ketone | 92 | | 84 | | 70-130 | 9 | | 20 |
| 2-Hexanone | 100 | | 92 | | 70-130 | 8 | | 20 |
| Bromochloromethane | 96 | | 95 | | 70-130 | 1 | | 20 |
| Tetrahydrofuran | 99 | | 94 | | 70-130 | 5 | | 20 |

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| MCP Volatile Organics by 8260/5035 - Westborough Lab Associated sample(s): 02 Batch: WG1150852-3 WG1150852-4 | | | | | | | | |
| 2,2-Dichloropropane | 91 | | 89 | | 70-130 | 2 | | 20 |
| 1,2-Dibromoethane | 100 | | 95 | | 70-130 | 5 | | 20 |
| 1,3-Dichloropropane | 99 | | 96 | | 70-130 | 3 | | 20 |
| 1,1,1,2-Tetrachloroethane | 95 | | 94 | | 70-130 | 1 | | 20 |
| Bromobenzene | 92 | | 91 | | 70-130 | 1 | | 20 |
| n-Butylbenzene | 90 | | 89 | | 70-130 | 1 | | 20 |
| sec-Butylbenzene | 88 | | 87 | | 70-130 | 1 | | 20 |
| tert-Butylbenzene | 86 | | 86 | | 70-130 | 0 | | 20 |
| o-Chlorotoluene | 92 | | 90 | | 70-130 | 2 | | 20 |
| p-Chlorotoluene | 91 | | 90 | | 70-130 | 1 | | 20 |
| 1,2-Dibromo-3-chloropropane | 86 | | 82 | | 70-130 | 5 | | 20 |
| Hexachlorobutadiene | 81 | | 81 | | 70-130 | 0 | | 20 |
| Isopropylbenzene | 88 | | 88 | | 70-130 | 0 | | 20 |
| p-Isopropyltoluene | 87 | | 86 | | 70-130 | 1 | | 20 |
| Naphthalene | 89 | | 86 | | 70-130 | 3 | | 20 |
| n-Propylbenzene | 90 | | 88 | | 70-130 | 2 | | 20 |
| 1,2,3-Trichlorobenzene | 89 | | 88 | | 70-130 | 1 | | 20 |
| 1,2,4-Trichlorobenzene | 89 | | 88 | | 70-130 | 1 | | 20 |
| 1,3,5-Trimethylbenzene | 89 | | 87 | | 70-130 | 2 | | 20 |
| 1,2,4-Trimethylbenzene | 90 | | 89 | | 70-130 | 1 | | 20 |
| Diethyl ether | 88 | | 86 | | 70-130 | 2 | | 20 |
| Diisopropyl Ether | 91 | | 91 | | 70-130 | 0 | | 20 |
| Ethyl-Tert-Butyl-Ether | 92 | | 91 | | 70-130 | 1 | | 20 |

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| MCP Volatile Organics by 8260/5035 - Westborough Lab Associated sample(s): 02 Batch: WG1150852-3 WG1150852-4 | | | | | | | | |
| Tertiary-Amyl Methyl Ether | 94 | | 92 | | 70-130 | 2 | | 20 |
| 1,4-Dioxane | 102 | | 92 | | 70-130 | 10 | | 20 |
| 2-Chloroethylvinyl ether | 96 | | 96 | | 70-130 | 0 | | 20 |
| Halothane | 83 | | 82 | | 70-130 | 1 | | 20 |
| Ethyl Acetate | 98 | | 93 | | 70-130 | 5 | | 20 |
| Freon-113 | 74 | | 73 | | 70-130 | 1 | | 20 |
| Vinyl acetate | 97 | | 94 | | 70-130 | 3 | | 20 |

| Surrogate | LCS %Recovery | Qual | LCSD %Recovery | Qual | Acceptance Criteria |
|---|---|---|---|---|---|
| 1,2-Dichloroethane-d4 | 102 | | 101 | | 70-130 |
| Toluene-d8 | 101 | | 101 | | 70-130 |
| 4-Bromofluorobenzene | 100 | | 99 | | 70-130 |
| Dibromofluoromethane | 100 | | 101 | | 70-130 |

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| MCP Volatile Organics by 5035 High - Westborough Lab Associated sample(s): 01 Batch: WG1150980-3 WG1150980-4 | | | | | | | | |
| Methylene chloride | 88 | | 87 | | 70-130 | 1 | | 20 |
| 1,1-Dichloroethane | 96 | | 94 | | 70-130 | 2 | | 20 |
| Chloroform | 98 | | 96 | | 70-130 | 2 | | 20 |
| Carbon tetrachloride | 101 | | 98 | | 70-130 | 3 | | 20 |
| 1,2-Dichloropropane | 99 | | 98 | | 70-130 | 1 | | 20 |
| Dibromochloromethane | 99 | | 99 | | 70-130 | 0 | | 20 |
| 1,1,2-Trichloroethane | 102 | | 101 | | 70-130 | 1 | | 20 |
| Tetrachloroethene | 100 | | 97 | | 70-130 | 3 | | 20 |
| Chlorobenzene | 95 | | 92 | | 70-130 | 3 | | 20 |
| Trichlorofluoromethane | 100 | | 98 | | 70-130 | 2 | | 20 |
| 1,2-Dichloroethane | 97 | | 96 | | 70-130 | 1 | | 20 |
| 1,1,1-Trichloroethane | 100 | | 97 | | 70-130 | 3 | | 20 |
| Bromodichloromethane | 100 | | 99 | | 70-130 | 1 | | 20 |
| trans-1,3-Dichloropropene | 94 | | 93 | | 70-130 | 1 | | 20 |
| cis-1,3-Dichloropropene | 103 | | 100 | | 70-130 | 3 | | 20 |
| 1,1-Dichloropropene | 103 | | 100 | | 70-130 | 3 | | 20 |
| Bromoform | 97 | | 98 | | 70-130 | 1 | | 20 |
| 1,1,2,2-Tetrachloroethane | 102 | | 102 | | 70-130 | 0 | | 20 |
| Benzene | 96 | | 93 | | 70-130 | 3 | | 20 |
| Toluene | 95 | | 92 | | 70-130 | 3 | | 20 |
| Ethylbenzene | 96 | | 94 | | 70-130 | 2 | | 20 |
| Chloromethane | 90 | | 85 | | 70-130 | 6 | | 20 |
| Bromomethane | 90 | | 86 | | 70-130 | 5 | | 20 |

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| MCP Volatile Organics by 5035 High - Westborough Lab Associated sample(s): 01 Batch: WG1150980-3 WG1150980-4 | | | | | | | | |
| Vinyl chloride | 95 | | 91 | | 70-130 | 4 | | 20 |
| Chloroethane | 97 | | 92 | | 70-130 | 5 | | 20 |
| 1,1-Dichloroethene | 95 | | 92 | | 70-130 | 3 | | 20 |
| trans-1,2-Dichloroethene | 95 | | 91 | | 70-130 | 4 | | 20 |
| Trichloroethene | 98 | | 96 | | 70-130 | 2 | | 20 |
| 1,2-Dichlorobenzene | 97 | | 95 | | 70-130 | 2 | | 20 |
| 1,3-Dichlorobenzene | 98 | | 95 | | 70-130 | 3 | | 20 |
| 1,4-Dichlorobenzene | 97 | | 95 | | 70-130 | 2 | | 20 |
| Methyl tert butyl ether | 92 | | 92 | | 70-130 | 0 | | 20 |
| p/m-Xylene | 97 | | 94 | | 70-130 | 3 | | 20 |
| o-Xylene | 96 | | 94 | | 70-130 | 2 | | 20 |
| cis-1,2-Dichloroethene | 94 | | 93 | | 70-130 | 1 | | 20 |
| Dibromomethane | 99 | | 100 | | 70-130 | 1 | | 20 |
| 1,2,3-Trichloropropane | 101 | | 100 | | 70-130 | 1 | | 20 |
| Styrene | 94 | | 92 | | 70-130 | 2 | | 20 |
| Dichlorodifluoromethane | 90 | | 86 | | 70-130 | 5 | | 20 |
| Acetone | 89 | | 88 | | 70-130 | 1 | | 20 |
| Carbon disulfide | 89 | | 86 | | 70-130 | 3 | | 20 |
| Methyl ethyl ketone | 84 | | 79 | | 70-130 | 6 | | 20 |
| Methyl isobutyl ketone | 90 | | 89 | | 70-130 | 1 | | 20 |
| 2-Hexanone | 90 | | 90 | | 70-130 | 0 | | 20 |
| Bromochloromethane | 99 | | 96 | | 70-130 | 3 | | 20 |
| Tetrahydrofuran | 99 | | 99 | | 70-130 | 0 | | 20 |

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| MCP Volatile Organics by 5035 High - Westborough Lab Associated sample(s): 01 Batch: WG1150980-3 WG1150980-4 | | | | | | | | |
| 2,2-Dichloropropane | 103 | | 100 | | 70-130 | 3 | | 20 |
| 1,2-Dibromoethane | 100 | | 99 | | 70-130 | 1 | | 20 |
| 1,3-Dichloropropane | 100 | | 99 | | 70-130 | 1 | | 20 |
| 1,1,1,2-Tetrachloroethane | 100 | | 97 | | 70-130 | 3 | | 20 |
| Bromobenzene | 96 | | 95 | | 70-130 | 1 | | 20 |
| n-Butylbenzene | 102 | | 100 | | 70-130 | 2 | | 20 |
| sec-Butylbenzene | 102 | | 98 | | 70-130 | 4 | | 20 |
| tert-Butylbenzene | 97 | | 95 | | 70-130 | 2 | | 20 |
| o-Chlorotoluene | 97 | | 95 | | 70-130 | 2 | | 20 |
| p-Chlorotoluene | 98 | | 94 | | 70-130 | 4 | | 20 |
| 1,2-Dibromo-3-chloropropane | 88 | | 88 | | 70-130 | 0 | | 20 |
| Hexachlorobutadiene | 95 | | 92 | | 70-130 | 3 | | 20 |
| Isopropylbenzene | 100 | | 96 | | 70-130 | 4 | | 20 |
| p-Isopropyltoluene | 99 | | 96 | | 70-130 | 3 | | 20 |
| Naphthalene | 91 | | 91 | | 70-130 | 0 | | 20 |
| n-Propylbenzene | 100 | | 97 | | 70-130 | 3 | | 20 |
| 1,2,3-Trichlorobenzene | 94 | | 93 | | 70-130 | 1 | | 20 |
| 1,2,4-Trichlorobenzene | 94 | | 94 | | 70-130 | 0 | | 20 |
| 1,3,5-Trimethylbenzene | 98 | | 94 | | 70-130 | 4 | | 20 |
| 1,2,4-Trimethylbenzene | 96 | | 94 | | 70-130 | 2 | | 20 |
| Diethyl ether | 90 | | 90 | | 70-130 | 0 | | 20 |
| Diisopropyl Ether | 94 | | 93 | | 70-130 | 1 | | 20 |
| Ethyl-Tert-Butyl-Ether | 96 | | 94 | | 70-130 | 2 | | 20 |

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| MCP Volatile Organics by 5035 High - Westborough Lab Associated sample(s): 01 Batch: WG1150980-3 WG1150980-4 | | | | | | | | |
| Tertiary-Amyl Methyl Ether | 95 | | 96 | | 70-130 | 1 | | 20 |
| 1,4-Dioxane | 100 | | 101 | | 70-130 | 1 | | 20 |
| 2-Chloroethylvinyl ether | 103 | | 108 | | 70-130 | 5 | | 20 |
| Halothane | 97 | | 94 | | 70-130 | 3 | | 20 |
| Ethyl Acetate | 97 | | 99 | | 70-130 | 2 | | 20 |
| Freon-113 | 96 | | 93 | | 70-130 | 3 | | 20 |
| Vinyl acetate | 100 | | 100 | | 70-130 | 0 | | 20 |

| Surrogate | LCS %Recovery | Qual | LCSD %Recovery | Qual | Acceptance Criteria |
|---|---|---|---|---|---|
| 1,2-Dichloroethane-d4 | 101 | | 101 | | 70-130 |
| Toluene-d8 | 101 | | 100 | | 70-130 |
| 4-Bromofluorobenzene | 100 | | 100 | | 70-130 |
| Dibromofluoromethane | 101 | | 101 | | 70-130 |

# SEMIVOLATILES

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-01
Client ID: TOPSOIL COMP
Sample Location: SHREWSBURY

Date Collected: 08/15/18 06:00
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 97,8270D
Analytical Date: 08/30/18 14:40
Analyst: SZ
Percent Solids: 83%

Extraction Method: EPA 3546
Extraction Date: 08/26/18 05:31

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor |
|---|---|---|---|---|---|---|
| **MCP Semivolatile Organics - Westborough Lab** | | | | | | |
| Acenaphthene | ND | | ug/kg | 160 | -- | 1 |
| 1,2,4-Trichlorobenzene | ND | | ug/kg | 200 | -- | 1 |
| Hexachlorobenzene | ND | | ug/kg | 120 | -- | 1 |
| Bis(2-chloroethyl)ether | ND | | ug/kg | 180 | -- | 1 |
| 2-Chloronaphthalene | ND | | ug/kg | 200 | -- | 1 |
| 1,2-Dichlorobenzene | ND | | ug/kg | 200 | -- | 1 |
| 1,3-Dichlorobenzene | ND | | ug/kg | 200 | -- | 1 |
| 1,4-Dichlorobenzene | ND | | ug/kg | 200 | -- | 1 |
| 3,3'-Dichlorobenzidine | ND | | ug/kg | 200 | -- | 1 |
| 2,4-Dinitrotoluene | ND | | ug/kg | 200 | -- | 1 |
| 2,6-Dinitrotoluene | ND | | ug/kg | 200 | -- | 1 |
| Azobenzene | ND | | ug/kg | 200 | -- | 1 |
| Fluoranthene | 220 | | ug/kg | 120 | -- | 1 |
| 4-Bromophenyl phenyl ether | ND | | ug/kg | 200 | -- | 1 |
| Bis(2-chloroisopropyl)ether | ND | | ug/kg | 240 | -- | 1 |
| Bis(2-chloroethoxy)methane | ND | | ug/kg | 210 | -- | 1 |
| Hexachlorobutadiene | ND | | ug/kg | 200 | -- | 1 |
| Hexachloroethane | ND | | ug/kg | 160 | -- | 1 |
| Isophorone | ND | | ug/kg | 180 | -- | 1 |
| Naphthalene | ND | | ug/kg | 200 | -- | 1 |
| Nitrobenzene | ND | | ug/kg | 180 | -- | 1 |
| Bis(2-ethylhexyl)phthalate | 310 | | ug/kg | 200 | -- | 1 |
| Butyl benzyl phthalate | ND | | ug/kg | 200 | -- | 1 |
| Di-n-butylphthalate | ND | | ug/kg | 200 | -- | 1 |
| Di-n-octylphthalate | ND | | ug/kg | 200 | -- | 1 |
| Diethyl phthalate | ND | | ug/kg | 200 | -- | 1 |
| Dimethyl phthalate | ND | | ug/kg | 200 | -- | 1 |
| Benzo(a)anthracene | ND | | ug/kg | 120 | -- | 1 |

**Project Name:** UEC GLAVIN **Lab Number:** L1832649

**Project Number:** 2629 **Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-01 Date Collected: 08/15/18 06:00

Client ID: TOPSOIL COMP Date Received: 08/20/18

Sample Location: SHREWSBURY Field Prep: Not Specified

Sample Depth:

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor |
|---|---|---|---|---|---|---|
| MCP Semivolatile Organics - Westborough Lab | | | | | | |
| Benzo(a)pyrene | ND | | ug/kg | 160 | -- | 1 |
| Benzo(b)fluoranthene | 170 | | ug/kg | 120 | -- | 1 |
| Benzo(k)fluoranthene | ND | | ug/kg | 120 | -- | 1 |
| Chrysene | 140 | | ug/kg | 120 | -- | 1 |
| Acenaphthylene | ND | | ug/kg | 160 | -- | 1 |
| Anthracene | ND | | ug/kg | 120 | -- | 1 |
| Benzo(ghi)perylene | ND | | ug/kg | 160 | -- | 1 |
| Fluorene | ND | | ug/kg | 200 | -- | 1 |
| Phenanthrene | 130 | | ug/kg | 120 | -- | 1 |
| Dibenzo(a,h)anthracene | ND | | ug/kg | 120 | -- | 1 |
| Indeno(1,2,3-cd)pyrene | ND | | ug/kg | 160 | -- | 1 |
| Pyrene | 230 | | ug/kg | 120 | -- | 1 |
| Aniline | ND | | ug/kg | 240 | -- | 1 |
| 4-Chloroaniline | ND | | ug/kg | 200 | -- | 1 |
| Dibenzofuran | ND | | ug/kg | 200 | -- | 1 |
| 2-Methylnaphthalene | ND | | ug/kg | 240 | -- | 1 |
| Acetophenone | ND | | ug/kg | 200 | -- | 1 |
| 2,4,6-Trichlorophenol | ND | | ug/kg | 120 | -- | 1 |
| 2-Chlorophenol | ND | | ug/kg | 200 | -- | 1 |
| 2,4-Dichlorophenol | ND | | ug/kg | 180 | -- | 1 |
| 2,4-Dimethylphenol | ND | | ug/kg | 200 | -- | 1 |
| 2-Nitrophenol | ND | | ug/kg | 420 | -- | 1 |
| 4-Nitrophenol | ND | | ug/kg | 270 | -- | 1 |
| 2,4-Dinitrophenol | ND | | ug/kg | 940 | -- | 1 |
| Pentachlorophenol | ND | | ug/kg | 390 | -- | 1 |
| Phenol | ND | | ug/kg | 200 | -- | 1 |
| 2-Methylphenol | ND | | ug/kg | 200 | -- | 1 |
| 3-Methylphenol/4-Methylphenol | ND | | ug/kg | 280 | -- | 1 |
| 2,4,5-Trichlorophenol | ND | | ug/kg | 200 | -- | 1 |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-01
Client ID: TOPSOIL COMP
Sample Location: SHREWSBURY
Date Collected: 08/15/18 06:00
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor |
|---|---|---|---|---|---|---|
| MCP Semivolatile Organics - Westborough Lab | | | | | | |

| Surrogate | % Recovery | Qualifier | Acceptance Criteria |
|---|---|---|---|
| 2-Fluorophenol | 63 | | 30-130 |
| Phenol-d6 | 66 | | 30-130 |
| Nitrobenzene-d5 | 74 | | 30-130 |
| 2-Fluorobiphenyl | 77 | | 30-130 |
| 2,4,6-Tribromophenol | 84 | | 30-130 |
| 4-Terphenyl-d14 | 64 | | 30-130 |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-02
Client ID: FILL COMP
Sample Location: SHREWSBURY

Date Collected: 08/15/18 06:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 97,8270D
Analytical Date: 08/27/18 13:35
Analyst: JG
Percent Solids: 90%

Extraction Method: EPA 3546
Extraction Date: 08/26/18 05:31

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor |
|---|---|---|---|---|---|---|
| **MCP Semivolatile Organics - Westborough Lab** | | | | | | |
| Acenaphthene | ND | | ug/kg | 140 | -- | 1 |
| 1,2,4-Trichlorobenzene | ND | | ug/kg | 180 | -- | 1 |
| Hexachlorobenzene | ND | | ug/kg | 110 | -- | 1 |
| Bis(2-chloroethyl)ether | ND | | ug/kg | 160 | -- | 1 |
| 2-Chloronaphthalene | ND | | ug/kg | 180 | -- | 1 |
| 1,2-Dichlorobenzene | ND | | ug/kg | 180 | -- | 1 |
| 1,3-Dichlorobenzene | ND | | ug/kg | 180 | -- | 1 |
| 1,4-Dichlorobenzene | ND | | ug/kg | 180 | -- | 1 |
| 3,3'-Dichlorobenzidine | ND | | ug/kg | 180 | -- | 1 |
| 2,4-Dinitrotoluene | ND | | ug/kg | 180 | -- | 1 |
| 2,6-Dinitrotoluene | ND | | ug/kg | 180 | -- | 1 |
| Azobenzene | ND | | ug/kg | 180 | -- | 1 |
| Fluoranthene | ND | | ug/kg | 110 | -- | 1 |
| 4-Bromophenyl phenyl ether | ND | | ug/kg | 180 | -- | 1 |
| Bis(2-chloroisopropyl)ether | ND | | ug/kg | 220 | -- | 1 |
| Bis(2-chloroethoxy)methane | ND | | ug/kg | 200 | -- | 1 |
| Hexachlorobutadiene | ND | | ug/kg | 180 | -- | 1 |
| Hexachloroethane | ND | | ug/kg | 140 | -- | 1 |
| Isophorone | ND | | ug/kg | 160 | -- | 1 |
| Naphthalene | ND | | ug/kg | 180 | -- | 1 |
| Nitrobenzene | ND | | ug/kg | 160 | -- | 1 |
| Bis(2-ethylhexyl)phthalate | ND | | ug/kg | 180 | -- | 1 |
| Butyl benzyl phthalate | ND | | ug/kg | 180 | -- | 1 |
| Di-n-butylphthalate | ND | | ug/kg | 180 | -- | 1 |
| Di-n-octylphthalate | ND | | ug/kg | 180 | -- | 1 |
| Diethyl phthalate | ND | | ug/kg | 180 | -- | 1 |
| Dimethyl phthalate | ND | | ug/kg | 180 | -- | 1 |
| Benzo(a)anthracene | ND | | ug/kg | 110 | -- | 1 |

**Project Name:** UEC GLAVIN **Lab Number:** L1832649

**Project Number:** 2629 **Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-02 Date Collected: 08/15/18 06:15

Client ID: FILL COMP Date Received: 08/20/18

Sample Location: SHREWSBURY Field Prep: Not Specified

Sample Depth:

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor |
|---|---|---|---|---|---|---|
| MCP Semivolatile Organics - Westborough Lab | | | | | | |
| Benzo(a)pyrene | ND | | ug/kg | 140 | -- | 1 |
| Benzo(b)fluoranthene | ND | | ug/kg | 110 | -- | 1 |
| Benzo(k)fluoranthene | ND | | ug/kg | 110 | -- | 1 |
| Chrysene | ND | | ug/kg | 110 | -- | 1 |
| Acenaphthylene | ND | | ug/kg | 140 | -- | 1 |
| Anthracene | ND | | ug/kg | 110 | -- | 1 |
| Benzo(ghi)perylene | ND | | ug/kg | 140 | -- | 1 |
| Fluorene | ND | | ug/kg | 180 | -- | 1 |
| Phenanthrene | ND | | ug/kg | 110 | -- | 1 |
| Dibenzo(a,h)anthracene | ND | | ug/kg | 110 | -- | 1 |
| Indeno(1,2,3-cd)pyrene | ND | | ug/kg | 140 | -- | 1 |
| Pyrene | ND | | ug/kg | 110 | -- | 1 |
| Aniline | ND | | ug/kg | 220 | -- | 1 |
| 4-Chloroaniline | ND | | ug/kg | 180 | -- | 1 |
| Dibenzofuran | ND | | ug/kg | 180 | -- | 1 |
| 2-Methylnaphthalene | ND | | ug/kg | 220 | -- | 1 |
| Acetophenone | ND | | ug/kg | 180 | -- | 1 |
| 2,4,6-Trichlorophenol | ND | | ug/kg | 110 | -- | 1 |
| 2-Chlorophenol | ND | | ug/kg | 180 | -- | 1 |
| 2,4-Dichlorophenol | ND | | ug/kg | 160 | -- | 1 |
| 2,4-Dimethylphenol | ND | | ug/kg | 180 | -- | 1 |
| 2-Nitrophenol | ND | | ug/kg | 390 | -- | 1 |
| 4-Nitrophenol | ND | | ug/kg | 250 | -- | 1 |
| 2,4-Dinitrophenol | ND | | ug/kg | 870 | -- | 1 |
| Pentachlorophenol | ND | | ug/kg | 360 | -- | 1 |
| Phenol | ND | | ug/kg | 180 | -- | 1 |
| 2-Methylphenol | ND | | ug/kg | 180 | -- | 1 |
| 3-Methylphenol/4-Methylphenol | ND | | ug/kg | 260 | -- | 1 |
| 2,4,5-Trichlorophenol | ND | | ug/kg | 180 | -- | 1 |

**Project Name:** UEC GLAVIN **Lab Number:** L1832649

**Project Number:** 2629 **Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-02 Date Collected: 08/15/18 06:15

Client ID: FILL COMP Date Received: 08/20/18

Sample Location: SHREWSBURY Field Prep: Not Specified

Sample Depth:

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor |
|---|---|---|---|---|---|---|
| MCP Semivolatile Organics - Westborough Lab | | | | | | |

| Surrogate | % Recovery | Qualifier | Acceptance Criteria |
|---|---|---|---|
| 2-Fluorophenol | 86 | | 30-130 |
| Phenol-d6 | 90 | | 30-130 |
| Nitrobenzene-d5 | 90 | | 30-130 |
| 2-Fluorobiphenyl | 82 | | 30-130 |
| 2,4,6-Tribromophenol | 92 | | 30-130 |
| 4-Terphenyl-d14 | 85 | | 30-130 |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

# Method Blank Analysis
## Batch Quality Control

Analytical Method: 97,8270D
Analytical Date: 08/27/18 12:19
Analyst: JG

Extraction Method: EPA 3546
Extraction Date: 08/26/18 05:31

| Parameter | Result | Qualifier | Units | RL | MDL |
|---|---|---|---|---|---|
| MCP Semivolatile Organics - Westborough Lab for sample(s): 01-02 Batch: WG1150711-1 | | | | | |
| Acenaphthene | ND | | ug/kg | 130 | -- |
| 1,2,4-Trichlorobenzene | ND | | ug/kg | 160 | -- |
| Hexachlorobenzene | ND | | ug/kg | 97 | -- |
| Bis(2-chloroethyl)ether | ND | | ug/kg | 150 | -- |
| 2-Chloronaphthalene | ND | | ug/kg | 160 | -- |
| 1,2-Dichlorobenzene | ND | | ug/kg | 160 | -- |
| 1,3-Dichlorobenzene | ND | | ug/kg | 160 | -- |
| 1,4-Dichlorobenzene | ND | | ug/kg | 160 | -- |
| 3,3'-Dichlorobenzidine | ND | | ug/kg | 160 | -- |
| 2,4-Dinitrotoluene | ND | | ug/kg | 160 | -- |
| 2,6-Dinitrotoluene | ND | | ug/kg | 160 | -- |
| Azobenzene | ND | | ug/kg | 160 | -- |
| Fluoranthene | ND | | ug/kg | 97 | -- |
| 4-Bromophenyl phenyl ether | ND | | ug/kg | 160 | -- |
| Bis(2-chloroisopropyl)ether | ND | | ug/kg | 190 | -- |
| Bis(2-chloroethoxy)methane | ND | | ug/kg | 180 | -- |
| Hexachlorobutadiene | ND | | ug/kg | 160 | -- |
| Hexachloroethane | ND | | ug/kg | 130 | -- |
| Isophorone | ND | | ug/kg | 150 | -- |
| Naphthalene | ND | | ug/kg | 160 | -- |
| Nitrobenzene | ND | | ug/kg | 150 | -- |
| Bis(2-ethylhexyl)phthalate | ND | | ug/kg | 160 | -- |
| Butyl benzyl phthalate | ND | | ug/kg | 160 | -- |
| Di-n-butylphthalate | ND | | ug/kg | 160 | -- |
| Di-n-octylphthalate | ND | | ug/kg | 160 | -- |
| Diethyl phthalate | ND | | ug/kg | 160 | -- |
| Dimethyl phthalate | ND | | ug/kg | 160 | -- |
| Benzo(a)anthracene | ND | | ug/kg | 97 | -- |
| Benzo(a)pyrene | ND | | ug/kg | 130 | -- |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

# Method Blank Analysis
## Batch Quality Control

Analytical Method: 97,8270D
Analytical Date: 08/27/18 12:19
Analyst: JG

Extraction Method: EPA 3546
Extraction Date: 08/26/18 05:31

| Parameter | Result | Qualifier | Units | RL | MDL |
|---|---|---|---|---|---|
| MCP Semivolatile Organics - Westborough Lab for sample(s): 01-02 Batch: WG1150711-1 | | | | | |
| Benzo(b)fluoranthene | ND | | ug/kg | 97 | -- |
| Benzo(k)fluoranthene | ND | | ug/kg | 97 | -- |
| Chrysene | ND | | ug/kg | 97 | -- |
| Acenaphthylene | ND | | ug/kg | 130 | -- |
| Anthracene | ND | | ug/kg | 97 | -- |
| Benzo(ghi)perylene | ND | | ug/kg | 130 | -- |
| Fluorene | ND | | ug/kg | 160 | -- |
| Phenanthrene | ND | | ug/kg | 97 | -- |
| Dibenzo(a,h)anthracene | ND | | ug/kg | 97 | -- |
| Indeno(1,2,3-cd)pyrene | ND | | ug/kg | 130 | -- |
| Pyrene | ND | | ug/kg | 97 | -- |
| Aniline | ND | | ug/kg | 190 | -- |
| 4-Chloroaniline | ND | | ug/kg | 160 | -- |
| Dibenzofuran | ND | | ug/kg | 160 | -- |
| 2-Methylnaphthalene | ND | | ug/kg | 190 | -- |
| Acetophenone | ND | | ug/kg | 160 | -- |
| 2,4,6-Trichlorophenol | ND | | ug/kg | 97 | -- |
| 2-Chlorophenol | ND | | ug/kg | 160 | -- |
| 2,4-Dichlorophenol | ND | | ug/kg | 150 | -- |
| 2,4-Dimethylphenol | ND | | ug/kg | 160 | -- |
| 2-Nitrophenol | ND | | ug/kg | 350 | -- |
| 4-Nitrophenol | ND | | ug/kg | 230 | -- |
| 2,4-Dinitrophenol | ND | | ug/kg | 780 | -- |
| Pentachlorophenol | ND | | ug/kg | 320 | -- |
| Phenol | ND | | ug/kg | 160 | -- |
| 2-Methylphenol | ND | | ug/kg | 160 | -- |
| 3-Methylphenol/4-Methylphenol | ND | | ug/kg | 230 | -- |
| 2,4,5-Trichlorophenol | ND | | ug/kg | 160 | -- |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

# Method Blank Analysis
## Batch Quality Control

Analytical Method: 97,8270D
Analytical Date: 08/27/18 12:19
Analyst: JG

Extraction Method: EPA 3546
Extraction Date: 08/26/18 05:31

| Parameter | Result | Qualifier | Units | RL | MDL |
|---|---|---|---|---|---|
| MCP Semivolatile Organics - Westborough Lab for sample(s): 01-02 Batch: WG1150711-1 | | | | | |
| Tentatively Identified Compounds | | | | | |
| No Tentatively Identified Compounds | ND | | ug/kg | | |

| Surrogate | %Recovery | Qualifier | Acceptance Criteria |
|---|---|---|---|
| 2-Fluorophenol | 89 | | 30-130 |
| Phenol-d6 | 94 | | 30-130 |
| Nitrobenzene-d5 | 93 | | 30-130 |
| 2-Fluorobiphenyl | 86 | | 30-130 |
| 2,4,6-Tribromophenol | 89 | | 30-130 |
| 4-Terphenyl-d14 | 86 | | 30-130 |

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| MCP Semivolatile Organics - Westborough Lab Associated sample(s): 01-02 Batch: WG1150711-2 WG1150711-3 | | | | | | | | |
| Acenaphthene | 86 | | 82 | | 40-140 | 5 | | 30 |
| 1,2,4-Trichlorobenzene | 81 | | 75 | | 40-140 | 8 | | 30 |
| Hexachlorobenzene | 88 | | 87 | | 40-140 | 1 | | 30 |
| Bis(2-chloroethyl)ether | 88 | | 83 | | 40-140 | 6 | | 30 |
| 2-Chloronaphthalene | 89 | | 87 | | 40-140 | 2 | | 30 |
| 1,2-Dichlorobenzene | 82 | | 74 | | 40-140 | 10 | | 30 |
| 1,3-Dichlorobenzene | 80 | | 75 | | 40-140 | 6 | | 30 |
| 1,4-Dichlorobenzene | 81 | | 74 | | 40-140 | 9 | | 30 |
| 3,3'-Dichlorobenzidine | 60 | | 63 | | 40-140 | 5 | | 30 |
| 2,4-Dinitrotoluene | 91 | | 91 | | 40-140 | 0 | | 30 |
| 2,6-Dinitrotoluene | 93 | | 92 | | 40-140 | 1 | | 30 |
| Azobenzene | 99 | | 97 | | 40-140 | 2 | | 30 |
| Fluoranthene | 87 | | 88 | | 40-140 | 1 | | 30 |
| 4-Bromophenyl phenyl ether | 84 | | 85 | | 40-140 | 1 | | 30 |
| Bis(2-chloroisopropyl)ether | 101 | | 92 | | 40-140 | 9 | | 30 |
| Bis(2-chloroethoxy)methane | 92 | | 90 | | 40-140 | 2 | | 30 |
| Hexachlorobutadiene | 85 | | 78 | | 40-140 | 9 | | 30 |
| Hexachloroethane | 89 | | 82 | | 40-140 | 8 | | 30 |
| Isophorone | 96 | | 92 | | 40-140 | 4 | | 30 |
| Naphthalene | 84 | | 80 | | 40-140 | 5 | | 30 |
| Nitrobenzene | 92 | | 85 | | 40-140 | 8 | | 30 |
| Bis(2-ethylhexyl)phthalate | 102 | | 104 | | 40-140 | 2 | | 30 |
| Butyl benzyl phthalate | 98 | | 99 | | 40-140 | 1 | | 30 |

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| MCP Semivolatile Organics - Westborough Lab Associated sample(s): 01-02 Batch: WG1150711-2 WG1150711-3 | | | | | | | | |
| Di-n-butylphthalate | 96 | | 96 | | 40-140 | 0 | | 30 |
| Di-n-octylphthalate | 103 | | 105 | | 40-140 | 2 | | 30 |
| Diethyl phthalate | 92 | | 93 | | 40-140 | 1 | | 30 |
| Dimethyl phthalate | 91 | | 91 | | 40-140 | 0 | | 30 |
| Benzo(a)anthracene | 84 | | 87 | | 40-140 | 4 | | 30 |
| Benzo(a)pyrene | 90 | | 91 | | 40-140 | 1 | | 30 |
| Benzo(b)fluoranthene | 89 | | 90 | | 40-140 | 1 | | 30 |
| Benzo(k)fluoranthene | 86 | | 87 | | 40-140 | 1 | | 30 |
| Chrysene | 88 | | 90 | | 40-140 | 2 | | 30 |
| Acenaphthylene | 87 | | 88 | | 40-140 | 1 | | 30 |
| Anthracene | 90 | | 89 | | 40-140 | 1 | | 30 |
| Benzo(ghi)perylene | 89 | | 88 | | 40-140 | 1 | | 30 |
| Fluorene | 88 | | 88 | | 40-140 | 0 | | 30 |
| Phenanthrene | 86 | | 87 | | 40-140 | 1 | | 30 |
| Dibenzo(a,h)anthracene | 87 | | 88 | | 40-140 | 1 | | 30 |
| Indeno(1,2,3-cd)pyrene | 90 | | 88 | | 40-140 | 2 | | 30 |
| Pyrene | 86 | | 87 | | 40-140 | 1 | | 30 |
| Aniline | 63 | | 61 | | 40-140 | 3 | | 30 |
| 4-Chloroaniline | 83 | | 87 | | 40-140 | 5 | | 30 |
| Dibenzofuran | 85 | | 83 | | 40-140 | 2 | | 30 |
| 2-Methylnaphthalene | 86 | | 82 | | 40-140 | 5 | | 30 |
| Acetophenone | 95 | | 88 | | 40-140 | 8 | | 30 |
| 2,4,6-Trichlorophenol | 91 | | 90 | | 30-130 | 1 | | 30 |

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| MCP Semivolatile Organics - Westborough Lab Associated sample(s): 01-02 Batch: WG1150711-2 WG1150711-3 | | | | | | | | |
| 2-Chlorophenol | 87 | | 84 | | 30-130 | 4 | | 30 |
| 2,4-Dichlorophenol | 90 | | 90 | | 30-130 | 0 | | 30 |
| 2,4-Dimethylphenol | 97 | | 96 | | 30-130 | 1 | | 30 |
| 2-Nitrophenol | 89 | | 83 | | 30-130 | 7 | | 30 |
| 4-Nitrophenol | 109 | | 108 | | 30-130 | 1 | | 30 |
| 2,4-Dinitrophenol | 78 | | 78 | | 30-130 | 0 | | 30 |
| Pentachlorophenol | 88 | | 82 | | 30-130 | 7 | | 30 |
| Phenol | 90 | | 84 | | 30-130 | 7 | | 30 |
| 2-Methylphenol | 92 | | 91 | | 30-130 | 1 | | 30 |
| 3-Methylphenol/4-Methylphenol | 96 | | 93 | | 30-130 | 3 | | 30 |
| 2,4,5-Trichlorophenol | 92 | | 90 | | 30-130 | 2 | | 30 |

| Surrogate | LCS %Recovery | Qual | LCSD %Recovery | Qual | Acceptance Criteria |
|---|---|---|---|---|---|
| 2-Fluorophenol | 87 | | 83 | | 30-130 |
| Phenol-d6 | 93 | | 88 | | 30-130 |
| Nitrobenzene-d5 | 92 | | 87 | | 30-130 |
| 2-Fluorobiphenyl | 82 | | 82 | | 30-130 |
| 2,4,6-Tribromophenol | 90 | | 87 | | 30-130 |
| 4-Terphenyl-d14 | 83 | | 82 | | 30-130 |

# PETROLEUM HYDROCARBONS

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-01
Client ID: TOPSOIL COMP
Sample Location: SHREWSBURY

Date Collected: 08/15/18 06:00
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 1,8015D(M)
Analytical Date: 08/27/18 19:14
Analyst: SC
Percent Solids: 83%

Extraction Method: EPA 3546
Extraction Date: 08/26/18 01:41

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor |
|---|---|---|---|---|---|---|
| Petroleum Hydrocarbon Quantitation - Westborough Lab | | | | | | |
| TPH | 70100 | | ug/kg | 39400 | -- | 1 |

| Surrogate | % Recovery | Qualifier | Acceptance Criteria |
|---|---|---|---|
| o-Terphenyl | 76 | | 40-140 |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-02
Client ID: FILL COMP
Sample Location: SHREWSBURY

Date Collected: 08/15/18 06:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 1,8015D(M)
Analytical Date: 08/27/18 12:39
Analyst: SC
Percent Solids: 90%

Extraction Method: EPA 3546
Extraction Date: 08/26/18 01:41

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor |
|---|---|---|---|---|---|---|
| Petroleum Hydrocarbon Quantitation - Westborough Lab | | | | | | |
| TPH | ND | | ug/kg | 36600 | -- | 1 |

| Surrogate | % Recovery | Qualifier | Acceptance Criteria |
|---|---|---|---|
| o-Terphenyl | 71 | | 40-140 |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

# Method Blank Analysis
## Batch Quality Control

Analytical Method: 1,8015D(M)
Analytical Date: 08/27/18 12:06
Analyst: SC

Extraction Method: EPA 3546
Extraction Date: 08/26/18 01:41

| Parameter | Result | Qualifier | Units | RL | MDL |
|---|---|---|---|---|---|
| Petroleum Hydrocarbon Quantitation - Westborough Lab for sample(s): 01-02 Batch: WG1150702-1 | | | | | |
| TPH | ND | | ug/kg | 32600 | -- |

| Surrogate | %Recovery | Qualifier | Acceptance Criteria |
|---|---|---|---|
| o-Terphenyl | 76 | | 40-140 |

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Petroleum Hydrocarbon Quantitation - Westborough Lab Associated sample(s): 01-02 Batch: WG1150702-2 | | | | | | | | |
| TPH | 95 | | - | | 40-140 | - | | 40 |

| Surrogate | LCS %Recovery | Qual | LCSD %Recovery | Qual | Acceptance Criteria |
|---|---|---|---|---|---|
| o-Terphenyl | 72 | | | | 40-140 |

# Lab Duplicate Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | Native Sample | Duplicate Sample | Units | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|
| Petroleum Hydrocarbon Quantitation - Westborough Lab Associated sample(s): 01-02 QC Batch ID: WG1150702-3 QC Sample: L1832649-01 Client ID: TOPSOIL COMP | | | | | | |
| TPH | 70100 | 69600 | ug/kg | 1 | | 40 |

| Surrogate | %Recovery | Qualifier | %Recovery | Qualifier | Acceptance Criteria |
|---|---|---|---|---|---|
| o-Terphenyl | 76 | | 67 | | 40-140 |

# PCBS

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-01
Client ID: TOPSOIL COMP
Sample Location: SHREWSBURY

Date Collected: 08/15/18 06:00
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Analytical Method: 97,8082A
Analytical Date: 08/28/18 15:59
Analyst: AWS
Percent Solids: 83%

Extraction Method: EPA 3546
Extraction Date: 08/26/18 02:37
Cleanup Method: EPA 3665A
Cleanup Date: 08/27/18
Cleanup Method: EPA 3660B
Cleanup Date: 08/27/18

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Column |
|---|---|---|---|---|---|---|---|
| MCP Polychlorinated Biphenyls - Westborough Lab | | | | | | | |
| Aroclor 1016 | ND | | ug/kg | 39.6 | -- | 1 | A |
| Aroclor 1221 | ND | | ug/kg | 39.6 | -- | 1 | A |
| Aroclor 1232 | ND | | ug/kg | 39.6 | -- | 1 | A |
| Aroclor 1242 | ND | | ug/kg | 39.6 | -- | 1 | A |
| Aroclor 1248 | ND | | ug/kg | 39.6 | -- | 1 | A |
| Aroclor 1254 | ND | | ug/kg | 39.6 | -- | 1 | B |
| Aroclor 1260 | ND | | ug/kg | 39.6 | -- | 1 | A |
| Aroclor 1262 | ND | | ug/kg | 39.6 | -- | 1 | A |
| Aroclor 1268 | ND | | ug/kg | 39.6 | -- | 1 | A |
| PCBs, Total | ND | | ug/kg | 39.6 | -- | 1 | B |

| Surrogate | % Recovery | Qualifier | Acceptance Criteria | Column |
|---|---|---|---|---|
| 2,4,5,6-Tetrachloro-m-xylene | 62 | | 30-150 | B |
| Decachlorobiphenyl | 58 | | 30-150 | B |
| 2,4,5,6-Tetrachloro-m-xylene | 59 | | 30-150 | A |
| Decachlorobiphenyl | 51 | | 30-150 | A |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-02
Client ID: FILL COMP
Sample Location: SHREWSBURY

Sample Depth:
Matrix: Soil
Analytical Method: 97,8082A
Analytical Date: 08/28/18 16:12
Analyst: AWS
Percent Solids: 90%

Date Collected: 08/15/18 06:15
Date Received: 08/20/18
Field Prep: Not Specified

Extraction Method: EPA 3546
Extraction Date: 08/26/18 02:37
Cleanup Method: EPA 3665A
Cleanup Date: 08/27/18
Cleanup Method: EPA 3660B
Cleanup Date: 08/27/18

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Column |
|---|---|---|---|---|---|---|---|
| MCP Polychlorinated Biphenyls - Westborough Lab | | | | | | | |
| Aroclor 1016 | ND | | ug/kg | 36.2 | -- | 1 | A |
| Aroclor 1221 | ND | | ug/kg | 36.2 | -- | 1 | A |
| Aroclor 1232 | ND | | ug/kg | 36.2 | -- | 1 | A |
| Aroclor 1242 | ND | | ug/kg | 36.2 | -- | 1 | A |
| Aroclor 1248 | ND | | ug/kg | 36.2 | -- | 1 | A |
| Aroclor 1254 | ND | | ug/kg | 36.2 | -- | 1 | B |
| Aroclor 1260 | ND | | ug/kg | 36.2 | -- | 1 | A |
| Aroclor 1262 | ND | | ug/kg | 36.2 | -- | 1 | A |
| Aroclor 1268 | ND | | ug/kg | 36.2 | -- | 1 | A |
| PCBs, Total | ND | | ug/kg | 36.2 | -- | 1 | B |

| Surrogate | % Recovery | Qualifier | Acceptance Criteria | Column |
|---|---|---|---|---|
| 2,4,5,6-Tetrachloro-m-xylene | 80 | | 30-150 | B |
| Decachlorobiphenyl | 70 | | 30-150 | B |
| 2,4,5,6-Tetrachloro-m-xylene | 74 | | 30-150 | A |
| Decachlorobiphenyl | 66 | | 30-150 | A |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

# Method Blank Analysis
## Batch Quality Control

Analytical Method: 97,8082A
Analytical Date: 08/28/18 18:22
Analyst: AWS

Extraction Method: EPA 3546
Extraction Date: 08/26/18 02:37
Cleanup Method: EPA 3665A
Cleanup Date: 08/27/18
Cleanup Method: EPA 3660B
Cleanup Date: 08/27/18

| Parameter | Result | Qualifier | Units | RL | MDL | Column |
|---|---|---|---|---|---|---|
| MCP Polychlorinated Biphenyls - Westborough Lab for sample(s): 01-02 Batch: WG1150708-1 | | | | | | |
| Aroclor 1016 | ND | | ug/kg | 31.5 | -- | A |
| Aroclor 1221 | ND | | ug/kg | 31.5 | -- | A |
| Aroclor 1232 | ND | | ug/kg | 31.5 | -- | A |
| Aroclor 1242 | ND | | ug/kg | 31.5 | -- | A |
| Aroclor 1248 | ND | | ug/kg | 31.5 | -- | A |
| Aroclor 1254 | ND | | ug/kg | 31.5 | -- | A |
| Aroclor 1260 | ND | | ug/kg | 31.5 | -- | A |
| Aroclor 1262 | ND | | ug/kg | 31.5 | -- | A |
| Aroclor 1268 | ND | | ug/kg | 31.5 | -- | A |
| PCBs, Total | ND | | ug/kg | 31.5 | -- | A |

| Surrogate | %Recovery | Qualifier | Acceptance Criteria | Column |
|---|---|---|---|---|
| 2,4,5,6-Tetrachloro-m-xylene | 79 | | 30-150 | B |
| Decachlorobiphenyl | 67 | | 30-150 | B |
| 2,4,5,6-Tetrachloro-m-xylene | 74 | | 30-150 | A |
| Decachlorobiphenyl | 60 | | 30-150 | A |

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits | Column |
|---|---|---|---|---|---|---|---|---|---|
| MCP Polychlorinated Biphenyls - Westborough Lab Associated sample(s): 01-02 Batch: WG1150708-2 WG1150708-3 | | | | | | | | | |
| Aroclor 1016 | 73 | | 76 | | 40-140 | 4 | | 30 | A |
| Aroclor 1260 | 64 | | 68 | | 40-140 | 6 | | 30 | A |

| Surrogate | LCS %Recovery | Qual | LCSD %Recovery | Qual | Acceptance Criteria | Column |
|---|---|---|---|---|---|---|
| 2,4,5,6-Tetrachloro-m-xylene | 76 | | 79 | | 30-150 | B |
| Decachlorobiphenyl | 67 | | 70 | | 30-150 | B |
| 2,4,5,6-Tetrachloro-m-xylene | 72 | | 76 | | 30-150 | A |
| Decachlorobiphenyl | 66 | | 69 | | 30-150 | A |

# METALS

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-01
Client ID: TOPSOIL COMP
Sample Location: SHREWSBURY
Date Collected: 08/15/18 06:00
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 83%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Antimony, Total | ND | | mg/kg | 2.35 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:39 | EPA 3050B | 97,6010D | AB |
| Arsenic, Total | 21.7 | | mg/kg | 0.471 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:39 | EPA 3050B | 97,6010D | AB |
| Barium, Total | 34.9 | | mg/kg | 0.471 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:39 | EPA 3050B | 97,6010D | AB |
| Beryllium, Total | 0.386 | | mg/kg | 0.235 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:39 | EPA 3050B | 97,6010D | AB |
| Cadmium, Total | ND | | mg/kg | 0.471 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:39 | EPA 3050B | 97,6010D | AB |
| Chromium, Total | 16.4 | | mg/kg | 0.471 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:39 | EPA 3050B | 97,6010D | AB |
| Lead, Total | 19.4 | | mg/kg | 2.35 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:39 | EPA 3050B | 97,6010D | AB |
| Mercury, Total | ND | | mg/kg | 0.076 | -- | 1 | 08/22/18 08:00 | 08/23/18 00:27 | EPA 7471B | 97,7471B | EA |
| Nickel, Total | 14.0 | | mg/kg | 1.18 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:39 | EPA 3050B | 97,6010D | AB |
| Selenium, Total | ND | | mg/kg | 2.35 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:39 | EPA 3050B | 97,6010D | AB |
| Silver, Total | ND | | mg/kg | 0.471 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:39 | EPA 3050B | 97,6010D | AB |
| Thallium, Total | ND | | mg/kg | 2.35 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:39 | EPA 3050B | 97,6010D | AB |
| Vanadium, Total | 18.6 | | mg/kg | 0.471 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:39 | EPA 3050B | 97,6010D | AB |
| Zinc, Total | 35.5 | | mg/kg | 2.35 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:39 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-02
Client ID: FILL COMP
Sample Location: SHREWSBURY
Date Collected: 08/15/18 06:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil
Percent Solids: 90%

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **MCP Total Metals - Mansfield Lab** | | | | | | | | | | | |
| Antimony, Total | ND | | mg/kg | 2.13 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:44 | EPA 3050B | 97,6010D | AB |
| Arsenic, Total | 28.4 | | mg/kg | 0.426 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:44 | EPA 3050B | 97,6010D | AB |
| Barium, Total | 41.9 | | mg/kg | 0.426 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:44 | EPA 3050B | 97,6010D | AB |
| Beryllium, Total | 0.404 | | mg/kg | 0.213 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:44 | EPA 3050B | 97,6010D | AB |
| Cadmium, Total | ND | | mg/kg | 0.426 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:44 | EPA 3050B | 97,6010D | AB |
| Chromium, Total | 19.4 | | mg/kg | 0.426 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:44 | EPA 3050B | 97,6010D | AB |
| Lead, Total | 6.86 | | mg/kg | 2.13 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:44 | EPA 3050B | 97,6010D | AB |
| Mercury, Total | ND | | mg/kg | 0.069 | -- | 1 | 08/22/18 08:00 | 08/23/18 00:29 | EPA 7471B | 97,7471B | EA |
| Nickel, Total | 17.0 | | mg/kg | 1.06 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:44 | EPA 3050B | 97,6010D | AB |
| Selenium, Total | ND | | mg/kg | 2.13 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:44 | EPA 3050B | 97,6010D | AB |
| Silver, Total | ND | | mg/kg | 0.426 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:44 | EPA 3050B | 97,6010D | AB |
| Thallium, Total | ND | | mg/kg | 2.13 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:44 | EPA 3050B | 97,6010D | AB |
| Vanadium, Total | 21.8 | | mg/kg | 0.426 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:44 | EPA 3050B | 97,6010D | AB |
| Zinc, Total | 33.0 | | mg/kg | 2.13 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:44 | EPA 3050B | 97,6010D | AB |

**Project Name:** UEC GLAVIN
**Project Number:** 2629
**Lab Number:** L1832649
**Report Date:** 08/30/18

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| MCP Total Metals - Mansfield Lab for sample(s): 01-02 Batch: WG1149117-1 | | | | | | | | | | |
| Mercury, Total | ND | | mg/kg | 0.083 | -- | 1 | 08/22/18 08:00 | 08/22/18 23:11 | 97,7471B | EA |

**Prep Information**

Digestion Method: EPA 7471B

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| MCP Total Metals - Mansfield Lab for sample(s): 01-02 Batch: WG1151757-1 | | | | | | | | | | |
| Antimony, Total | ND | | mg/kg | 2.00 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:27 | 97,6010D | AB |
| Arsenic, Total | ND | | mg/kg | 0.400 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:27 | 97,6010D | AB |
| Barium, Total | ND | | mg/kg | 0.400 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:27 | 97,6010D | AB |
| Beryllium, Total | ND | | mg/kg | 0.200 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:27 | 97,6010D | AB |
| Cadmium, Total | ND | | mg/kg | 0.400 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:27 | 97,6010D | AB |
| Chromium, Total | ND | | mg/kg | 0.400 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:27 | 97,6010D | AB |
| Lead, Total | ND | | mg/kg | 2.00 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:27 | 97,6010D | AB |
| Nickel, Total | ND | | mg/kg | 1.00 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:27 | 97,6010D | AB |
| Selenium, Total | ND | | mg/kg | 2.00 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:27 | 97,6010D | AB |
| Silver, Total | ND | | mg/kg | 0.400 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:27 | 97,6010D | AB |
| Thallium, Total | ND | | mg/kg | 2.00 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:27 | 97,6010D | AB |
| Vanadium, Total | ND | | mg/kg | 0.400 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:27 | 97,6010D | AB |
| Zinc, Total | ND | | mg/kg | 2.00 | -- | 1 | 08/29/18 13:10 | 08/29/18 17:27 | 97,6010D | AB |

**Prep Information**

Digestion Method: EPA 3050B

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| MCP Total Metals - Mansfield Lab Associated sample(s): 01-02 Batch: WG1149117-2 WG1149117-3 SRM Lot Number: D102-540 | | | | | | | | |
| Mercury, Total | 115 | | 116 | | 65-134 | 1 | | 30 |
| MCP Total Metals - Mansfield Lab Associated sample(s): 01-02 Batch: WG1151757-2 WG1151757-3 SRM Lot Number: D102-540 | | | | | | | | |
| Antimony, Total | 157 | | 156 | | 1-199 | 1 | | 30 |
| Arsenic, Total | 92 | | 92 | | 83-117 | 0 | | 30 |
| Barium, Total | 87 | | 86 | | 83-118 | 1 | | 30 |
| Beryllium, Total | 92 | | 88 | | 83-116 | 4 | | 30 |
| Cadmium, Total | 94 | | 85 | | 83-118 | 10 | | 30 |
| Chromium, Total | 87 | | 88 | | 83-117 | 1 | | 30 |
| Lead, Total | 88 | | 89 | | 82-118 | 1 | | 30 |
| Nickel, Total | 89 | | 88 | | 83-117 | 1 | | 30 |
| Selenium, Total | 94 | | 92 | | 79-121 | 2 | | 30 |
| Silver, Total | 91 | | 94 | | 80-120 | 3 | | 30 |
| Thallium, Total | 88 | | 85 | | 81-119 | 3 | | 30 |
| Vanadium, Total | 86 | | 86 | | 80-120 | 0 | | 30 |
| Zinc, Total | 89 | | 90 | | 81-118 | 1 | | 30 |

# INORGANICS
# &
# MISCELLANEOUS

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-01
Client ID: TOPSOIL COMP
Sample Location: SHREWSBURY

Date Collected: 08/15/18 06:00
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| **General Chemistry - Westborough Lab** | | | | | | | | | | |
| Specific Conductance @ 25 C | 38 | | umhos/cm | 10 | -- | 1 | - | 08/21/18 02:16 | 1,9050A | UN |
| Solids, Total | 82.9 | | % | 0.100 | NA | 1 | - | 08/21/18 13:49 | 121,2540G | RI |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

## SAMPLE RESULTS

Lab ID: L1832649-02
Client ID: FILL COMP
Sample Location: SHREWSBURY

Date Collected: 08/15/18 06:15
Date Received: 08/20/18
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| **General Chemistry - Westborough Lab** | | | | | | | | | | |
| Specific Conductance @ 25 C | 23 | | umhos/cm | 10 | -- | 1 | - | 08/21/18 02:16 | 1,9050A | UN |
| Solids, Total | 90.3 | | % | 0.100 | NA | 1 | - | 08/21/18 13:49 | 121,2540G | RI |

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| General Chemistry - Westborough Lab Associated sample(s): 01-02 Batch: WG1148640-1 | | | | | | | | |
| Specific Conductance | 100 | | - | | 99-101 | - | | |

**Project Name:** UEC GLAVIN
**Project Number:** 2629

**Lab Number:** L1832649
**Report Date:** 08/30/18

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L1832649-01A | Vial MeOH preserved | A | NA | | 3.9 | Y | Absent | | MCP-8260H-10(14) |
| L1832649-01B | Vial MeOH preserved | A | NA | | 3.9 | Y | Absent | | MCP-8260H-10(14) |
| L1832649-01C | Glass 60ml unpreserved split | A | NA | | 3.9 | Y | Absent | | MCP-CR-6010T-10(180),MCP-AS-6010T-10(180),MCP-7471T-10(28),MCP-CD-6010T-10(180),MCP-TL-6010T-10(180),MCP-AG-6010T-10(180),MCP-SB-6010T-10(180),MCP-ZN-6010T-10(180),MCP-BE-6010T-10(180),MCP-SE-6010T-10(180),MCP-BA-6010T-10(180),MCP-V-6010T-10(180),MCP-NI-6010T-10(180),MCP-PB-6010T-10(180) |
| L1832649-01D | Glass 250ml/8oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-8082-10(365),MCP-8270-10(14),TS(7),TPH-DRO-D(14),COND-9050(28) |
| L1832649-01E | Glass 250ml/8oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-8082-10(365),MCP-8270-10(14),TS(7),TPH-DRO-D(14),COND-9050(28) |
| L1832649-02A | Vial MeOH preserved | A | NA | | 3.9 | Y | Absent | | MCP-8260H-10(14) |
| L1832649-02B | Vial MeOH preserved | A | NA | | 3.9 | Y | Absent | | MCP-8260H-10(14) |
| L1832649-02C | Glass 60ml unpreserved split | A | NA | | 3.9 | Y | Absent | | MCP-CR-6010T-10(180),MCP-AS-6010T-10(180),MCP-7471T-10(28),MCP-CD-6010T-10(180),MCP-TL-6010T-10(180),MCP-AG-6010T-10(180),MCP-SB-6010T-10(180),MCP-ZN-6010T-10(180),MCP-BE-6010T-10(180),MCP-SE-6010T-10(180),MCP-BA-6010T-10(180),MCP-V-6010T-10(180),MCP-NI-6010T-10(180),MCP-PB-6010T-10(180) |
| L1832649-02D | Glass 250ml/8oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-8082-10(365),MCP-8270-10(14),TS(7),TPH-DRO-D(14),COND-9050(28) |
| L1832649-02E | Glass 250ml/8oz unpreserved | A | NA | | 3.9 | Y | Absent | | MCP-8082-10(365),MCP-8270-10(14),TS(7),TPH-DRO-D(14),COND-9050(28) |

*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | UEC GLAVIN | **Lab Number:** | L1832649 |
| **Project Number:** | 2629 | **Report Date:** | 08/30/18 |

# GLOSSARY

### *Acronyms*

| | |
|---|---|
| EDL | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME). |
| EMPC | - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration. |
| EPA | - Environmental Protection Agency. |
| LCS | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LCSD | - Laboratory Control Sample Duplicate: Refer to LCS. |
| LFB | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| MDL | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| MS | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. |
| MSD | - Matrix Spike Sample Duplicate: Refer to MS. |
| NA | - Not Applicable. |
| NC | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit. |
| NDPA/DPA | - N-Nitrosodiphenylamine/Diphenylamine. |
| NI | - Not Ignitable. |
| NP | - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil. |
| RL | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| RPD | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples. |
| STLP | - Semi-dynamic Tank Leaching Procedure per EPA Method 1315. |
| TEF | - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD. |
| TEQ | - Toxic Equivalent: The measure of a sample¿s toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values. |
| TIC | - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations. |

### *Footnotes*

| | |
|---|---|
| 1 | - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method. |

### *Terms*

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

*Report Format:* Data Usability Report

| | | | |
|---|---|---|---|
| **Project Name:** | UEC GLAVIN | **Lab Number:** | L1832649 |
| **Project Number:** | 2629 | **Report Date:** | 08/30/18 |

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensation Product".

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**J** - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

**ND** - Not detected at the reporting limit (RL) for the sample.

*Report Format:* Data Usability Report

| | | | |
|---|---|---|---|
| **Project Name:** | UEC GLAVIN | **Lab Number:** | L1832649 |
| **Project Number:** | 2629 | **Report Date:** | 08/30/18 |

## REFERENCES


1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - IV, 2007.

97 EPA Test Methods (SW-846) with QC Requirements & Performance Standards for the Analysis of EPA SW-846 Methods under the Massachusetts Contingency Plan, WSC-CAM-IIA, IIB, IIIA, IIIB, IIIC, IIID, VA, VB, VC, VIA, VIB, VIIIA and VIIIB, July 2010.

121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.


## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624:** m/p-xylene, o-xylene
**EPA 8260C:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), Methyl methacrylate, 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270D:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**EPA 300:** DW: Bromide
**EPA 6860:** SCM: Perchlorate
**EPA 9010:** NPW and SCM: Amenable Cyanide Distillation
**SM4500**: NPW: Amenable Cyanide, Dissolved Oxygen; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS
**EPA 8082A:** NPW: PCB: 1, 5, 31, 87,101, 110, 141, 151, 153, 180, 183, 187.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B**
**EPA 332**: Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, EPA 351.1, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D.**
**EPA 624**: Volatile Halocarbons & Aromatics,
**EPA 608**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625**: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045**: PCB-Oil.
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Be, Cd, Cr, Cu, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb, As, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 8/20/18

ALPHA Job #: L1832649

ALPHA ANALYTICAL
8 Walkup Drive, Westboro, MA 01581, Tel: 508-898-9220
320 Forbes Blvd, Mansfield, MA 02048, Tel: 508-822-9300

**Client Information**

Client: Lord Associates

Address: Norwood

Phone:

Email: jpulicafico@lordenv.com

**Project Information**

Project Name: UEC Glavin

Project Location: Shrewsbury

Project #: 2629

Project Manager: Jon Pulicafico

ALPHA Quote #:

**Turn-Around Time**

☒ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due:

**Report Information - Data Deliverables**

☐ ADEx ☐ EMAIL

**Billing Information**

☐ Same as Client info PO #:

**Regulatory Requirements & Project Information Requirements**

☒ Yes ☐ No MA MCP Analytical Methods ☐ Yes ☐ No CT RCP Analytical Methods

☐ Yes ☐ No Matrix Spike Required on this SDG? (Required for MCP Inorganics)

☐ Yes ☐ No GW1 Standards (Info Required for Metals & EPH with Targets)

☐ Yes ☐ No NPDES RGP

☐ Other State /Fed Program _____ Criteria _____

Additional Project Information:

ANALYSIS: VOC: ☐ 8260 ☐ 624 ☐ 524.2; SVOC: ☐ ABN ☐ PAH; METALS: ☐ MCP 13 ☐ MCP 14 ☐ RCP 15; METALS: ☐ RCRA5 ☐ RCRA8 ☐ PP13; EPH: ☐ Ranges & Targets ☐ Ranges Only; VPH: ☐ Ranges & Targets ☐ Ranges Only; ☐ PCB ☐ PEST; TPH: ☐ Quant Only ☐ Fingerprint; Comp 97 + Extractable DEP 14 metals

SAMPLE INFO: Filtration ☐ Field ☐ Lab to do; Preservation ☐ Lab to do

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler Initials | Comp 97 + Extractable DEP 14 metals | Sample Comments | TOTAL # BOTTLES |
|---|---|---|---|---|---|---|---|---|
| 32649-01 | Topsoil Comp | 8/15/18 | 6:00 | S | JP | X | | 4 |
| 02 | Fill Comp | " | 6:15 | S | JP | X | | 4 |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Container Type | | | | | | | | | | | | A/V | | | | | |
| Preservative | | | | | | | | | | | | A/F | | | | | |

Container Type: P= Plastic, A= Amber glass, V= Vial, G= Glass, B= Bacteria cup, C= Cube, O= Other, E= Encore, D= BOD Bottle

Preservative: A= None, B= HCl, C= $HNO_3$, D= $H_2SO_4$, E= NaOH, F= MeOH, G= $NaHSO_4$, H= $Na_2S_2O_3$, I= Ascorbic Acid, J= $NH_4Cl$, K= Zn Acetate, O= Other

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| [illegible] | 8/15/18 6:30 | [illegible] AAL | 8/20/18 1310 |
| [illegible] | 8/20/18 1720 | [illegible] | 8/20 1720 |

All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 12-Mar-2012)

# Method Blank Summary
# Form 4
# VOLATILES

| | | | |
|---|---|---|---|
| **Client** | : Lord Associates, Inc. | **Lab Number** | : L1832649 |
| **Project Name** | : UEC GLAVIN | **Project Number** | : 2629 |
| **Lab Sample ID** | : WG1150852-5 | **Lab File ID** | : V00180825A05 |
| **Instrument ID** | : VOA100 | | |
| **Matrix** | : SOIL | **Analysis Date** | : 08/25/18 09:46 |

| Client Sample No. | Lab Sample ID | Analysis Date |
|---|---|---|
| WG1150852-3LCS | WG1150852-3 | 08/25/18 08:02 |
| WG1150852-4LCSD | WG1150852-4 | 08/25/18 08:28 |
| FILL COMP | L1832649-02 | 08/25/18 14:06 |

# Method Blank Summary
# Form 4
# VOLATILES

| | | | |
|---|---|---|---|
| **Client** | : Lord Associates, Inc. | **Lab Number** | : L1832649 |
| **Project Name** | : UEC GLAVIN | **Project Number** | : 2629 |
| **Lab Sample ID** | : WG1150980-5 | **Lab File ID** | : V00180826A05 |
| **Instrument ID** | : VOA100 | | |
| **Matrix** | : SOIL | **Analysis Date** | : 08/26/18 11:13 |

| Client Sample No. | Lab Sample ID | Analysis Date |
|---|---|---|
| WG1150980-3LCS | WG1150980-3 | 08/26/18 09:55 |
| WG1150980-4LCSD | WG1150980-4 | 08/26/18 10:22 |
| TOPSOIL COMP | L1832649-01 | 08/26/18 16:09 |

# Continuing Calibration
# Form 7

| | | | |
|---|---|---|---|
| Client | : Lord Associates, Inc. | Lab Number | : L1832649 |
| Project Name | : UEC GLAVIN | Project Number | : 2629 |
| Instrument ID | : VOA100 | Calibration Date | : 08/25/18 08:02 |
| Lab File ID | : V00180825A01 | Init. Calib. Date(s) | : 08/02/18 08/02/18 |
| Sample No | : WG1150852-2 | Init. Calib. Times | : 20:03 23:32 |
| Channel | : | | |

| Compound | Ave. RRF | RRF | Min RRF | %D | Max %D | Area% | Dev(min) |
|---|---|---|---|---|---|---|---|
| Fluorobenzene | 1 | 1 | - | 0 | 20 | 141 | 0 |
| Dichlorodifluoromethane | 0.229 | 0.171 | - | 25.3* | 20 | 109 | 0 |
| Chloromethane | 0.295 | 0.255 | - | 13.6 | 20 | 127 | 0 |
| Vinyl chloride | 0.284 | 0.237 | - | 16.5 | 20 | 116 | 0 |
| Bromomethane | 0.175 | 0.155 | - | 11.4 | 20 | 140 | 0 |
| Chloroethane | 0.172 | 0.153 | - | 11 | 20 | 124 | 0 |
| Trichlorofluoromethane | 0.294 | 0.237 | - | 19.4 | 20 | 109 | 0 |
| Ethyl ether | 0.125 | 0.11 | - | 12 | 20 | 127 | 0 |
| 1,1-Dichloroethene | 0.202 | 0.162 | - | 19.8 | 20 | 111 | 0 |
| Carbon disulfide | 0.71 | 0.558 | - | 21.4* | 20 | 115 | 0 |
| Freon-113 | 0.208 | 0.154 | - | 26* | 20 | 106 | 0 |
| Acrolein | 0.029 | 0.026* | - | 10.3 | 20 | 134 | 0 |
| Methylene chloride | 0.266 | 0.22 | - | 17.3 | 20 | 127 | 0 |
| Acetone | 20 | 18.807 | - | 6 | 20 | 142 | 0 |
| trans-1,2-Dichloroethene | 0.233 | 0.201 | - | 13.7 | 20 | 121 | 0 |
| Methyl acetate | 0.114 | 0.105 | - | 7.9 | 20 | 143 | 0 |
| Methyl tert-butyl ether | 0.567 | 0.517 | - | 8.8 | 20 | 132 | 0 |
| tert-Butyl alcohol | 0.017 | 0.017* | - | 0 | 20 | 135 | 0 |
| Diisopropyl ether | 0.809 | 0.739 | - | 8.7 | 20 | 130 | 0 |
| 1,1-Dichloroethane | 0.447 | 0.404 | - | 9.6 | 20 | 127 | 0 |
| Halothane | 0.174 | 0.145 | - | 16.7 | 20 | 113 | 0 |
| Acrylonitrile | 20 | 18.635 | - | 6.8 | 20 | 141 | 0 |
| Ethyl tert-butyl ether | 0.686 | 0.632 | - | 7.9 | 20 | 132 | 0 |
| Vinyl acetate | 0.473 | 0.461 | - | 2.5 | 20 | 137 | 0 |
| cis-1,2-Dichloroethene | 0.248 | 0.221 | - | 10.9 | 20 | 124 | 0 |
| 2,2-Dichloropropane | 0.329 | 0.301 | - | 8.5 | 20 | 127 | 0 |
| Bromochloromethane | 0.099 | 0.095 | - | 4 | 20 | 129 | 0 |
| Cyclohexane | 0.385 | 0.318 | - | 17.4 | 20 | 108 | 0 |
| Chloroform | 0.416 | 0.384 | - | 7.7 | 20 | 128 | 0 |
| Ethyl acetate | 0.167 | 0.164 | - | 1.8 | 20 | 138 | 0 |
| Carbon tetrachloride | 0.276 | 0.231 | - | 16.3 | 20 | 112 | 0 |
| Tetrahydrofuran | 20 | 19.83 | - | 0.9 | 20 | 142 | -.01 |
| Dibromofluoromethane | 0.235 | 0.235 | - | 0 | 20 | 142 | 0 |
| 1,1,1-Trichloroethane | 0.324 | 0.281 | - | 13.3 | 20 | 115 | 0 |
| 2-Butanone | 0.077 | 0.061* | - | 20.8* | 20 | 103 | 0 |
| 1,1-Dichloropropene | 0.303 | 0.266 | - | 12.2 | 20 | 116 | 0 |
| Benzene | 0.948 | 0.846 | - | 10.8 | 20 | 125 | 0 |
| tert-Amyl methyl ether | 0.575 | 0.542 | - | 5.7 | 20 | 134 | 0 |
| 1,2-Dichloroethane-d4 | 0.24 | 0.244 | - | -1.7 | 20 | 147 | 0 |
| 1,2-Dichloroethane | 0.269 | 0.256 | - | 4.8 | 20 | 133 | 0 |
| Methyl cyclohexane | 0.375 | 0.306 | - | 18.4 | 20 | 107 | 0 |
| Trichloroethene | 0.225 | 0.2* | - | 11.1 | 20 | 120 | 0 |
| Dibromomethane | 0.113 | 0.11 | - | 2.7 | 20 | 134 | 0 |
| 1,2-Dichloropropane | 0.236 | 0.224 | - | 5.1 | 20 | 131 | 0 |
| 2-Chloroethyl vinyl ether | 0.086 | 0.083 | - | 3.5 | 20 | 150 | 0 |

* Value outside of QC limits.

# Continuing Calibration
# Form 7

| | | | |
|---|---|---|---|
| Client | : Lord Associates, Inc. | Lab Number | : L1832649 |
| Project Name | : UEC GLAVIN | Project Number | : 2629 |
| Instrument ID | : VOA100 | Calibration Date | : 08/25/18 08:02 |
| Lab File ID | : V00180825A01 | Init. Calib. Date(s) | : 08/02/18 08/02/18 |
| Sample No | : WG1150852-2 | Init. Calib. Times | : 20:03 23:32 |
| Channel | : | | |

| Compound | Ave. RRF | RRF | Min RRF | %D | Max %D | Area% | Dev(min) |
|---|---|---|---|---|---|---|---|
| Bromodichloromethane | 0.281 | 0.271 | - | 3.6 | 20 | 132 | 0 |
| 1,4-Dioxane | 0.00166 | 0.0017* | - | -2.4 | 20 | 137 | 0 |
| cis-1,3-Dichloropropene | 0.343 | 0.336 | - | 2 | 20 | 133 | 0 |
| Chlorobenzene-d5 | 1 | 1 | - | 0 | 20 | 140 | 0 |
| Toluene-d8 | 1.421 | 1.43 | - | -0.6 | 20 | 141 | 0 |
| Toluene | 0.843 | 0.753 | - | 10.7 | 20 | 123 | 0 |
| 4-Methyl-2-pentanone | 0.094 | 0.086* | - | 8.5 | 20 | 131 | 0 |
| Tetrachloroethene | 0.32 | 0.279 | - | 12.8 | 20 | 112 | 0 |
| trans-1,3-Dichloropropene | 20 | 18.41 | - | 7.9 | 20 | 134 | 0 |
| Ethyl methacrylate | 0.353 | 0.309 | - | 12.5 | 20 | 120 | 0 |
| 1,1,2-Trichloroethane | 0.206 | 0.208 | - | -1 | 20 | 135 | 0 |
| Chlorodibromomethane | 0.274 | 0.265 | - | 3.3 | 20 | 133 | 0 |
| 1,3-Dichloropropane | 0.437 | 0.434 | - | 0.7 | 20 | 134 | 0 |
| 1,2-Dibromoethane | 0.221 | 0.22 | - | 0.5 | 20 | 132 | 0 |
| 2-Hexanone | 0.16 | 0.159 | - | 0.6 | 20 | 134 | 0 |
| Chlorobenzene | 0.885 | 0.801 | - | 9.5 | 20 | 126 | 0 |
| Ethylbenzene | 1.575 | 1.404 | - | 10.9 | 20 | 122 | 0 |
| 1,1,1,2-Tetrachloroethane | 0.286 | 0.273 | - | 4.5 | 20 | 127 | 0 |
| p/m Xylene | 0.588 | 0.527 | - | 10.4 | 20 | 120 | 0 |
| o Xylene | 0.572 | 0.519 | - | 9.3 | 20 | 123 | 0 |
| Styrene | 0.938 | 0.842 | - | 10.2 | 20 | 121 | 0 |
| 1,4-Dichlorobenzene-d4 | 1 | 1 | - | 0 | 20 | 140 | 0 |
| Bromoform | 0.337 | 0.321 | - | 4.7 | 20 | 135 | 0 |
| Isopropylbenzene | 3.02 | 2.656 | - | 12.1 | 20 | 118 | 0 |
| 4-Bromofluorobenzene | 1.036 | 1.034 | - | 0.2 | 20 | 140 | 0 |
| Bromobenzene | 0.705 | 0.649 | - | 7.9 | 20 | 125 | 0 |
| n-Propylbenzene | 3.699 | 3.322 | - | 10.2 | 20 | 121 | 0 |
| 1,4-Dichlorobutane | 0.897 | 0.89 | - | 0.8 | 20 | 136 | 0 |
| 1,1,2,2-Tetrachloroethane | 0.612 | 0.618 | - | -1 | 20 | 136 | 0 |
| 4-Ethyltoluene | 3.102 | 2.769 | - | 10.7 | 20 | 121 | 0 |
| 2-Chlorotoluene | 2.221 | 2.043 | - | 8 | 20 | 128 | 0 |
| 1,3,5-Trimethylbenzene | 2.558 | 2.266 | - | 11.4 | 20 | 120 | 0 |
| 1,2,3-Trichloropropane | 0.484 | 0.479 | - | 1 | 20 | 133 | 0 |
| trans-1,4-Dichloro-2-buten | 0.168 | 0.168 | - | 0 | 20 | 142 | 0 |
| 4-Chlorotoluene | 2.225 | 2.018 | - | 9.3 | 20 | 125 | 0 |
| tert-Butylbenzene | 2.1 | 1.814 | - | 13.6 | 20 | 116 | 0 |
| 1,2,4-Trimethylbenzene | 2.539 | 2.295 | - | 9.6 | 20 | 124 | 0 |
| sec-Butylbenzene | 3.195 | 2.804 | - | 12.2 | 20 | 117 | 0 |
| p-Isopropyltoluene | 2.685 | 2.345 | - | 12.7 | 20 | 117 | 0 |
| 1,3-Dichlorobenzene | 1.348 | 1.246 | - | 7.6 | 20 | 126 | 0 |
| 1,4-Dichlorobenzene | 1.37 | 1.259 | - | 8.1 | 20 | 127 | 0 |
| p-Diethylbenzene | 1.665 | 1.448 | - | 13 | 20 | 117 | 0 |
| n-Butylbenzene | 2.585 | 2.319 | - | 10.3 | 20 | 121 | 0 |
| 1,2-Dichlorobenzene | 1.219 | 1.132 | - | 7.1 | 20 | 128 | 0 |
| 1,2,4,5-Tetramethylbenzene | 2.578 | 2.27 | - | 11.9 | 20 | 121 | 0 |

* Value outside of QC limits.

# Continuing Calibration
# Form 7

| | | | |
|---|---|---|---|
| Client | : Lord Associates, Inc. | Lab Number | : L1832649 |
| Project Name | : UEC GLAVIN | Project Number | : 2629 |
| Instrument ID | : VOA100 | Calibration Date | : 08/25/18 08:02 |
| Lab File ID | : V00180825A01 | Init. Calib. Date(s) | : 08/02/18 08/02/18 |
| Sample No | : WG1150852-2 | Init. Calib. Times | : 20:03 23:32 |
| Channel | : | | |

| Compound | Ave. RRF | RRF | Min RRF | %D | Max %D | Area% | Dev(min) |
|---|---|---|---|---|---|---|---|
| 1,2-Dibromo-3-chloropropan | 20 | 17.264 | - | 13.7 | 20 | 125 | 0 |
| 1,3,5-Trichlorobenzene | 1.018 | 0.918 | - | 9.8 | 20 | 122 | 0 |
| Hexachlorobutadiene | 0.477 | 0.385 | - | 19.3 | 20 | 107 | 0 |
| 1,2,4-Trichlorobenzene | 0.868 | 0.773 | - | 10.9 | 20 | 120 | 0 |
| Naphthalene | 1.798 | 1.599 | - | 11.1 | 20 | 120 | 0 |
| 1,2,3-Trichlorobenzene | 0.778 | 0.691 | - | 11.2 | 20 | 121 | 0 |

* Value outside of QC limits.

# Continuing Calibration
# Form 7

| | | | |
|---|---|---|---|
| Client | : Lord Associates, Inc. | Lab Number | : L1832649 |
| Project Name | : UEC GLAVIN | Project Number | : 2629 |
| Instrument ID | : VOA100 | Calibration Date | : 08/26/18 09:55 |
| Lab File ID | : V00180826A02 | Init. Calib. Date(s) | : 08/02/18 08/02/18 |
| Sample No | : WG1150980-2 | Init. Calib. Times | : 20:03 23:32 |
| Channel | : | | |

| Compound | Ave. RRF | RRF | Min RRF | %D | Max %D | Area% | Dev(min) |
|---|---|---|---|---|---|---|---|
| Fluorobenzene | 1 | 1 | - | 0 | 20 | 142 | 0 |
| Dichlorodifluoromethane | 0.229 | 0.206 | - | 10 | 20 | 132 | 0 |
| Chloromethane | 0.295 | 0.266 | - | 9.8 | 20 | 133 | 0 |
| Vinyl chloride | 0.284 | 0.27 | - | 4.9 | 20 | 133 | 0 |
| Bromomethane | 0.175 | 0.158 | - | 9.7 | 20 | 142 | 0 |
| Chloroethane | 0.172 | 0.167 | - | 2.9 | 20 | 136 | 0 |
| Trichlorofluoromethane | 0.294 | 0.295 | - | -0.3 | 20 | 136 | 0 |
| Ethyl ether | 0.125 | 0.113 | - | 9.6 | 20 | 130 | 0 |
| 1,1-Dichloroethene | 0.202 | 0.192 | - | 5 | 20 | 133 | 0 |
| Carbon disulfide | 0.71 | 0.633 | - | 10.8 | 20 | 132 | 0 |
| Freon-113 | 0.208 | 0.2 | - | 3.8 | 20 | 138 | 0 |
| Acrolein | 0.029 | 0.026* | - | 10.3 | 20 | 133 | 0 |
| Methylene chloride | 0.266 | 0.235 | - | 11.7 | 20 | 136 | 0 |
| Acetone | 20 | 17.778 | - | 11.1 | 20 | 135 | 0 |
| trans-1,2-Dichloroethene | 0.233 | 0.222 | - | 4.7 | 20 | 134 | 0 |
| Methyl acetate | 0.114 | 0.101 | - | 11.4 | 20 | 138 | 0 |
| Methyl tert-butyl ether | 0.567 | 0.524 | - | 7.6 | 20 | 134 | 0 |
| tert-Butyl alcohol | 0.017 | 0.016* | - | 5.9 | 20 | 129 | 0 |
| Diisopropyl ether | 0.809 | 0.762 | - | 5.8 | 20 | 135 | 0 |
| 1,1-Dichloroethane | 0.447 | 0.43 | - | 3.8 | 20 | 136 | 0 |
| Halothane | 0.174 | 0.168 | - | 3.4 | 20 | 131 | 0 |
| Acrylonitrile | 20 | 18.123 | - | 9.4 | 20 | 138 | 0 |
| Ethyl tert-butyl ether | 0.686 | 0.655 | - | 4.5 | 20 | 137 | 0 |
| Vinyl acetate | 0.473 | 0.471 | - | 0.4 | 20 | 141 | 0 |
| cis-1,2-Dichloroethene | 0.248 | 0.233 | - | 6 | 20 | 132 | 0 |
| 2,2-Dichloropropane | 0.329 | 0.341 | - | -3.6 | 20 | 145 | 0 |
| Bromochloromethane | 0.099 | 0.097 | - | 2 | 20 | 133 | 0 |
| Cyclohexane | 0.385 | 0.41 | - | -6.5 | 20 | 140 | 0 |
| Chloroform | 0.416 | 0.407 | - | 2.2 | 20 | 136 | 0 |
| Ethyl acetate | 0.167 | 0.162 | - | 3 | 20 | 138 | 0 |
| Carbon tetrachloride | 0.276 | 0.279 | - | -1.1 | 20 | 137 | 0 |
| Tetrahydrofuran | 20 | 19.847 | - | 0.8 | 20 | 142 | 0 |
| Dibromofluoromethane | 0.235 | 0.237 | - | -0.9 | 20 | 144 | 0 |
| 1,1,1-Trichloroethane | 0.324 | 0.325 | - | -0.3 | 20 | 134 | 0 |
| 2-Butanone | 0.077 | 0.065* | - | 15.6 | 20 | 110 | 0 |
| 1,1-Dichloropropene | 0.303 | 0.312 | - | -3 | 20 | 136 | 0 |
| Benzene | 0.948 | 0.906 | - | 4.4 | 20 | 134 | 0 |
| tert-Amyl methyl ether | 0.575 | 0.545 | - | 5.2 | 20 | 136 | 0 |
| 1,2-Dichloroethane-d4 | 0.24 | 0.242 | - | -0.8 | 20 | 146 | 0 |
| 1,2-Dichloroethane | 0.269 | 0.262 | - | 2.6 | 20 | 137 | 0 |
| Methyl cyclohexane | 0.375 | 0.392 | - | -4.5 | 20 | 138 | 0 |
| Trichloroethene | 0.225 | 0.222 | - | 1.3 | 20 | 134 | 0 |
| Dibromomethane | 0.113 | 0.112 | - | 0.9 | 20 | 136 | 0 |
| 1,2-Dichloropropane | 0.236 | 0.233 | - | 1.3 | 20 | 137 | 0 |
| 2-Chloroethyl vinyl ether | 0.086 | 0.088 | - | -2.3 | 20 | 162 | 0 |

* Value outside of QC limits.

# Continuing Calibration
# Form 7

| | | | |
|---|---|---|---|
| Client | : Lord Associates, Inc. | Lab Number | : L1832649 |
| Project Name | : UEC GLAVIN | Project Number | : 2629 |
| Instrument ID | : VOA100 | Calibration Date | : 08/26/18 09:55 |
| Lab File ID | : V00180826A02 | Init. Calib. Date(s) | : 08/02/18 08/02/18 |
| Sample No | : WG1150980-2 | Init. Calib. Times | : 20:03 23:32 |
| Channel | : | | |

| Compound | Ave. RRF | RRF | Min RRF | %D | Max %D | Area% | Dev(min) |
|---|---|---|---|---|---|---|---|
| Bromodichloromethane | 0.281 | 0.281 | - | 0 | 20 | 138 | 0 |
| 1,4-Dioxane | 0.00166 | 0.00166* | - | 0 | 20 | 134 | 0 |
| cis-1,3-Dichloropropene | 0.343 | 0.352 | - | -2.6 | 20 | 139 | 0 |
| Chlorobenzene-d5 | 1 | 1 | - | 0 | 20 | 142 | 0 |
| Toluene-d8 | 1.421 | 1.436 | - | -1.1 | 20 | 143 | 0 |
| Toluene | 0.843 | 0.802 | - | 4.9 | 20 | 133 | 0 |
| 4-Methyl-2-pentanone | 0.094 | 0.084* | - | 10.6 | 20 | 130 | 0 |
| Tetrachloroethene | 0.32 | 0.319 | - | 0.3 | 20 | 130 | 0 |
| trans-1,3-Dichloropropene | 20 | 18.699 | - | 6.5 | 20 | 138 | 0 |
| Ethyl methacrylate | 0.353 | 0.316 | - | 10.5 | 20 | 125 | 0 |
| 1,1,2-Trichloroethane | 0.206 | 0.209 | - | -1.5 | 20 | 138 | 0 |
| Chlorodibromomethane | 0.274 | 0.271 | - | 1.1 | 20 | 137 | 0 |
| 1,3-Dichloropropane | 0.437 | 0.438 | - | -0.2 | 20 | 137 | 0 |
| 1,2-Dibromoethane | 0.221 | 0.22 | - | 0.5 | 20 | 134 | 0 |
| 2-Hexanone | 0.16 | 0.144 | - | 10 | 20 | 122 | 0 |
| Chlorobenzene | 0.885 | 0.841 | - | 5 | 20 | 134 | 0 |
| Ethylbenzene | 1.575 | 1.516 | - | 3.7 | 20 | 133 | 0 |
| 1,1,1,2-Tetrachloroethane | 0.286 | 0.287 | - | -0.3 | 20 | 135 | 0 |
| p/m Xylene | 0.588 | 0.571 | - | 2.9 | 20 | 132 | 0 |
| o Xylene | 0.572 | 0.551 | - | 3.7 | 20 | 132 | 0 |
| Styrene | 0.938 | 0.882 | - | 6 | 20 | 128 | 0 |
| 1,4-Dichlorobenzene-d4 | 1 | 1 | - | 0 | 20 | 139 | 0 |
| Bromoform | 0.337 | 0.327 | - | 3 | 20 | 137 | 0 |
| Isopropylbenzene | 3.02 | 3.017 | - | 0.1 | 20 | 133 | 0 |
| 4-Bromofluorobenzene | 1.036 | 1.032 | - | 0.4 | 20 | 139 | 0 |
| Bromobenzene | 0.705 | 0.673 | - | 4.5 | 20 | 129 | 0 |
| n-Propylbenzene | 3.699 | 3.717 | - | -0.5 | 20 | 135 | 0 |
| 1,4-Dichlorobutane | 0.897 | 0.901 | - | -0.4 | 20 | 138 | 0 |
| 1,1,2,2-Tetrachloroethane | 0.612 | 0.624 | - | -2 | 20 | 137 | 0 |
| 4-Ethyltoluene | 3.102 | 3.057 | - | 1.5 | 20 | 134 | 0 |
| 2-Chlorotoluene | 2.221 | 2.156 | - | 2.9 | 20 | 134 | 0 |
| 1,3,5-Trimethylbenzene | 2.558 | 2.496 | - | 2.4 | 20 | 132 | 0 |
| 1,2,3-Trichloropropane | 0.484 | 0.488 | - | -0.8 | 20 | 135 | 0 |
| trans-1,4-Dichloro-2-buten | 0.168 | 0.172 | - | -2.4 | 20 | 145 | 0 |
| 4-Chlorotoluene | 2.225 | 2.169 | - | 2.5 | 20 | 134 | 0 |
| tert-Butylbenzene | 2.1 | 2.046 | - | 2.6 | 20 | 131 | 0 |
| 1,2,4-Trimethylbenzene | 2.539 | 2.449 | - | 3.5 | 20 | 132 | 0 |
| sec-Butylbenzene | 3.195 | 3.251 | - | -1.8 | 20 | 136 | 0 |
| p-Isopropyltoluene | 2.685 | 2.661 | - | 0.9 | 20 | 132 | 0 |
| 1,3-Dichlorobenzene | 1.348 | 1.32 | - | 2.1 | 20 | 133 | 0 |
| 1,4-Dichlorobenzene | 1.37 | 1.335 | - | 2.6 | 20 | 135 | 0 |
| p-Diethylbenzene | 1.665 | 1.638 | - | 1.6 | 20 | 132 | 0 |
| n-Butylbenzene | 2.585 | 2.649 | - | -2.5 | 20 | 138 | 0 |
| 1,2-Dichlorobenzene | 1.219 | 1.178 | - | 3.4 | 20 | 132 | 0 |
| 1,2,4,5-Tetramethylbenzene | 2.578 | 2.397 | - | 7 | 20 | 127 | 0 |

* Value outside of QC limits.

# Continuing Calibration
# Form 7

| | | | |
|---|---|---|---|
| Client | : Lord Associates, Inc. | Lab Number | : L1832649 |
| Project Name | : UEC GLAVIN | Project Number | : 2629 |
| Instrument ID | : VOA100 | Calibration Date | : 08/26/18 09:55 |
| Lab File ID | : V00180826A02 | Init. Calib. Date(s) | : 08/02/18 08/02/18 |
| Sample No | : WG1150980-2 | Init. Calib. Times | : 20:03 23:32 |
| Channel | : | | |

| Compound | Ave. RRF | RRF | Min RRF | %D | Max %D | Area% | Dev(min) |
|---|---|---|---|---|---|---|---|
| 1,2-Dibromo-3-chloropropan | 20 | 17.548 | - | 12.3 | 20 | 126 | 0 |
| 1,3,5-Trichlorobenzene | 1.018 | 0.982 | - | 3.5 | 20 | 130 | 0 |
| Hexachlorobutadiene | 0.477 | 0.454 | - | 4.8 | 20 | 126 | 0 |
| 1,2,4-Trichlorobenzene | 0.868 | 0.821 | - | 5.4 | 20 | 127 | 0 |
| Naphthalene | 1.798 | 1.629 | - | 9.4 | 20 | 122 | 0 |
| 1,2,3-Trichlorobenzene | 0.778 | 0.729 | - | 6.3 | 20 | 127 | 0 |

* Value outside of QC limits.

# 4.1.2 SCHEMATIC DESIGN BINDER

## E. Geotechnical Analysis

1. Geotechnical Analysis
2. Geotechnical Report

To better determine soil conditions at the Glavin Center site, additional geotechnical work was conducted during the Schematic Design phase. The investigation included 18 borings and 7 test pits throughout the site and along Lake Street. Soil samples were also analyzed for arsenic levels and the results are included in the Environmental Assessment section of this binder.

In summary, the geotechnical testing confirmed that our original assumptions about the soil characteristics, bearing capacity, and water levels, during the PSR phase were appropriate and could be used for the Schematic Design. No significant ledge, high water table, or peat were detected. The soil is primarily Paxton soils which has characteristics that will be considered as the site drainage, compaction, and bearing capacity of the building are developed.

With the somewhat elevated levels of naturally occurring arsenic present, the design efforts focused on opportunities to limit off-site disposal of the soil. For the estimate, it was assumed that over 13,000cy of material would need to be removed from the site. As Design Development evolves, the Design Team will work to minimize the quantity of off site trucking and disposal required. Additionally, all pervious active student areas of the site have been estimated with the assumption that 12″ of new soil will be required with a barrier membrane separation from the native soil.

LGCI
Lahlaf Geotechnical Consulting, Inc.

September 7, 2018

Ms. Katie Crockett
Lamoureux Pagano & Associates, Inc.
108 Grove Street, Suite 300
Worcester, MA 01605
Tel: (508) 752-2831
Fax: (508) 757-7769
E-mail: KCrockett@lamoureuxpagano.com

**Re: Preliminary Geotechnical Report**
**Proposed Beal Early Childhood Center School**
**Glavin Site**
**Shrewsbury, Massachusetts**
**LGCI Project No. 1806**

Dear Ms. Crockett:

Lahlaf Geotechnical Consulting, Inc. (LGCI) has completed preliminary subsurface explorations at the site of the Proposed Beal Early Childhood Center School at the Glavin Site in Shrewsbury, Massachusetts. This preliminary report contains the results of our preliminary subsurface explorations and our preliminary foundation design and construction recommendations. We are submitting our report electronically. Please notify us if you require a hard copy.

The soil samples from our explorations are currently stored at LGCI for further analysis, if requested. Unless notified otherwise, we will dispose of the soil samples after three months.

Thank you for choosing LGCI as your geotechnical engineer.

Very truly yours,

**Lahlaf Geotechnical Consulting, Inc.**

Abdelmadjid M. Lahlaf, Ph.D., P.E.
Principal Engineer

LGCI
Lahlaf Geotechnical Consulting, Inc.

# PRELIMINARY GEOTECHNICAL REPORT
# PROPOSED BEAL EARLY CHILDHOOD CENTER SCHOOL
# GLAVIN SITE
# SHREWSBURY, MASSACHUSETTS

LGCI Project No. 1806
September 7, 2018

Prepared for:

**LAMOUREUX PAGANO & ASSOCIATES, INC.**
108 Grove Street, Suite 300
Worcester, MA 01605
Tel: (508) 752-2831
Fax: (508) 757-7769

**PRELIMINARY GEOTECHNICAL REPORT**
**PROPOSED BEAL EARLY CHILDHOOD CENTER SCHOOL**
**GLAVIN SITE**
**SHREWSBURY, MASSACHUSETTS**
LGCI Project No. 1806
September 7, 2018

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Principal Engineer

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**Preliminary Geotechnical Report**
**Proposed Beal Early Childhood Center School**
**Glavin Site**
**Shrewsbury, Massachusetts**
**LGCI Project No. 1806**

# 1. PROJECT INFORMATION

## 1.1 Project Authorization

This report presents the results of two phases of geotechnical services performed by Lahlaf Geotechnical Consulting, Inc. (LGCI) for the proposed Beal Early Childhood Center School in Shrewsbury, Massachusetts.

The first phase of our services included a review of the available information at the site and was part of a feasibility study. It was performed in general accordance with our proposal No. 17157-Rev. 1 dated November 28, 2017, revised November 30, 2017. Mr. Michael Pagano of Lamoureux Pagano & Associates, Inc. (LPA) authorized our services by signing our proposal on December 22, 2017. The second phase of our services, which included performing preliminary subsurface explorations at the site, was performed in general accordance with our proposal No. 18063 dated May 30, 2018. Ms. Katie Crockett of LPA authorized our services by signing our proposal on June 14, 2018.

## 1.2 Purpose and Scope of Services

The purpose of this study was to obtain preliminary subsurface information at the site and to provide preliminary recommendations for foundation design and construction. This report includes the results of our desk study and supersedes our letter report dated February 14, 2018.

As part of this study, LGCI performed the following services:

- Reviewed the existing information about the site.
- Coordinated our preliminary field explorations with LPA.
- Marked the exploration locations at the site and notified Dig Safe Systems Inc. (Dig Safe) and the Town of Shrewsbury DPW.
- Engaged an excavation subcontractor to excavate seven (7) test pits.
- Engaged a drilling subcontractor to advance eighteen (18) soil borings and to install one (1) groundwater observation well in one (1) boring.
- Provided a geotechnical field engineer at the site to coordinate and observe the borings and test pits, describe the soil samples, and prepare field logs.
- Submitted three (3) soil samples for grain-size analyses.

- Prepared this preliminary geotechnical report containing the results of our preliminary subsurface explorations and our preliminary recommendations for foundation design and construction.

We understand that additional explorations will be performed at the site during the Schematic Design (SD) Phase and/or the design development (DD) Phase after the proposed building layout, size, and location are established.

LGCI did not perform environmental services for this project. LGCI did not perform an assessment to evaluate the presence or absence of hazardous or toxic materials above or below the ground surface at or around the site. Any statement about the color, odor, or the presence of suspicious materials included in our boring and test pit logs or report were made by LGCI for information only and to support our geotechnical services. No environmental recommendations and/or opinions are included in this report.

Our scope did not include attending meetings, preparing or reviewing specifications, performing contract document review, or providing construction services. LGCI would be pleased to perform these services when needed. Recommendations for stormwater management, erosion control, pavement design, slope stability analyses, and detailed cost or quantity estimates are not included in our scope of work.

### 1.3 Site Description

Our understanding of the existing conditions is based on our field observations, our discussions with LPA, and on the following drawings:

- Drawings EX1.1 to EX1.4 titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts," (Existing Condition Plan) provided to LGCI by LPA via e-mail on August 16, 2018.

- Sketch titled: "Beal Early Childhood Center, Preliminary Evaluation of Alternatives, Glavin Center Property," (Site Plan) prepared by LPA and provided to us by LPA via e-mail on November 20, 2017.

- Plan titled: "Worcester School for the Mentally Retarded, Shrewsbury, MA, Boring Logs Sheet No. 1, Plan No. S-00," dated May 27, 1971 and provided to LGCI by LPA via e-mail on February 6, 2018

The site is located at 214 Lake Street in Shrewsbury, Massachusetts as shown in Figure 1. Based on the Site Plan, the site is about 98.87 acres in size and has a developable area of about 16.5 acres. This parcel of land is referred to as Glavin Center Property (Glavin Site).

The Glavin Site consists of two parcels of land on the western and eastern side of Lake Street. The western parcel is primarily occupied by the Glavin Center that is comprised of several one- to two-story buildings, associated parking lots and driveways, the Shrewsbury Library, a one-story building, and athletic fields. The Glavin Center and Shrewsbury Library are located on the northern side of the western parcel and the athletic fields are located on the southern side of the western parcel. The parcel on the eastern side of Lake Street has an irregular shape and consists of agricultural land on the northern side and wooded land on the southern side. Abandoned buildings are located close to the agricultural land on the northern side. The site is surrounded by private properties.

The Existing Condition Plan indicates that the existing grades on the northern side of the western parcel range between about El. 549 feet on the western edge and El. 609 feet on the eastern edge. The Existing Condition Plan did not provide the existing grades of the athletic fields on the southern side of the western parcel; however, based on field observations, the existing grades in the athletic fields generally slope downward from the Glavin Center and Shrewsbury Library to the athletic fields. The existing grades in the eastern parcel just east of Lake Street range between about El. 609 feet on the northern side and El. 565 feet on the southern side. Based on our field observations, the existing grade is generally level in the wooded area, and slopes downward from Lake Street over the agricultural land.

## 1.4 Project Description

Our understanding of the proposed construction is based on our discussions with LPA, and on the following drawings:

- Drawing C3.0 titled: "Site Preparation Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts," (Site Preparation Plan) prepared by LPA and provided to LGCI by LPA via e-mail on August 24, 2018.

- Drawing L1.0 titled: "Site Plan & Drawing Key, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts," (Proposed Site Plan) prepared by LPA and provided to LGCI by LPA via e-mail on August 9, 2018.

- Drawings L1.1 to L1.3 titled: "Grading, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts," (Proposed Grading Plan) prepared by LPA and provided to LGCI by LPA via e-mail on August 9, 2018.

- Drawing A3.1 titled: "Ground Floor Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts," prepared by LPA and provided to LGCI by LPA via e-mail on August 9, 2018.

We understand that LPA was selected by the Town of Shrewsbury to conduct a feasibility study for the proposed Beal Early Childhood Center School at the Glavin Site in Shrewsbury, MA. We understand that the proposed school will accommodate 780 students in the grades of K-4.

Based on the Site Preparation Plan, the proposed construction will consist of a school building located near the northwestern corner of the western parcel of the site. Based on the Proposed Site Plan, the proposed construction will include paved driveways, parking areas, playgrounds, a playing field, and gardens.

The proposed building will extend across the northwestern corner of the parking lot and the northern athletic field nearby the Glavin Center. The proposed building will have a lower level, referred to as the Ground Floor that will be mostly located between the existing northern parking lot and the northern athletic field. The Ground Floor will have a finished floor elevation (FFE) of El. 556 feet and will approximately extend over the western half of the proposed building footprint. The proposed building will have an upper at-grade level, referred to as the Main Floor, that will be mostly located in the existing grass areas and driveways between existing buildings. The Main Floor will have an FFE of El. 570 feet. The transition between the Ground Floor and the Main Floor will extend in a north-south direction. The Ground Floor will be accessible from and is at grade with the area on the western side of the proposed building. The Main Floor will be accessible from and is at grade with the area on the eastern side of the proposed building. A retaining wall with an exposed height of about 12 feet will be constructed near the southeastern corner of the proposed building.

Based on the Existing Condition Plan, up to 2 feet of fill is required on the southern side and cuts of up to 4 feet are required on the northern side for the Ground Floor. The Main Floor will require up to 10 feet of fill.

The proposed driveway will extend around the proposed building. Paved parking areas will be located east and south of the proposed building. The proposed finished grades will range between El. 556 feet on the southern side to El. 580 feet on the northern side. The paved parking areas will be partially constructed within the footprint of the existing building after the latter is demolished. The proposed construction also includes the widening of Lake Street.

### 1.5 Elevation Datum

The Existing Condition Plan does not include a reference for the elevation datum. We have assumed the elevations shown on the Existing Condition Plan and which we included on our boring and test pit logs, are referenced to the North American Vertical Datum of 1988 (NAVD88).

# 2. SITE AND SUBSURFACE CONDITIONS

## 2.1 Surficial Geology

LGCI reviewed the following surficial geological map: "Surficial Geologic Map of the Clinton-Concord-Grafton-Medfield 12- Quadrangle Area in East Central Massachusetts," prepared by Stone, B.D. and Stone, J.R. for U.S. Geological Survey, Open File Report 2006-1260A.

The surficial geologic map indicates that the natural soils in the general vicinity of the site consist of thin till comprised of non-sorted, non-stratified matrix of sand, some silt, and little clay and contains scattered clasts of gravel and a few large boulders. The surficial geologic map of the site is shown in Figure 2.

## 2.2 Previous Explorations

LPA provided LGCI with the logs of borings and test pits performed at the site before the construction of the Worcester School of the Mentally Retarded in Shrewsbury, Massachusetts (current Glavin Center). As part of the construction for the Worcester School of the Mentally Retarded, six (6) test pits and thirty-six (36) borings were performed at the site between November 25 and 27, 1970.

The test pits extended to a depth of 10 feet beneath the ground surface. Topsoil was encountered at the ground surface in all the test pits and extended to depths ranging between 1 and 2 feet beneath the ground surface. Natural sand was encountered beneath the topsoil and extended to the termination depths of the test pits. The natural sand consisted of fine sand with up to approximately 10 percent fines and up to approximately 35 percent gravel. A few of the test pits contained 20 to 35 percent cobbles or boulders.

The borings extended to depths ranging between 5 and 20 feet below the ground surface. Topsoil was encountered at the ground surface and extended to depths ranging between 1 and 3 feet beneath the ground surface. Natural sand was encountered beneath the topsoil and extended to the borings termination depths. The natural sand consisted of fine sand with trace up to approximately 35 percent fines. The percentage of gravel ranged between 20 to 50 percent. The natural sand in a few borings contained approximately 10 percent up to approximately 50 percent silty clay. The SPT N-values in the sand layer ranged between 7 to 281 blows per foot, with many of the SPT N-values between 13 to 100 blows per foot, indicating medium dense to very dense material.

The locations and logs of the previous borings and test pits are included in Appendix A.

## 2.3 LGCI's Explorations

### 2.3.1 General

We marked our explorations locations in the field, and we notified Dig Safe and the Town of Shrewsbury to assist with utility clearance.

### 2.3.2 Soil Borings

LGCI engaged Northern Drill Service, Inc. of Northborough, Massachusetts to advance eighteen (18) soil borings (B-1 to B-18) at the site between July 30 and August 3, 2018. One (1) groundwater observation well was installed in boring B-6-OW. The borings extended to depths ranging between 16 and 317 feet beneath the ground surface.

An LGCI engineer observed and logged the borings in the field. The borings were advanced with a Mobile B-59 truck-mounted drill rig using 3 ¼-inch-ID hollow stem augers and 4-inch cased wash boring techniques.

The drillers performed Standard Penetration Tests (SPT) and obtained split spoon samples with an automatic hammer at two- or five-foot intervals as noted on the boring logs in general accordance with ASTM D-1586. Unless notified otherwise, we will dispose of the soil samples after three months.

Upon completion, the boreholes were backfilled with the soil cuttings.

Appendix B contains LGCI's boring logs and Figure 3A to 3D show the boring locations. Table 1 contains a summary of the borings.

The ground surface elevations shown in the boring logs were interpolated to the nearest ½ foot from the Existing Condition Plan.

### 2.3.3 Test Pits

LGCI engaged Hoffman Environmental Services, Inc. of North Kingstown, Rhode Island to excavate seven (7) test pits (TP-1 to TP-7) at the site on July 26 and August 1, 2018. The test pits extended to depths ranging between 7 and 12 feet beneath the ground surface.

An LGCI engineer observed and logged the test pits in the field. The test pits were excavated with a CAT 430F2 excavator. Upon completion, the test pits were backfilled with the excavated materials which were placed and tamped with the excavator bucket in 1-to 2-foot lifts.

Appendix C contains LGCI's test pit logs and Figures 3A to 3D show the test pit locations. Table 2 contains a summary of the test pits.

The ground surface elevations shown in the test pit logs were interpolated to the nearest ½ foot from the Existing Condition Plan.

## 2.4 Subsurface Conditions

The subsurface description in this report is based on a limited number of borings and test pits and is intended to highlight the major soil strata encountered during our borings and test pits. The subsurface conditions are known only at the actual boring and test pit locations. Variations may occur and should be expected between boring and test pit locations. Boring and test pit logs represent conditions that we observed at the time of our borings and test pits, and are edited based on the results of the laboratory test data as appropriate. The strata boundaries shown in our boring and test pit logs are based on our interpretations and the actual transition may be gradual. Graphic soil symbols are for illustration only.

The soil strata encountered in our borings and test pits were as follows, starting from the ground surface.

Topsoil/Subsoil – A layer of surficial organic soil was encountered at the ground surface in all borings and test pits. The topsoil extended to depths ranging between 0.3 and 2 feet beneath ground surface. Subsoil was encountered below the topsoil in test pit TP-7 and extended to a depth of 1.5 feet beneath ground surface. The subsoil was described as silty sand with up to 25 percent fines and up to 5 percent gravel. The subsoil contained traces of organics and roots.

Fill – A layer of fill was encountered below the topsoil in all borings except in borings B-5 and B-7, and in all test pits except in test pit TP-7. The fill extended to depths ranging between 1.5 and 11 feet beneath the ground surface. Please note that the transition from the fill to the natural sand was difficult to distinguish in the borings as the fill consisted of reworked natural sand in many borings.

The fill consisted mostly of silty sand with gravel and occasionally of poorly graded sand with silt, well graded sand with silt, or silt with sand. The fines content in the fill generally ranged between 10 and 25 percent. The gravel content in the fill ranged between 5 and 40 percent. The fill contained traces of organics and roots. The fill also contained up to 5 percent cobbles and boulders up to 1.5 feet in diameter. One test pit contained between 5 and 10 percent cobbles and boulders. Buried subsoil was encountered beneath the fill in test pit TP-6.

Sand – A layer of sand was encountered beneath the topsoil/subsoil and fill and extended to the termination depths of the borings and test pits. The sand was mostly described as silty sand with up to 40 percent fines and up to 30 percent gravel. One sample of sand was described as well

graded sand with silt with up to 15 percent fines and up to 10 percent gravel. The sand layer contained up to 5 percent cobbles and boulders that were up to 2 feet in diameter. In test pits TP-1 and TP-7, the sand contained between 5 and 10 percent cobbles and boulders up to 3 feet in diameter.

The SPT N-values in the sand ranged between 13 and 88 blows per foot (bpf), with most SPT N-values between 13 and 50 bpf, indicating medium dense to dense sand.

## 2.5 Groundwater

Groundwater was observed in the borings at depths ranging between 4 and 20 feet beneath the ground surface. Groundwater was not observed in the test pits. One (1) groundwater observation well was installed in boring B-6-OW. The groundwater level measured in the groundwater observation well on August 3, 2018 was 13 feet below the ground surface.

The groundwater data reported in this report is based on observations made during or shortly after the completion of our explorations and may not represent the actual groundwater levels, as additional time may be required for the groundwater levels to stabilize. Water was introduced into the borehole for borings B-12, B-14, and B-15 during drilling, and the groundwater levels measured at the end of drilling in the borings may not be representative of the actual groundwater conditions. The groundwater levels presented in this report only represent the conditions encountered at the time and location of our explorations. Seasonal fluctuation should be anticipated.

## 2.6 Laboratory Test Data

LGCI submitted three (3) soil samples obtained from a boring and two test pits for grain-size analysis. The laboratory data sheets are included in Appendix D and the results are summarized below.

| Test Pit/ Boring | Sample ID | Sample Depth (ft) | Material | Percent Gravel | Percent Sand | Percent Fines |
|---|---|---|---|---|---|---|
| B-15 | S2 | 2 – 4 | Fill | 1.7 | 31.3 | 67.0 |
| TP-3 | S1 | 0.4 – 2.5 | Fill | 15.0 | 35.9 | 49.1 |
| TP-4 | S2 | 2 – 10 | Sand | 9.9 | 44.9 | 45.2 |

# 3. EVALUATION AND RECOMMENDATIONS

## 3.1 Preliminary Foundation Recommendations

### 3.1.1 General

Based on our field observations, our understanding of the proposed construction, our observation of our preliminary borings and test pits, and the results of our laboratory testing, there are a few issues that we would like to highlight for consideration and discussion.

Removal of the topsoil – - The topsoil and the subsoil are not suitable to support the proposed building and paved areas.

Removal of Existing Fill – The existing fill should be entirely removed from within the proposed building footprint. Based on our preliminary explorations, the existing fill removal is anticipated to generally extend to about 2 to 6 feet, and will extend locally to depths of up to 11 feet. The thickness of the fill should be further explored with additional explorations during the next phase of the project. The removal should extend beyond the proposed building a distance equal to the thickness of the distance between the bottom of the footings and the natural soil or 5 feet, whichever is greater.

The proposed building foundations should bear on Structural Fill placed directly on the natural sand. Our recommendation for footing design is presented in Section 3.1.2.

We anticipate that the major considerations during construction will be the removal of the topsoil/subsoil and existing fill, and the handling and stockpiling of these materials.

Additional Explorations – We recommend performing additional explorations during the DD phase of the project. The additional explorations should include soil borings, test pits, and groundwater observations wells.

### 3.1.2 Footing Design

- We recommend supporting the proposed building on spread and continuous footings bearing on Structural Fill placed directly over the natural soil.

- For footing design, we recommend using a preliminary net allowable bearing pressure of 4,000 pounds per square foot (psf).

- The subgrade of footings should be prepared in accordance with the recommendations in Section 4.1.

- All foundations should be designed in accordance with *The Commonwealth of Massachusetts State Building Code 780 CMR, Ninth Edition* (MSBC 9th Edition).

- Exterior footings and footings in unheated areas that are placed on the natural soil should be placed at a minimum depth of 4 feet below the final exterior grade to provide adequate frost cover protection. Interior footings in heated areas may be designed and constructed at a minimum depth of 2 feet below finished floor grades.

- We recommend that wall footings have a minimum width of 2 feet, and that column footings have a minimum width of 3 feet. For foundations with a least lateral dimension smaller than 3 feet, the allowable bearing pressure should be reduced to 1/3 of the recommended allowable bearing pressure times the least dimension in feet.

- Wall footings should be designed and constructed with continuous, longitudinal steel reinforcement for greater bending strength to span across small areas of loose or soft soils that may go undetected during construction.

- A representative of LGCI should observe the subgrade of footings to verify that the footing subgrade has been prepared in accordance with our recommendations.

### 3.1.3 Settlement

Settlement assessments could not be performed at this time as column loads are not available; however, we believe that footings designed in accordance with the recommendations in this report will experience total settlement of less than 1 inch. LGCI will finalize our settlement estimates after performing additional explorations at the site and after the proposed column loads are available.

## 3.2 Concrete Slab Considerations

- The proposed floor slabs can be constructed as slabs-on-grade.

- The proposed floor slabs should be supported on a minimum of 12 inches of Structural Fill placed directly over the natural soil.

- Exposed boulders should be removed from the subgrade of the slab and the resulting excavation should be backfilled with Structural Fill.

- A vapor retarder membrane with a minimum thickness of 15 mils could be used beneath the slabs. The need for such a membrane should be determined by the architect. The membrane should be protected from puncture during placement of the steel mesh and construction of the slabs.

- For the design of the floor slabs bearing on the materials described above, we recommend using a modulus of subgrade reaction, $k_{s1}$, of 100 tons per cubic foot (tcf) (116 pci). Please note that the values of $k_{s1}$ are for a 1 x 1 square foot area. These values should be adjusted for larger areas using the following expression:

$$Modulus\ of\ Subgrade\ Reaction\ (k_s) = k_{s1} * \left(\frac{B+1}{2B}\right)^2$$

where:

$k_s$ = Coefficient of vertical subgrade reaction for loaded area,
$k_{s1}$ = Coefficient of vertical subgrade reaction for 1 x 1 square foot area, and
B = Width of area loaded, in feet.

Please note that cracking of slabs-on-grade can occur as a result of heaving or compression of the underlying soil, but also as a result of concrete curing stresses. To reduce the potential for cracking, the precautions listed below should be closely followed for construction of all slabs-on-grade:

- Construction joints should be provided between the floor slab and the walls and columns in accordance with the American Concrete Institute (ACI) requirements, or other applicable code.

- Backfill in interior and exterior utility trenches should be properly compacted.

- In order for the movement of exterior slabs not to be transmitted to the building foundation or superstructure, exterior slabs such as approach slabs and sidewalks, should be isolated from the building superstructure.

### 3.3 Under-slab Drains

Based on the preliminary subsurface data, we believe that an under-slab drainage system is required under the Ground Floor slab. We will finalize our recommendations and provide additional details about the under-slab drainage system during the DD phase after additional explorations are performed and the proposed building layout and finished floor elevation are finalized.

### 3.4 Seismic Design Criteria

In accordance with Section 1613 of MSBC 9th Edition, the seismic criteria for the site are as follows:

- Site Class: D
- Spectral Response Acceleration at short period ($S_s$): 0.184 g

- Spectral Response Acceleration at 1 sec. ($S_1$): 0.066g
- Site Coefficient $F_a$ (Table 9.4.1.2.4a): 1.6
- Site Coefficient $F_v$ (Table 9.4.1.2.4b): 2.4
- Adjusted spectral response $S_{ms}$: 0.294 g
- Adjusted spectral responses $S_{m1}$: 0.158 g

Based on our observations in the test pits and the results of the borings, the natural soil layer at the site is not susceptible to liquefaction during a seismic event.

This recommendations for seismic design criteria are preliminary and based on a limited field exploration program. The final recommendation will be provided in the DD phase.

## 3.5 Lateral Pressures for Wall Design and Perimeter Drains

### 3.5.1 Lateral Earth Pressures

We recommend using the following lateral earth pressures for the design of retaining walls:

| | |
|---|---|
| Coefficient of Active Earth Pressure, $K_A$: | 0.31 |
| Coefficient of At-Rest Earth Pressure, $K_o$: | 0.5 |
| Coefficient of Passive Earth Pressure, $K_p$: | 3.3 |
| Total Unit Weight, $\gamma$: | 125 pounds per cubic foot |

Note: The values in the table are based on a friction angle for the backfill of 32 degrees and neglecting friction between the backfill and the wall. The design active and passive coefficients are based on horizontal surfaces (non-sloping backfill) on both the active and passive sides, and a vertical wall face.

- Exterior walls of below ground spaces and the wall separating the two slab levels should be designed using the "at-rest" pressure coefficient.

- Site retaining walls should be designed using the active earth pressure coefficient described above.

- Passive earth pressures should only be used at the toe of the wall where special measures or provisions are taken to prevent disturbance or future removal of the soil on the passive side of the wall, or in areas where the wall design includes a key.

- Where a permanent vertical uniform load will be applied on the active side immediately adjacent to the wall, a horizontal surcharge load equal to half of the uniform vertical load should be applied over the height of the wall. At a minimum, a temporary construction surcharge of 100 psf should be applied uniformly over the height of the wall.

- We recommend using an ultimate friction factor of 0.50 between the natural soil and the bottom of the retaining wall. Retaining walls should be designed for minimum factors of safety of 1.5 for sliding and 2.0 for overturning.

### 3.5.2 Seismic Pressure

- In accordance with the *Massachusetts State Building Code, 9th Edition*, Section 1610, a lateral earthquake force equal to $0.100*(S_s)*(F_a)*\gamma*H^2$ should be included in the design of the wall (for horizontal backfill), where $S_s$ is the maximum considered earthquake spectral response acceleration (defined in Section 3.4), $F_a$ is the site coefficient (defined in Section 3.4), $\gamma$ is the total unit weight of the soil backfill, and H is the height of the wall.

  The earthquake force should be distributed as an inverted triangle over the height of the wall. In accordance with MSBC 9th Edition, Section 1610.2, a load factor of 1.43 shall be applied to the earthquake force for wall strength design.

- Temporary surcharges should not be included when designing for earthquake loads. Surcharge loads applied for extended periods of time shall be included in the total static lateral soil pressure and their earthquake lateral force shall be computed and added to the force determined above.

### 3.5.3 Wall Drains

- We recommend that free-draining material be placed within 3 feet of the exterior of walls of below ground spaces of buildings, if any, and behind site retraining walls.

- To reduce the potential for dampness in below ground building spaces, if any, proposed below ground walls should be damp-proofed.

- We recommend that drains be provided behind the exterior of walls of below ground spaces, if any, and behind site retaining walls. The drains should consist of 6-inch perforated PVC pipes installed with the slots facing down. Perimeter drains should be installed at the bottom of the wall in 18 inches of crushed stone wrapped in a geotextile for separation and filtration.

Groundwater collected by the wall drains could be discharged in a lower area if gravity flow is possible. Alternatively, it should be discharged into the street drains. A permit would be required for discharge into street drains. For site retaining walls, the water collected from the drains could be discharged through weep holes. If wetness on the face of the wall is not desirable, the wall drains should be connected to the street drains.

### 3.6 Parking Lots and Driveways

The subsurface conditions encountered at the site are generally suitable to support the proposed driveways and parking lots after preparation of the subgrade as described in Section 4.1. The proposed driveways and parking areas should be constructed with minimum asphalt and subbase thicknesses in accordance with the recommendations and details prepared by the project civil engineer. We recommend improving the subgrade of parking lots and driveways beneath the subbase layer as described in Section 4.1.

# 4. CONSTRUCTION CONSIDERATIONS

## 4.1 Subgrade Preparation

- The topsoil and subsoil layers, root balls, organic soil, the existing fill, and other deleterious matter should be entirely removed from within the proposed building footprint.

- Topsoil and subsoil, organic material, root balls, and other deleterious material should be entirely removed from within the paved areas.

- Cobbles and boulders should be removed at least 6 inches from beneath footings and 12 inches from beneath the bottom of slabs and paved areas. The resulting excavations should be backfilled with compacted Structural Fill under the building and with Ordinary Fill under the subbase of paved areas.

- The base of the footing excavations in the natural soil should be compacted with a dynamic vibratory compactor weighing at least 200 pounds and imparting a minimum of 4 kips of force to the subgrade, before placing concrete.

- The subgrades of slabs and paved areas in the natural soil should be compacted with a heavy vibratory roller compactor imparting a dynamic effort of at least 40 kips.

- Where soft zones are revealed by the compaction effort and where organic soil is exposed, the soft materials or organic soil should be removed and replaced with Structural Fill within the building and with Ordinary Fill beneath the subbase of paved areas.

- Due to the high susceptibility of the natural soil for disturbance under foot and vehicular traffic, we recommend placing a minimum of 6 inches of Structural Fill under footings on top of the natural soil to provide a firm working surface during placement of formwork and rebar.

- To improve the existing fill under the paved areas, we recommend removing the top one foot of existing fill beneath the bottom of the proposed pavement subbase and compacting the exposed subgrade to a firm and unyielding condition with a minimum of six (6) passes of a dynamic vibratory compactor imparting a minimum of 40 kips before placing backfill. Where soft zones are revealed by the compaction effort, the soft materials should be removed and replaced with Ordinary Fill. After the exposed subgrade is compacted, the grades should be restored to the bottom of the proposed pavement subbase using the granular portion of excavated material and Ordinary Fill where the grades need to be raised. If pumping of the existing fill is observed, the compactor should be switched to static mode. Where the existing fill contains or overlies organic soil, the organic soil should be removed at least 2 feet beneath the bottom of the subbase layer.

- Fill placed within the footprint of the proposed building should meet the gradation and compaction requirements of Structural Fill shown in Section 4.3.

- Fill placed under the subbase of paved areas, should meet the gradation and compaction requirements of Ordinary Fill shown in Section 4.3.

- Fill placed in the top 12 inches beneath sidewalks should consist of Structural Fill with less than 5 percent fines.

- When crushed stone is required in the drawings or it is used for the convenience of the contractor, it should be wrapped in a geotextile fabric for separation.

- An LGCI geotechnical engineer or his representative should observe the exposed subgrades prior to fill and concrete placement to verify that the exposed bearing materials are suitable for the design soil bearing pressure. If soft or loose pockets are encountered in the footing excavations, the soft or loose materials should be removed, and the bottom of the footing should be placed at a lower elevation on firm soil, or the resulting excavation should be backfilled with Structural Fill, or crushed stone wrapped in a geotextile for separation.

### 4.2 Subgrade Protection

The onsite sand may be frost susceptible. If construction takes place during freezing weather, special measures should be taken to prevent the subgrade from freezing. Such measures should include the use of heat blankets or excavating the final six inches of soil just before pouring concrete. Footings should be backfilled as soon as possible after footing construction. Soil used as backfill should be free of frozen material, as should the ground on which it is placed. Filling operations should be halted in freezing weather.

Materials with high fines contents are typically difficult to handle when wet as they are sensitive to moisture content variations. Subgrade support capacities may deteriorate when such soils become wet and/or disturbed. The contractor should keep exposed subgrades properly drained and free of ponded water. Subgrades should be protected from machine and foot traffic to reduce disturbance.

### 4.3 Fill Materials

Structural Fill and Ordinary Fill should consist of inert, hard, durable sand and gravel, free from organic matter, clay, surface coatings and deleterious materials, and should conform to the gradation requirements shown below.

### 4.3.1 Structural Fill

The Structural Fill should have a plasticity index of less than 6 and should meet the gradation requirements shown below. Structural Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557), with moisture contents within ±2 percentage points of optimum moisture content.

| Sieve Size | Percent Passing by Weight |
|---|---|
| 3 inches | 100 |
| 1 ½ inch | 80 - 100 |
| ½ inch | 50 – 100 |
| No. 4 | 30 – 85 |
| No. 20 | 15 – 60 |
| No. 60 | 5 – 35 |
| No. 200* | 0 – 10 |

* 0 – 5 Under sidewalks

### 4.3.2 Ordinary Fill

Ordinary Fill should have a plasticity index of less than 6 and should meet the gradation requirements shown below. Ordinary Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557), with moisture contents within ±2 percentage points of optimum moisture content.

| Sieve Size | Percent Passing by Weight |
|---|---|
| 6 inches | 100 |
| 1 inch | 50 - 100 |
| No. 4 | 20 – 100 |
| No. 20 | 10 - 70 |
| No. 60 | 5 – 45 |
| No. 200 | 0 – 20 |

## 4.4 Reuse of Onsite Materials

Based on the grain-size analyses and our field observations, the existing fill and the natural soil at the site do not meet the gradation requirements for Structural Fill and/or Ordinary Fill.

Materials to be used as fill should first be tested for compliance with the applicable gradation specifications.

Soils with more than 20 percent fines content are generally very sensitive to moisture content variations and are susceptible to frost. Such soils are very difficult to compact at moisture contents that are much higher or much lower than the optimum moisture content determined from the laboratory compaction test. Therefore, strict moisture control should be implemented during stockpiling, placement, and compaction of the onsite soils.

### 4.5 Groundwater Control Procedures

Based on the groundwater levels encountered in our explorations, we anticipate that groundwater control procedures will likely be needed for footing and utility excavations. We anticipate that filtered sump pumps installed in pits located at least three feet below the bottom of the excavation may be sufficient to handle surface runoff that may enter the excavation. Where deep trenches are required for utilities, multiple sump pumps would be required to maintain a dry excavation subgrade.

The contractor should be permitted to employ whatever commonly accepted means and practices as necessary to maintain the groundwater level below the bottom of the excavation, and to maintain a dry excavation during wet weather. Groundwater levels should be maintained at a minimum of 1-foot below the bottom of excavations during construction. Placement of reinforcing steel or concrete in standing water should not be permitted.

Proper permits should be obtained from authorities having jurisdiction over the work. At a minimum, the water collected from excavations should be filtered for fines in sedimentation basins before being discharged. The sedimentation basins could be constructed of hay bales wrapped in a geotextile fabric.

To reduce the potential for sinkholes developing over sump pump pits after the sump pumps are removed, the crushed stone placed in the sump pump pits should be wrapped in a geotextile for separation. Alternatively, the crushed stone should be entirely removed after the sump pump is no longer in use and the sump pump pit should be restored with suitable backfill.

### 4.6 Temporary Excavations

All excavations to receive human traffic, including utility trenches, basement or footing excavations, or others (i.e. underground storage tanks, etc.), should be constructed in accordance with the OSHA guidelines.

The site soils should generally be considered Type “C” and should have a maximum allowable slope of 1.5 Horizontal to 1 Vertical (1.5H:1V) for excavations less than 20 feet deep. Deeper excavations, if needed, should have shoring designed by a professional engineer.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of the excavation sides and bottom.

## 5. RECOMMENDATIONS FOR FUTURE WORK

We recommend engaging LGCI to perform the following services:

- Perform DD Phase explorations including soil borings and test pits, install groundwater observation wells, and revise our preliminary geotechnical report.
- Assist LPA in preparing Earth Moving specifications and reviewing the geotechnical aspect of foundation drawings.
- Review the geotechnical aspects of contractor submittals.
- Provide a field representative during construction to observe the subgrades for footings, floor slabs, and paved areas, and submit daily field reports documenting our observations and field recommendations.

## 6. REPORT LIMITATIONS

Our analysis and recommendations are based on project information provided to us at the time of this report. If changes to the type, size, and location of the proposed structures or to the site grading are made, the recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the conclusions and recommendations modified in writing by LGCI. LGCI cannot accept responsibility for designs based on our recommendations unless we are engaged to review the final plans and specifications to determine whether any changes in the project affect the validity of our recommendations and whether our recommendations have been properly implemented in the design.

It is not part of our scope to perform a more detailed site history; therefore, we have not explored for or researched the locations of buried utilities or other structures in the area of the proposed construction. Our scope did not include environmental services or services related to moisture, mold, or other biological contaminants in or around the site.

The recommendations in this report are based in part on the data obtained from the subsurface explorations. The nature and extent of variations between explorations may not become evident until construction. If variations from anticipated conditions are encountered, it may be necessary to revise the recommendations in this report. We cannot accept responsibility for designs based on recommendations in this report unless we are engaged to 1) make site visits during construction to check that the subsurface conditions exposed during construction are in general conformance with our design assumptions and 2) ascertain that, in general, the work is being performed in compliance with the contract documents.

Our report has been prepared in accordance with generally accepted engineering practices and in accordance with the terms and conditions set forth in our agreement. No other warranty, expressed or implied, is made. This report has been prepared for the exclusive use of Lamoureux Pagano & Associates, Inc. for the specific application to the proposed Beal Early Childhood Center School at the Glavin Site in Shrewsbury, Massachusetts as conceived at this time.

# 7. REFERENCES

The Commonwealth of Massachusetts (2017), "The Massachusetts State Building Code, Ninth Edition."

The Department of Labor, Occupational Safety and Health Administration (1989), "Occupational Safety and Health Standards - Excavations; Final Rule," 20 CFR Part 1926, Subpart P.

USGS - Shrewsbury, MA topographic map from www.digital-topo-maps.com

**Table 1 - Summary of LGCI's Borings**
**Proposed Beal Early Childhood Center School**
**Glavin Site, Shrewsbury, Massachusetts**
**LGCI Project No. 1806**

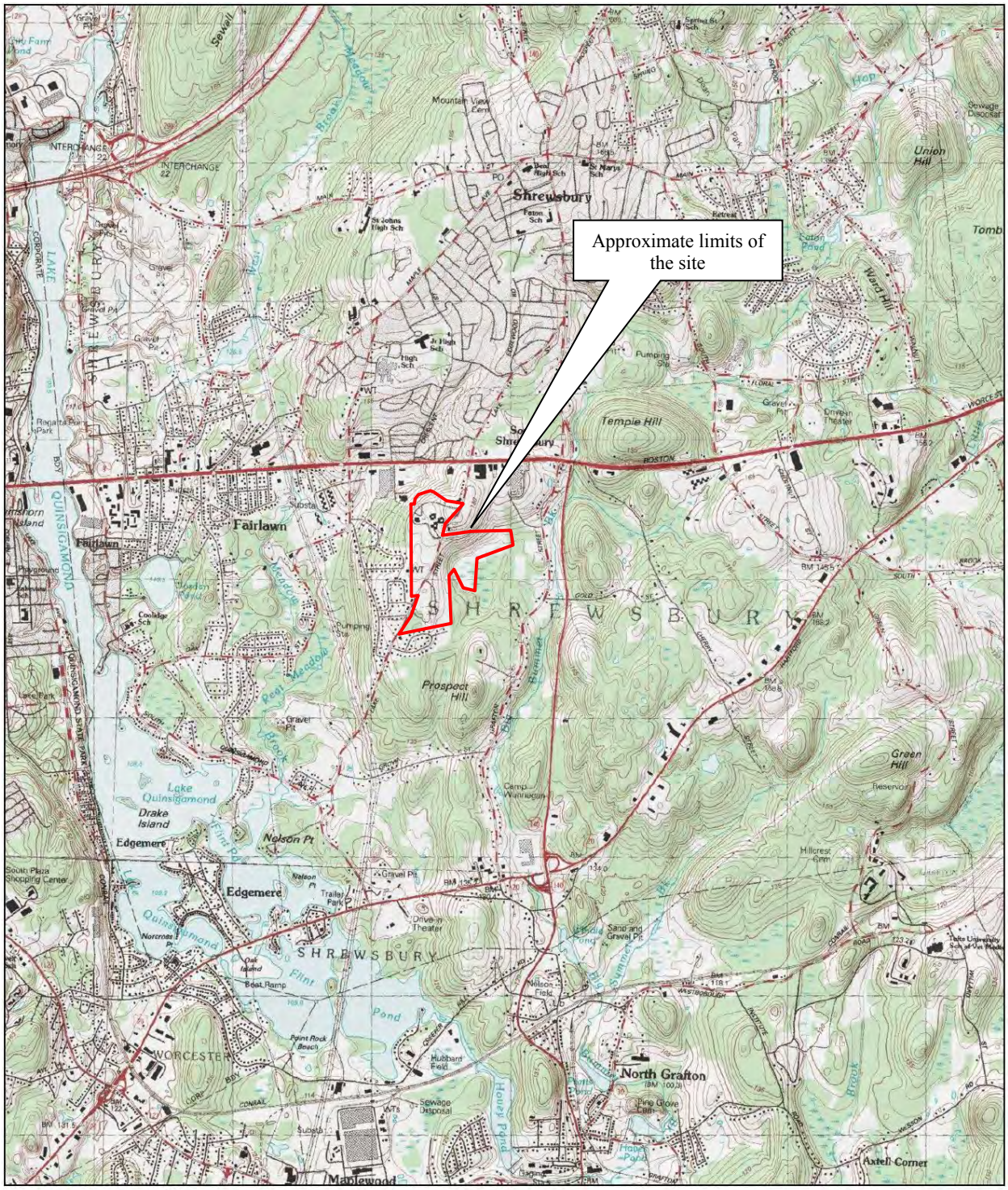
| Boring No. | Ground Surface Elevation (ft.)[1] | Groundwater Depth / El. (ft.)[2] | Bottom of Topsoil Depth / El. (ft.) | Bottom of Fill Depth / El. (ft.) | Bottom of Boring Depth / El. (ft.) |
|---|---|---|---|---|---|
| B-1 | 566.0 | - / **-** | 0.5 / **565.5** | 7.0 / **559.0** | 22.0 / **544.0** |
| B-2 | 566.0 | - / **-** | 2.0 / **564.0** | 7.2 / **558.8** | 21.0 / **545.0** |
| B-3 | 568.5 | - / **-** | 0.5 / **568.0** | 4.0 / **564.5** | 22.0 / **546.5** |
| B-4 | 572.0 | - / **-** | 0.8 / **571.2** | 2.0 / **570.0** | 22.0 / **550.0** |
| B-5 | 576.0 | - / **-** | 2.0 / **574.0** | - / **-** | 21.8 / **554.2** |
| B-6-OW[3] | 554.0 | 13.0 / **541.0** | 0.3 / **553.7** | 2.0 / **552.0** | 27.0 / **527.0** |
| B-7 | 549.5 | 4.9 / **544.6** | 0.3 / **549.2** | - / **-** | 22.0 / **527.5** |
| B-8 | 554.5 | - / **-** | 0.7 / **553.8** | 6.0 / **548.5** | 22.0 / **532.5** |
| B-9 | 554.0 | - / **-** | 0.7 / **553.3** | 11.0 / **543.0** | 22.0 / **532.0** |
| B-10 | 555.0 | 20.0 / **535.0** | 0.5 / **554.5** | 4.0 / **551.0** | 22.0 / **533.0** |
| B-11 | 560.0 | - / **-** | 1.0 / **559.0** | 4.0 / **556.0** | 22.0 / **538.0** |
| B-12 | 556.5 | 19.0 / **537.5** | 0.5 / **556.0** | 6.0 / **550.5** | 31.0 / **525.5** |
| B-13 | 603.0 | - / **-** | 0.5 / **602.5** | 4.0 / **599.0** | 16.0 / **587.0** |
| B-14 | 600.0 | - / **-** | 0.5 / **599.5** | 6.0 / **594.0** | 16.0 / **584.0** |
| B-15 | 585.5 | 4.0 / **581.5** | 2.0 / **583.5** | 7.0 / **578.5** | 16.0 / **569.5** |
| B-16 | 561.0 | 15.0 / **546.0** | 0.5 / **560.5** | 4.0 / **557.0** | 21.0 / **540.0** |
| B-17 | 561.5 | - / **-** | 0.5 / **561.0** | 4.0 / **557.5** | 17.0 / **544.5** |
| B-18 | 578.0 | - / **-** | 0.6 / **577.4** | 6.0 / **572.0** | 17.0 / **561.0** |

1. The ground surface elevation was interpolated to the nearest 1/2 foot using a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.
2. The groundwater level was measured based on sample moisture or at the end of drilling, as indicated in the logs.
3. The groundwater level in boring B-6-OW was measured in the groundwater observation well on 8/3/18.
4. "-" means layer not encountered.

**Table 2 - Summary of LGCI's Test Pits**
**Proposed Beal Early Childhood Center School**
**Glavin Site, Shrewsbury, Massachusetts**
**LGCI Project No. 1806**

| Test Pit No. | Ground Surface Elevation (ft.)[1] | Groundwater Depth / El. (ft.)[2] | Bottom of Topsoil Depth / El. (ft.) | Bottom of Fill / Subsoil Depth / El. (ft.) | Bottom of Test Pit Depth / El. (ft.) |
|---|---|---|---|---|---|
| | | | | | |
| TP-1 | 570.5 | - / **-** | 1.7 / **568.8** | 7.0 / **563.5** | 11.0 / **559.5** |
| TP-2 | 555.5 | - / **-** | 0.5 / **555.0** | 10.0 / **545.5** | 12.0 / **543.5** |
| TP-3 | 558.0 | - / **-** | 0.4 / **557.6** | 2.5 / **555.5** | 12.0 / **546.0** |
| TP-4 | 555.0 | - / **-** | 0.5 / **554.5** | 2.0 / **553.0** | 12.0 / **543.0** |
| TP-5 | 556.5 | - / **-** | 0.4 / **556.1** | 2.0 / **554.5** | 12.0 / **544.5** |
| TP-6 | 567.0 | - / **-** | 0.3 / **566.7** | 2.5 / **564.5** | 7.0 / **560.0** |
| TP-7 | 609.0 | - / **-** | 0.7 / **608.3** | 1.5 / **607.5** | 10.0 / **599.0** |

1. The ground surface elevation was interpolated to the nearest 1/2 foot using a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to 1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.
2. The groundwater level was not observed in any of the test pits, as indicated in the logs.
3. "-" means layer not encountered.

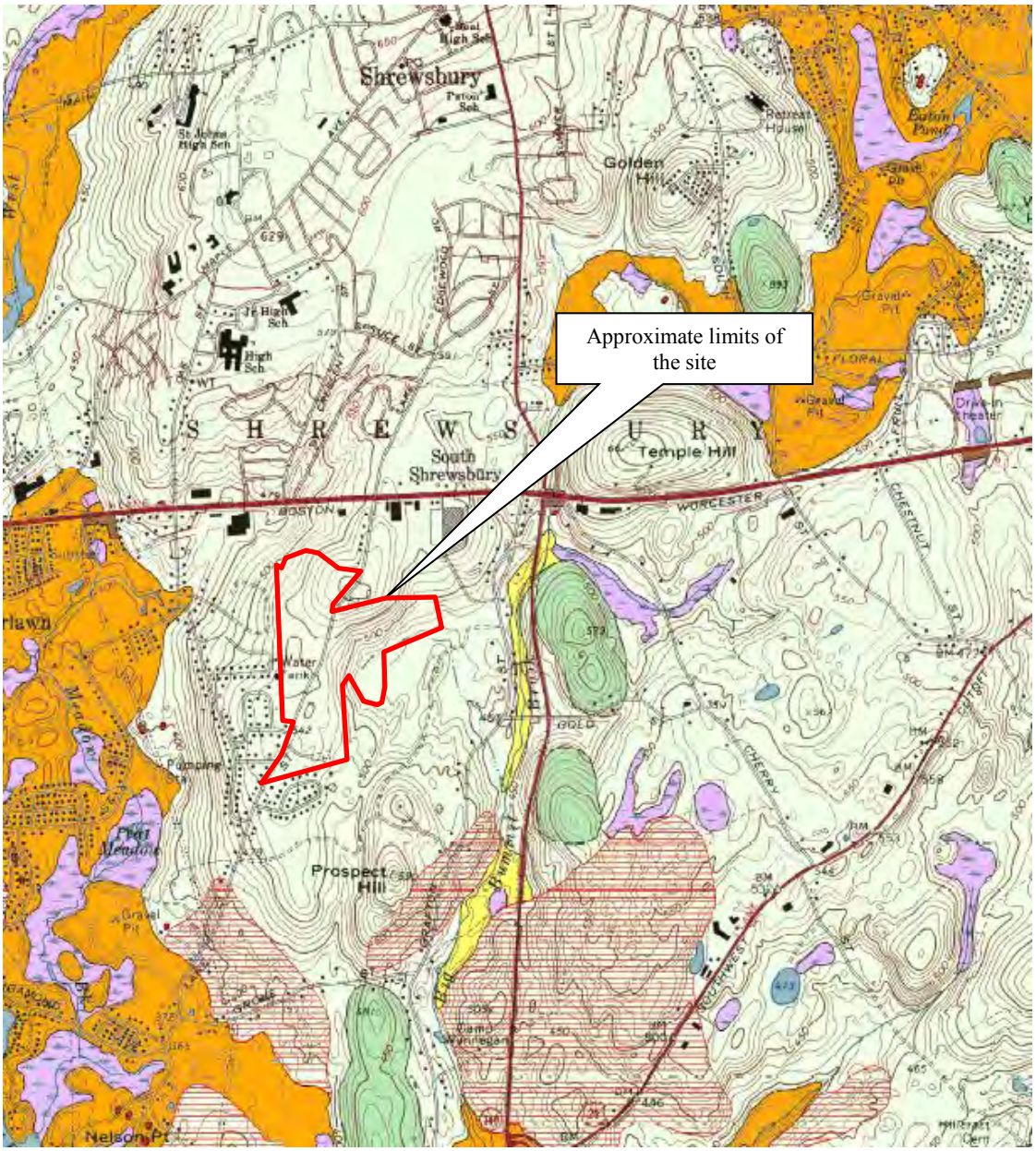



Map provided by MyTopo.com

Contour Intervals: 3 meters

Figure based on USGS topographic map of Shrewsbury, MA obtained from www.mytopo.com/maps

| Client: | Project: | Figure 1 – Site Location Map – Glavin Center Site | |
|---|---|---|---|
| Lamoureux Pagano & Associates, Inc. | Proposed Beal Early Childhood Center School | | |
| LGCI Lahlaf Geotechnical Consulting, Inc. | Project Location: Shrewsbury, MA | LGCI Project No.: 1806 | Date: Sept. 2018 |

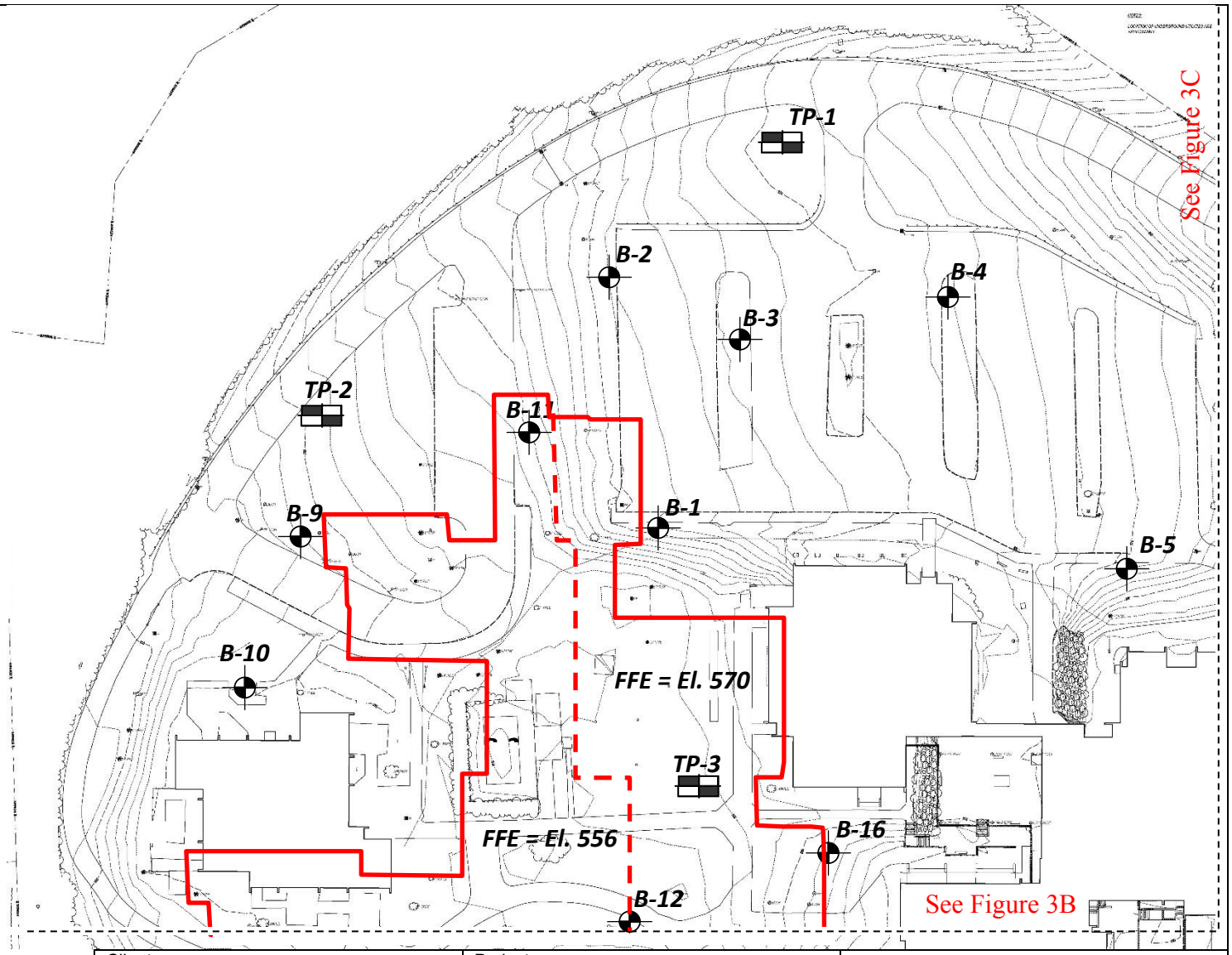



N

**Thin till**—Nonsorted, nonstratified matrix of sand, some silt, and little clay containing scattered gravel clasts and few large boulders; in areas where till is generally less than 10-15 ft thick and including areas of bedrock outcrop where till is absent. Predominantly upper till of the last glaciation; loose to moderately compact, generally sandy, commonly stony. Two facies are present in some places; a looser, coarser-grained ablation facies, melted out from supraglacial position; and an underlying more compact, finer-grained lodgement facies deposited subglacially. In general, both ablation and lodgement facies of upper till derived from fine-grained bedrock are finer grained, more compact, less stony and have fewer surface boulders than upper till derived from coarser grained crystalline rocks. Fine-grained bedrock sources include the red Mesozoic sedimentary rocks of the Connecticut River lowland, marble in the western river valleys, and fine-grained schists in upland areas.

Figure based on map titled: "Surficial Geologic Map of the Clinton-Concord-Grafton-Medfield 12- Quadrangle Area in East Central Massachusetts," prepared by Stone, B.D. and Stone, J.R. for U.S. Geological Survey, Open File Report 2006-1260A.

| Client: | Project: | Figure 2 – Surficial Geologic Map - Glavin Site | |
|---|---|---|---|
| Lamoureux Pagano & Associates, Inc. | Proposed Beal Early Childhood Center School | | |
| LGCI Lahlaf Geotechnical Consulting, Inc. | Project Location: Shrewsbury, MA | LGCI Project No.: 1806 | Date: Sept. 2018 |




Legend

Approximate location of borings advanced by Northern Drill Service, Inc. of Northborough, MA between July 30 and August 3, 2018 and observed by LGCI.

Approximate location of test pits advanced by Hoffman Environmental Services, Inc. of North Kingstown, RI between July 26 and August 1, 2018 and observed by LGCI.

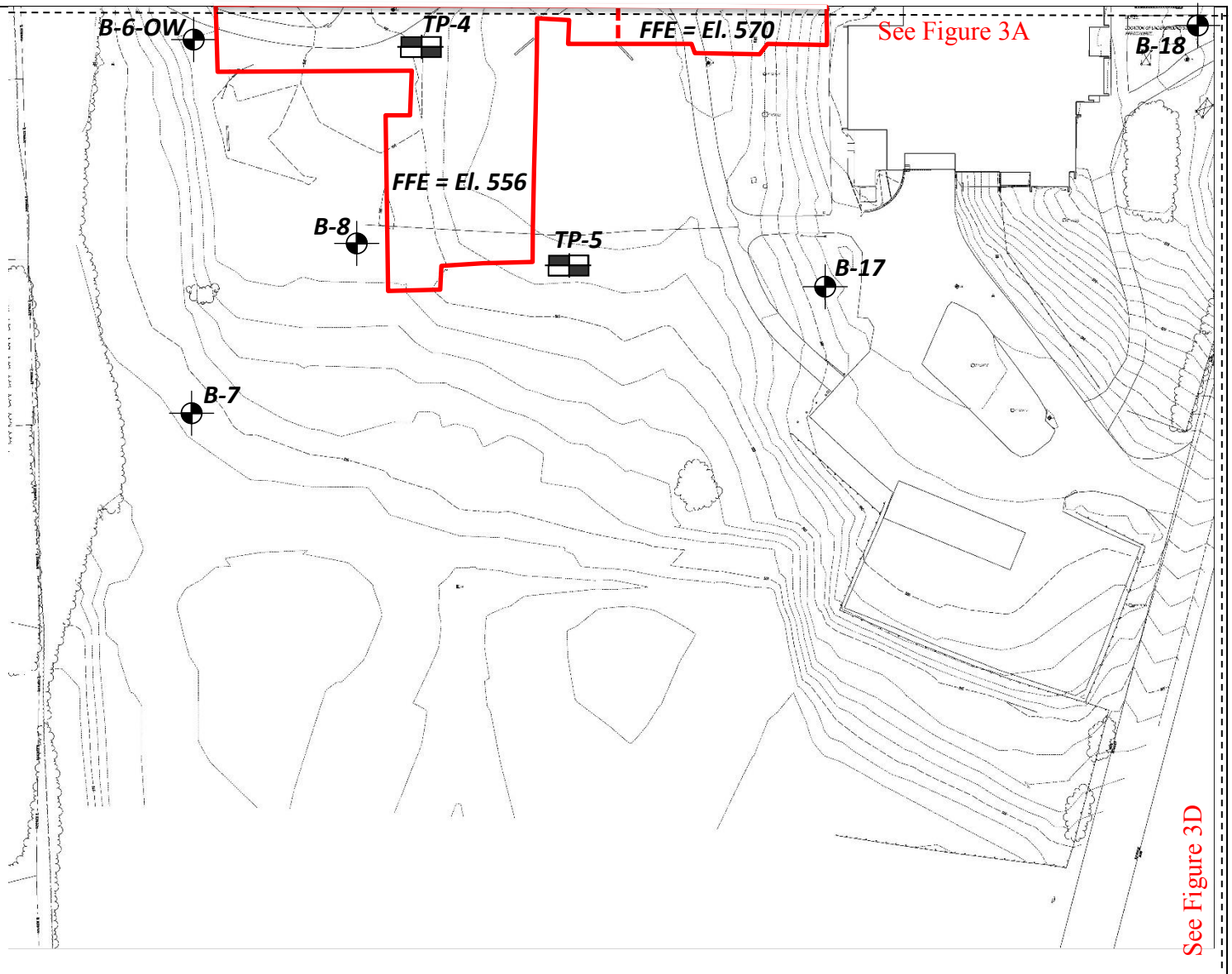
0 50 100 200

Approximate Scale (feet)

Note

Figure based on a drawing titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheet EX1.1," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

| Client: | Project: | Figure 3A – Boring and Test Pit Location Plan | |
|---|---|---|---|
| Lamoureux Pagano & Associates, Inc. | Proposed Beal Early Childhood Center School | | |
| LGCI Lahlaf Geotechnical Consulting, Inc. | Project Location: Shrewsbury, MA | LGCI Project No.: 1806 | Date: Sept. 2018 |




N

Legend

Approximate location of borings advanced by Northern Drill Service, Inc. of Northborough, MA between July 30 and August 3, 2018 and observed by LGCI.

Approximate location of test pits advanced by Hoffman Environmental Services, Inc. of North Kingstown, RI between July 26 and August 1, 2018 and observed by LGCI.

0 50 100 200

Approximate Scale (feet)

Note

Figure based on a drawing titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheet EX1.3," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

| Client: | Project: | Figure 3B – Boring and Test Pit Location Plan | |
|---|---|---|---|
| Lamoureux & Associates, Inc. | Proposed Beal Early Childhood Center School | | |
| LGCI Lahlaf Geotechnical Consulting, Inc. | Project Location: Shrewsbury, MA | LGCI Project No.: 1806 | Date: Sept. 2018 |

N

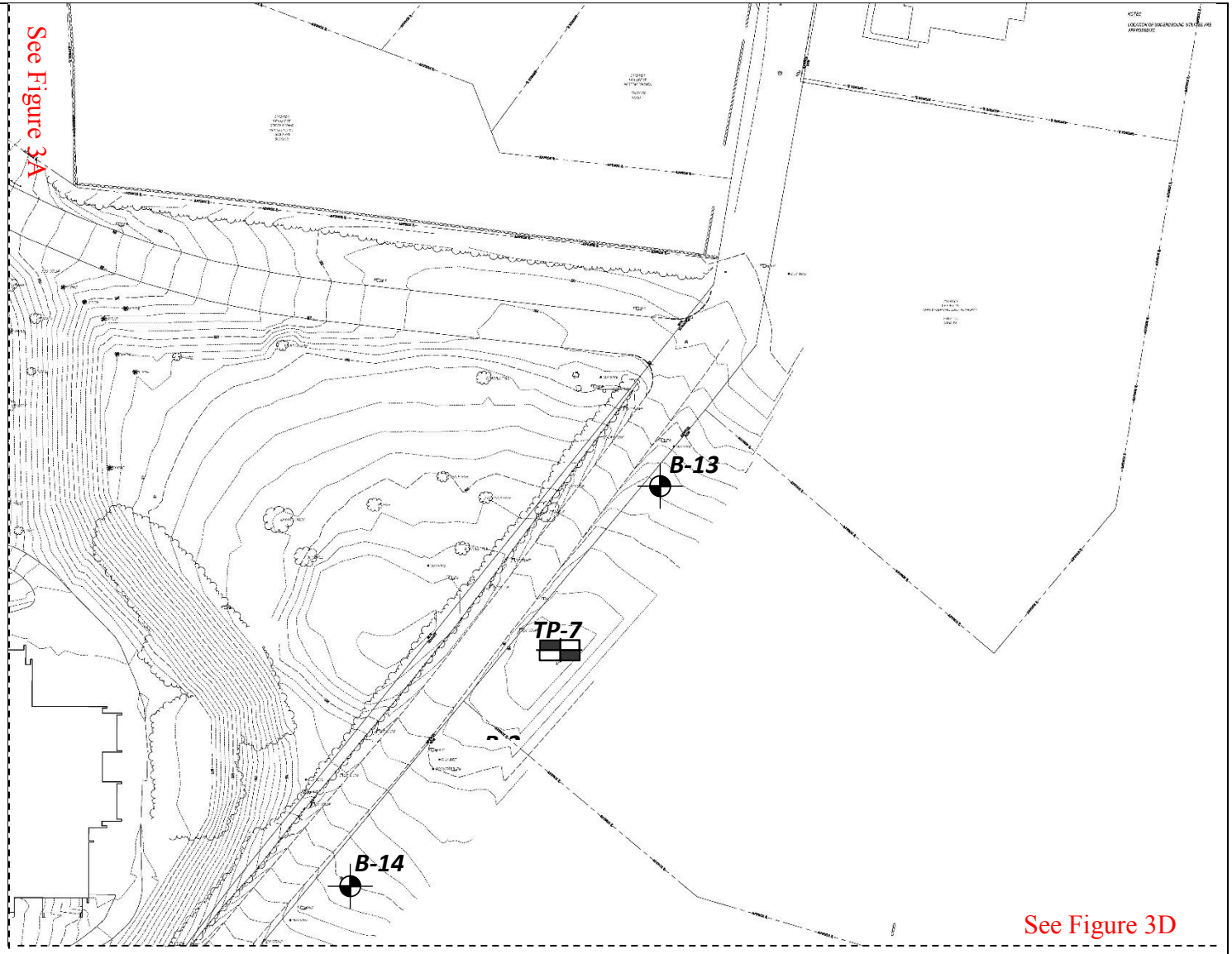
Legend

Approximate location of borings advanced by Northern Drill Service, Inc. of Northborough, MA between July 30 and August 3, 2018 and observed by LGCI.

Approximate location of test pits advanced by Hoffman Environmental Services, Inc. of North Kingstown, RI between July 26 and August 1, 2018 and observed by LGCI.

0 50 100 200

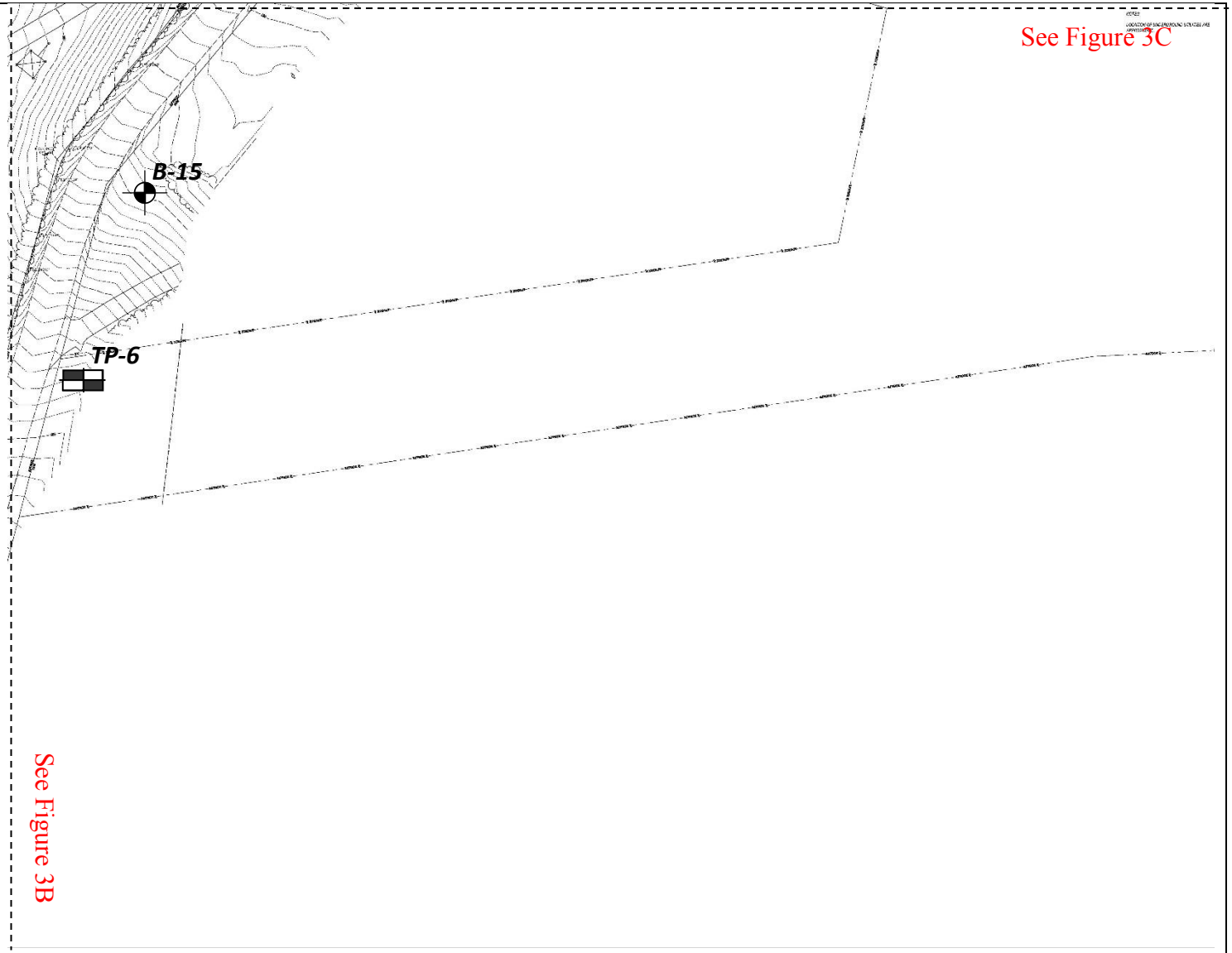
Approximate Scale (feet)




Note

Figure based on a drawing titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheet EX1.2," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

| Client: | Project: | Figure 3C – Boring and Test Pit Location Plan | |
|---|---|---|---|
| Lamoureux Pagano & Associates, Inc. | Proposed Beal Early Childhood Center School | | |
| LGCI Lahlaf Geotechnical Consulting, Inc. | Project Location: Shrewsbury, MA | LGCI Project No.: 1806 | Date: Sept. 2018 |




N

Legend

Approximate location of borings advanced by Northern Drill Service, Inc. of Northborough, MA between July 30 and August 3, 2018 and observed by LGCI.

Approximate location of test pits advanced by Hoffman Environmental Services, Inc. of North Kingstown, RI between July 26 and August 1, 2018 and observed by LGCI.

0 50 100 200

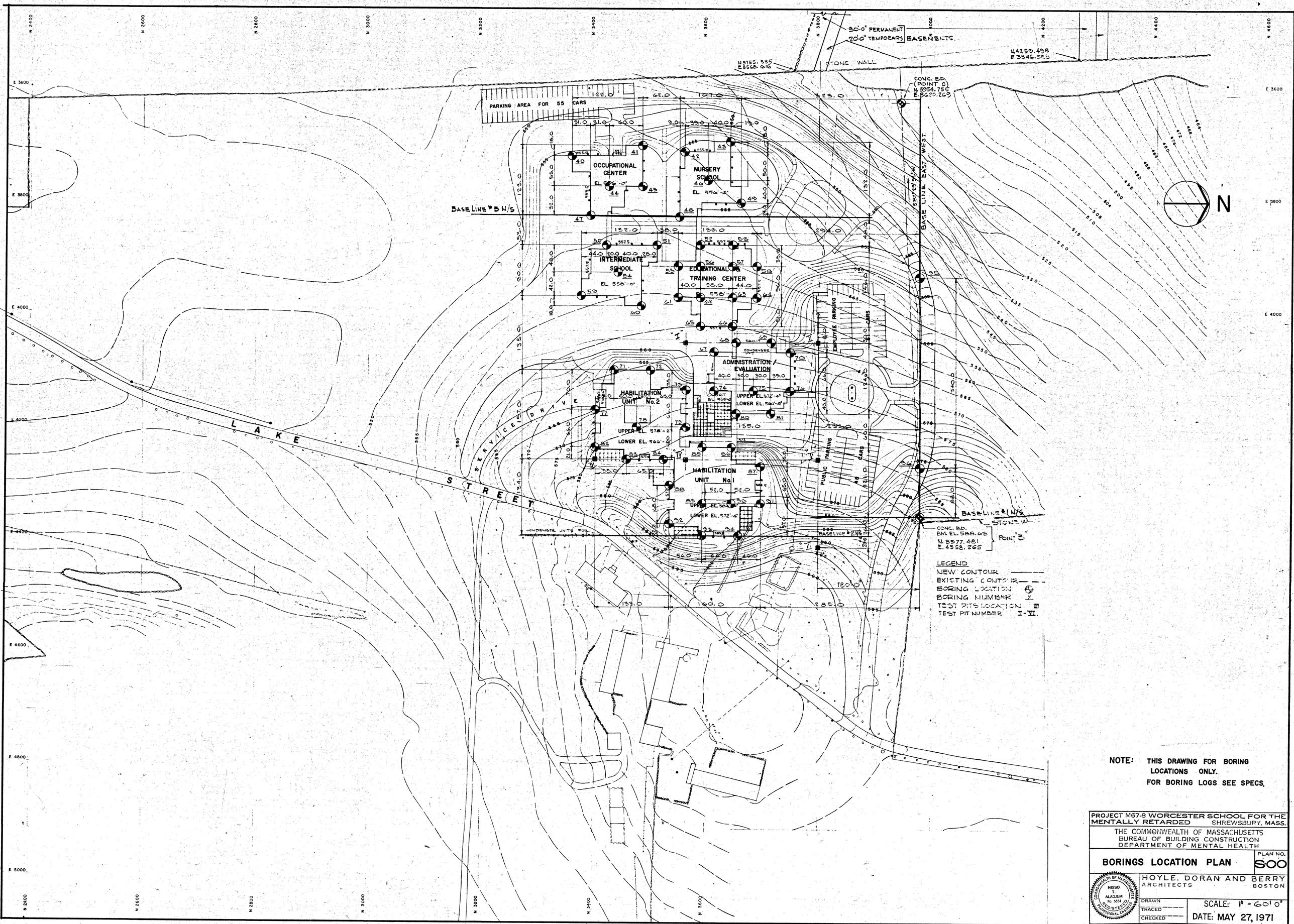
Approximate Scale (feet)

Note

Figure based on a drawing titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheet EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

| Client: | Project: | Figure 3D – Boring and Test Pit Location Plan | |
|---|---|---|---|
| Lamoureux Pagano & Associates, Inc. | Proposed Beal Early Childhood Center School | | |
| LGCI Lahlaf Geotechnical Consulting, Inc. | Project Location: Shrewsbury, MA | LGCI Project No.: 1806 | Date: Sept. 2018 |

# APPENDIX A - Location and Logs of Previous Borings and Test Pits




NOTE: THIS DRAWING FOR BORING LOCATIONS ONLY.
FOR BORING LOGS SEE SPECS.

PROJECT M67-9 WORCESTER SCHOOL FOR THE MENTALLY RETARDED SHREWSBURY, MASS.

THE COMMONWEALTH OF MASSACHUSETTS
BUREAU OF BUILDING CONSTRUCTION
DEPARTMENT OF MENTAL HEALTH

**BORINGS LOCATION PLAN**

PLAN NO. S00

COMMONWEALTH OF MASSACHUSETTS NISSO T. ALADJEM No. 5054 REGISTERED PROFESSIONAL ENGINEER

HOYLE, DORAN AND BERRY
ARCHITECTS BOSTON

DRAWN
TRACED
CHECKED

SCALE: 1" = 60'0"
DATE: MAY 27, 1971

## TEST PIT I

GROUND SURFACE ELEV. 568.5

| | |
|---|---|
| 0'0" – 1'6" | LOOSE LOAMY SAND |
| 1'6" – 5'6" | FIRM FINE SAND, SOME GRAVEL & CLAY, TRACE INORGANIC SILT |
| 5'6" – 10'0" | VERY HARD FINE SAND, SOME GRAVEL & STONES, SOME BOULDERS, LITTLE CLAY, TRACE INORGANIC SILT |

NO WATER ENCOUNTERED

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

## TEST PIT II

GROUND SURFACE ELEV. 564.0

| | |
|---|---|
| 0'0" – 2'0" | LOOSE LOAMY SAND |
| 2'0" – 4'0" | FIRM FINE SAND, SOME GRAVEL & CLAY, TRACE INORGANIC SILT |
| 4'0" – 10'0" | VERY HARD FINE SAND, SOME GRAVEL & STONES, SOME CLAY, TRACE INORGANIC SILT |

NO WATER ENCOUNTERED

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

## TEST PIT III

GROUND SURFACE ELEV. 580.0

| | |
|---|---|
| 0'0" – 1'0" | LOAMY SAND |
| 1'0" – 5'0" | FIRM FINE SAND, SOME CLAY, TRACE OF GRAVEL & STONES, TRACE OF INORGANIC SILT |
| 5'0" – 10'0" | VERY HARD FINE SAND, SOME GRAVEL & STONES, SOME CLAY, TRACE INORGANIC SILT |

NO WATER ENCOUNTERED

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

## TEST PIT IV

GROUND SURFACE ELEV. 588.0

| | |
|---|---|
| 0'0" – 1'0" | LOAM, TRACE SAND |
| 1'0" – 6'0" | FIRM FINE SAND, SOME CLAY, LITTLE GRAVEL, TRACE INORGANIC SILT |
| 6'0" – 10'0" | VERY HARD FINE SAND, SOME CLAY & GRAVEL, SOME STONES, TRACE INORGANIC SILT; VERY HARD FINE SAND & CLAY, SOME STONES, TRACE INORG. SILT |

▽ 8'6"

AT COMPLETION OF TEST PIT NO WATER ENCOUNTERED. OBSERVED WATER LEVEL 4-1/2-HOURS AFTER COMPLETION, WATER TABLE SEEKED ITS LEVEL.
WATER LEVEL 9'0" below ground surface

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

## TEST PIT V

GROUND SURFACE ELEV. 587.5

| | |
|---|---|
| 0'0" – 1'0" | LOAM, TRACE SAND |
| 1'0" – 6'0" | FIRM FINE SAND, SOME GRAVEL, STONES & CLAY, TRACE INORGANIC SILT |
| 6'0" – 10'0" | VERY HARD FINE SAND SOME GRAVEL & STONES SOME CLAY, TRACE OF INORGANIC SILT |

▽ 6'0"

WATER LEVEL 8'0" below ground surface

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

## TEST PIT VI

GROUND SURFACE ELEV. 601.5

| | |
|---|---|
| 0'0" – 1'0" | LOAM, TRACE SAND |
| 1'0" – 5'6" | FIRM FINE SAND, TRACE OF GRAVEL, TRACE OF INORGANIC SILTY CLAY |
| 5'6" – 10'0" | VERY HARD FINE SAND, SOME GRAVEL & STONES, SOME CLAY, TRACE INORGANIC SILT |

NO WATER ENCOUNTERED

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

## BORING #46

GROUND SURFACE ELEV. 550.0

| | | |
|---|---|---|
| 0'0" – 1'6" | LOAM, TRACE SAND | 4 |
| 1'6" – 3'0" | FIRM FINE SAND & INORGANIC SILTY CLAY, SOME GRAVEL | 9 |
| 3'0" – 10'0" | VERY HARD FINE SAND, SOME GRAV. & INORGANIC SILTY CLAY | 47; 55 |

▽ 4'6"

WATER LEVEL 4'6" below ground surface

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

## BORING #47

GROUND SURFACE ELEV. 554.0

| | | |
|---|---|---|
| 0'0" – 1'6" | LOAM | 4 |
| 1'6" – 3'0" | FIRM SANDY LOAM | 10 |
| 3'0" – 10'0" | HARD FINE SAND, SOME INORGANIC SILTY CLAY, SOME GRAVEL & STONES | 33; 44 |

▽ 6'0"

WATER LEVEL 6'0" below ground surface

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

## BORING #48

GROUND SURFACE ELEV. 554.0

| | | |
|---|---|---|
| 0'0" – 1'6" | LOAM | 4 |
| 1'6" – 2'6" | * | 17 |
| 2'6" – 10'0" | HARD FINE SAND, SOME INORGANIC SILTY CLAY, SOME GRAVEL & STONES | 41 |
| | VERY HARD FINE SAND, SOME GRAVEL & STONES, LITTLE INORGANIC SILTY CLAY | 66 |

551.83

▽ 5'6"

WATER LEVEL 5'6" below ground surface

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

*FIRM FINE SAND & INORGANIC SILTY CLAY, SOME GRAVEL & STONES

## BORING #49

GROUND SURFACE ELEV. 549.0

| | | |
|---|---|---|
| 0'0" – 1'0" | LOAM | 6 |
| 1'0" – 4'0" | FIRM FINE SAND, SOME INORGANIC SILTY CLAY, SOME GRAVEL | 21; 24 |
| 4'0" – 10'0" | VERY HARD FINE SAND, SOME INORGANIC SILTY CLAY, SOME GRAVEL & BOULDERS | 55; 60 |

▽ 6'0"

WATER LEVEL 6'0" below ground surface

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

## BORING #50

GROUND SURFACE ELEV. 555.0

| | | |
|---|---|---|
| 0'0" – 1'0" | LOAM | 3 |
| 1'0" – 3'0" | FIRM FINE SAND, SOME INORG. SILTY CLAY, SOME GRAVEL | 13 |
| 3'0" – 10'0" | VERY HARD FINE SAND, SOME INORGANIC SILTY CLAY, SOME GRAVEL & STONES | 58; 72 |

▽ 5'6"

WATER LEVEL 5'6" below ground surface

DATE STARTED 11-25-70
DATE COMPLETED 11-25-70

## BORING #51

GROUND SURFACE ELEV. 555.5

| | | |
|---|---|---|
| 0'0" – 1'0" | LOAM | 5 |
| 1'0" – 2'0" | * | 13 |
| 2'0" – 6'0" | HARD FINE SAND, SOME GRAVEL & STONES, LITTLE INORGANIC SILTY CLAY | 35 |
| 6'0" – 10'0" | VERY HARD FINE SAND & INORGANIC SILTY CLAY, SOME GRAVEL & STONES | 50 |

▽ 6'0"

WATER LEVEL 6'6" below ground surface

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

*FIRM FINE SAND & INORGANIC SILTY CLAY, SOME GRAVEL

BORING #40

GROUND SURFACE ELEV. 552.0

| | |
|---|---|
| LOOSE LOAMY SAND | 2 |
| LOOSE FINE SAND, SOME GRAVEL, LITTLE INORGANIC SILTY CLAY | 7 |
| HARD FINE SAND, SOME GRAVEL, TRACE INORGANIC SILTY CLAY | 47 |
| VERY HARD FINE SAND, GRAV. BLDRS., TRACE INORG. SILT | 134 |

1'6" 4'6" 8'0" 10'0"

WATER LEVELL 4'6"
below ground surface

DATE STARTED 11-25-70
DATE COMPLETED 11-25-70

BORING #41

GROUND SURFACE ELEV. 551.0

| | |
|---|---|
| LOOSE LOAMY SAND | 4 |
| FIRM FINE SAND, SOME GRAVEL, TRACE INORG. SILT | 28 |
| VERY HARD FINE SAND, GRAVEL & BOULDERS, TRACE INORGANIC SILT | 130 |
| VERY HARD FINE SAND, SOME GRAVEL, TRACE INORGANIC SILT | 66 |

2'0" 4'0" 7'0" 10'0"

WATER LEVEL 5'0"
below ground surface

DATE STARTED 11-25-70
DATE COMPLETED 11-25-70

BORING #42

GROUND SURFACE ELEV. 549.5

| | |
|---|---|
| LOOSE LOAMY SAND | 4 |
| HARD FINE SAND, SOME GRAVEL, TRACE INORGANIC SILTY CLAY | 32 |
| VERY HARD FINE SAND, GRAVEL & BOULDERS, TRACE INORGANIC SILTY CLAY | 131 |
| VERY HARD FINE SAND, SOME GRAVEL, TRACE INORGANIC SILTY CLAY | 62 |

2'0" 4'0" 8'0" 10'0"

WATER LEVEL 4'0"
below ground surface

DATE STARTED 11-25-70
DATE COMPLETED 11-25-70

BORING #43

GROUND SURFACE ELEV. 545.0

| | |
|---|---|
| LOOSE LOAMY SAND | 4 |
| FIRM FINE SAND, SOME GRAVEL, TRACE INORGANIC SILTY CLAY | 23 |
| VERY HARD FINE SAND & GRAVEL, TRACE INORGANIC SILTY CLAY | 127 * |

2'0" 7'0" 10'0"

WATER LEVEL 4'6"
below ground surface

DATE STARTED 11-25-70
DATE COMPLETED 11-25-70

* USED "A" ROD WITH 140 LB. WEIGHT.

BORING #44

GROUND SURFACE ELEV. 553.5

| | |
|---|---|
| LOAM | 4 |
| * | 15 |
| VERY HARD FINE SAND, SOME GRAVEL & STONES, TRACE INORGANIC SILTY CLAY | 56 |
| | 54 |

1'6" 2'6" 10'0"

WATER LEVEL 4'6"
below ground surface

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

*FIRM LOAMY FINE SAND, LITTLE GRAVEL, TRACE INORGANIC SILTY CLAY

BORING #45

GROUND SURFACE ELEV. 554.0

| | |
|---|---|
| LOAM, TRACE SAND | 4 |
| FIRM FINE SAND, SOME GRAVEL, TRACE INORGANIC SILTY CLAY | 18 |
| VERY HARD FINE SAND, SOME GRAVEL, SOME INORGANIC SILTY CLAY | 55 |

2'0" 4'6" 10'0"

WATER LEVEL 4'0"
below ground surface

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

BORING #52

GROUND SURFACE ELEV. 554.5

| | |
|---|---|
| LOAM | 6 |
| FIRM FINE SAND & INORGANIC SILTY CLAY, SOME GRAVEL | 21<br>29 |
| VERY HARD FINE SAND, SOME INORGANIC SILTY CLAY, SOME GRAVEL | 57<br>53 |

1'6" 4'6" 10'0"

NO WATER ENCOUNTERED

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

BORING #53

GROUND SURFACE ELEV. 552.5

| | |
|---|---|
| LOAM, TRACE SAND | 3 |
| VERY HARD FINE SAND, SOME INORGANIC SILTY CLAY, SOME GRAVEL & BLDRS. | 134 |
| VERY HARD FINE SAND, SOME INORGANIC SILTY CLAY, SOME GRAVEL & BLDRS. | 60 |

2'0" 5'0" 10'0"

NO WATER ENCOUNTERED

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

BORING #54

GROUND SURFACE ELEV. 557.5

| | |
|---|---|
| LOAM | 4 |
| * | 15 |
| HARD FINE SAND, SOME INORGANIC SILTY CLAY, SOME GRAVEL & STONES | 60 |
| ** | 139 |
| VERY HARD FINE SAND, SOME INORGANIC SILTY CLAY, SOME GRAVEL & STONES | 73 |

1'6" 2'6" 5'6" 6'6" 10'0"

WATER LEVEL 4'6"
below ground surface

DATE STARTED 11-25-70
DATE COMPLETED 11-25-70

*FIRM LOAMY FINE SAND, INORGANIC SILTY CLAY, SOME GRAVEL

**VERY HARD FINE SAND, GRAVEL & STONES, SOME INORGANIC SILTY CLAY

BORING #55

GROUND SURFACE ELEV. 556.5

| | |
|---|---|
| LOAM | 7 |
| HARD FINE SAND & INORGANIC SILTY CLAY, SOME GRAVEL | 33<br>39 |
| VERY HARD FINE SAND & INORGANIC SILTY CLAY, SOME GRAVEL | 140 *<br>36 * |

1'6" 6'0" 10'0"

WATER LEVEL 5'6"
below ground surface

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

* USED "A" ROD WITH 140 LB. WEIGHT.

BORING #56

GROUND SURFACE ELEV. 556.0

| | |
|---|---|
| LOAM | 6 |
| HARD FINE SAND & SOME INORGANIC SILTY CLAY, SOME GRAVEL | 32<br>33<br>35<br>42 |

1'0" 10'0"

NO WATER ENCOUNTERED

DATE STARTED 11-25-70
DATE COMPLETED 11-25-70

BORING #57

GROUND SURFACE ELEV. 554.5

| | |
|---|---|
| LOAM, TRACE SAND | 3 |
| FIRM FINE SAND, SOME INORGANIC SILTY CLAY, SOME GRAVEL | 28 |
| HARD FINE SAND, SOME INORGANIC SILTY CLAY, SOME GRAVEL | 48 |

1'6" 5'0" 10'0"

WATER LEVEL 5'0"
below ground surface

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

BORING #58

GROUND SURFACE ELEV. 553.5

| | |
|---|---|
| LOAM, TRACE SAND | 3 |
| FIRM FINE SAND & INORG. SILTY CLAY SOME GRAVEL | 26 |
| VERY HARD FINE SAND & INORG. SILTY CLAY, SOME GRAVEL & BLDRS. | * 136 |
| VERY HARD FINE SAND & GRAVEL, SOME INORGANIC SILTY CLAY | 61 |

2'0" 3'6" ▽ 5'6" 10'0"

WATER LEVEL 5'6"
below ground surface

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

BORING #59

GROUND SURFACE ELEV. 558.5

| | |
|---|---|
| LOAM | 5 |
| FIRM FINE SAND & INORG. SILTY CLAY SOME GRAVEL | 27 |
| HARD FINE SAND & INORGANIC SILTY CLAY SOME GRAVEL & STONES | 58 |
| * | 281 |
| VERY HARD FINE SAND, SOME GRAV. & STONES, TRACE INORGANIC SILT | 91 |

1'0" 2'6" 6'0" 7'0" 10'0"

NO WATER ENCOUNTERED

DATE STARTED 11-25-70
DATE COMPLETED 11-25-70

*VERY HARD FINE SAND & INORGANIC SILTY CLAY, SOME GRAVEL & STONES

BORING #60

GROUND SURFACE ELEV. 560.0

| | |
|---|---|
| LOAM | 6 |
| FIRM FINE SAND, LITTLE GRAVEL, TRACE INORGANIC SILTY CLAY | 24 29 |
| VERY HARD FINE SAND, SOME GRAVEL, TRACE INORGANIC SILTY CLAY | 52 54 |

1'6" 4'6" 10'0"

NO WATER ENCOUNTERED

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

BORING #61

GROUND SURFACE ELEV. 559.5

| | |
|---|---|
| LOAM | 7 |
| FIRM FINE SAND, SOME GRAVEL, LITTLE INORGANIC SILTY CLAY | 23 26 |
| HARD FINE SAND, SOME GRAVEL, TRACE INORGANIC SILT | 51 54 |

1'6" 4'0" 10'0"

NO WATER ENCOUNTERED

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

BORING #62

GROUND SURFACE ELEV. 560.0

| | |
|---|---|
| LOAM | 7 |
| HARD FINE SAND, SOME GRAVEL, SOME INORGANIC SILTY CLAY | 37 41 |
| VERY HARD FINE SAND, SOME GRAVEL, SOME INORGANIC SILTY CLAY | 53 58 |

2'0" 6'6" 10'0"

NO WATER ENCOUNTERED

DATE STARTED 11-25-70
DATE COMPLETED 11-25-70

BORING #63

GROUND SURFACE ELEV. 559.0

| | |
|---|---|
| LOAM, TRACE SAND | 3 |
| FIRM FINE SAND, SOME GRAVEL, LITTLE INORGANIC SILTY CLAY | 24 |
| VERY HARD FINE SAND, SOME GRAVEL, LITTLE INORGANIC SILTY CLAY | 62 |

1'6" 4'6" 10'0"

NO WATER ENCOUNTERED

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

BORING #70

GROUND SURFACE ELEV. 567.0

| | |
|---|---|
| LOOSE LOAMY SAND | 7 |
| FIRM FINE LOAMY SAND | 19 |
| VERY HARD FINE SAND, SOME GRAVEL, SOME INORGANIC SILTY CLAY | 129 127 * 131 * |

1'0" 3'0" 558.92½ 15'0"

NO WATER ENCOUNTERED

DATE STARTED 11-24-70
DATE COMPLETED 11-24-70

* USED "A" ROD WITH 140 LB. WEIGHT.

BORING #71

GROUND SURFACE ELEV. 569.0

| | |
|---|---|
| LOAM | 6 |
| ** | 25 |
| VERY HARD FINE SAND, SOME GRAVEL, SOME INORGANIC SILTY CLAY | 66 57 |
| VERY HARD FINE SAND, GRAVEL & SOME STONES, LITTLE INORGANIC SILTY CLAY | 135 196 * |

1'0" 2'0" ▽ 561.67½ 8'6" 15'0"

WATER LEVEL 7'6"
below ground surface

DATE STARTED 11-25-70
DATE COMPLETED 11-25-70

* USED "A" ROD WITH 140 LB. WEIGHT

**FIRM FINE LOAMY SAND, LITTLE INORGANIC SILTY CLAY

BORING #72

GROUND SURFACE ELEV. 571.0

| | |
|---|---|
| LOAM, LITTLE SAND, INORG. SILTY CLAY | 7 |
| FIRM FINE LOAMY SAND, SOME INORG. SILTY CLAY | 26 |
| VERY HARD FINE SAND, SOME GRAVEL & STONES, LITTLE INORGANIC SILT | 51 |
| VERY HARD FINE SAND, SOME GRAVEL & STONES, LITTLE INORGANIC SILT | 133 177 * |

1'0" 2'6" 6'0" 561.67½ 15'0"

NO WATER ENCOUNTERED

DATE STARTED 11-24-70
DATE COMPLETED 11-24-70

* USED "A" ROD WITH 140 LB. WEIGHT.

BORING #73

GROUND SURFACE ELEV. 576.0

| | |
|---|---|
| LOOSE LOAMY SAND | 8 |
| HARD FINE SAND, SOME GRAVEL, SOME INORGANIC SILTY CLAY | 42 52 |
| VERY HARD FINE SAND, SOME GRAV. & BOULDERS, LITTLE INORGANIC SILTY CLAY | 198 170 132 234 150 * 54 * |

1'6" 3'6" 561.67½ ▽ 20'0"

WATER LEVEL 15'6"
below ground surface

DATE STARTED 11-20-70
DATE COMPLETED 11-24-70

* USED "A" ROD WITH 140 LB. WEIGHT

BORING #74

GROUND SURFACE ELEV. 576.0

| | |
|---|---|
| LOAM, TRACE SAND | 8 |
| HARD FINE SAND, SOME CLAY, SOME INORG. SILTY CLAY | 41 |
| VERY HARD FINE SAND, SOME GRAV. & STONES, LITTLE INORGANIC SILTY CLAY | 125 160 170 |
| DRILLED BOULDER | |
| VERY HARD FINE SAND, SOME GRAV. & STONES, LITTLE INORGANIC SILTY CLAY | 100 * 156 * |

2'0" 4'0" 15'0" ▽ 16'0" 20'0" 555.83½

WATER LEVEL 16'0" (TRAPPED)
below ground surface

DATE STARTED 11-18-70
DATE COMPLETED 11-19-70

* USED "A" ROD WITH 140 LB. WEIGHT.

BORING #75

GROUND SURFACE ELEV. 576.0

| | |
|---|---|
| LOAM, TRACE SAND | 8 |
| FIRM FINE LOAMY SAND, SOME GRAV. | 18 |
| HARD FINE SAND, SOME INORGANIC SILTY CLAY, SOME GRAVEL | 47 |

1'6" 3'0" 5'0"

- REFUSAL -
(120 blows, no penetration)

NO WATER ENCOUNTERED

DATE STARTED 11-24-70
DATE COMPLETED 11-24-70

## BORING #64

GROUND SURFACE ELEV. 558.5

| | | |
|---|---|---|
| 1'6" | LOAM, TRACE SAND | 7 |
| | HARD FINE SAND, SOME GRAVEL, TRACE INORGANIC SILT | 33<br>37 |
| 4'6" | V. HARD FINE SAND, SOME GRAVEL, TR. INORGANIC SILT | 80 |
| 6'0" | VERY HARD FINE SAND, SOME GRAVEL, LITTLE INORGANIC SILT | 124 |
| 10'0" | | |

WATER LEVEL 5'6" below ground surface

DATE STARTED 11-27-70
DATE COMPLETED 11-27-70

## BORING #65

GROUND SURFACE ELEV. 564.5

| | | |
|---|---|---|
| 2'6" | LOAM, TRACE SAND | 6 |
| 3'6" | ** | 43 |
| | VERY HARD FINE SAND, SOME GRAVEL, LITTLE INORGANIC SILT | 55<br>57 |
| 9'6" | | 51 |
| | VERY HARD FINE SAND, SOME GRAVEL, LITTLE INORGANIC SILTY CLAY, SOME BOULDERS | 126<br>132<br>82 *<br>185 *<br>140 * |
| 15'0" | | |

NO WATER ENCOUNTERED

DATE STARTED 11-25-70
DATE COMPLETED 11-25-70

* USED "A" ROD WITH 140 LB. WEIGHT.

** HARD FINE SAND & INORGANIC SILT, SOME GRAVEL.

## BORING #66

GROUND SURFACE ELEV. 564.5

| | | |
|---|---|---|
| 3'0" | LOAM, TRACE SAND | 6 |
| | VERY HARD FINE SAND, SOME GRAVEL, LITTLE INORGANIC SILT | 57 |
| 6'0" | VERY HARD FINE SAND, SOME GRAVEL, LITTLE INORGANIC SILT | 127 |
| 8'0" | VERY HARD FINE SAND, SOME GRAVEL, & STONES, LITTLE INORGANIC SILT | 81 *<br>92 * |
| 15'0" | | |

NO WATER ENCOUNTERED

DATE STARTED 11-25-70
DATE COMPLETED 11-25-70

* USED "A" ROD WITH 140 LB. WEIGHT

## BORING #67

GROUND SURFACE ELEV. 569.5

| | | |
|---|---|---|
| 2'6" | LOAM, TRACE SAND | 7 |
| | VERY HARD FINE SAND, SOME INORGANIC SILT | 55 |
| 10'0" | VERY HARD FINE SAND, SOME GRAVEL & STONES, TRACE INORGANIC SILT | 99 *<br>105 * |
| 555.83' | | |
| 15'0" | | |

NO WATER ENCOUNTERED

DATE STARTED 11-25-70
DATE COMPLETED 11-25-70

* USED "A" ROD WITH 140 LB. WEIGHT.

## BORING #68

GROUND SURFACE ELEV. 568.0

| | | |
|---|---|---|
| 1'6" | LOAM, TRACE SAND | 7 |
| | HARD LOAMY FINE SAND, SOME STONES | 43 |
| 4'0" | HARD FINE SAND, SOME GRAVEL, SOME INORGANIC SILTY CLAY | 35 |
| 7'0" | VERY HARD FINE SAND, SOME GRAVEL, SOME INORGANIC SILTY CLAY | 75 |
| 555.83' 12'0" | | |
| | VERY HARD FINE SAND & GRAVEL, SOME INORGANIC SILTY CLAY | 100 *<br>101 * |
| 15'0" | | |

NO WATER ENCOUNTERED

DATE STARTED 11-25-70
DATE COMPLETED 11-25-70

* USED "A" ROD WITH 140 LB. WEIGHT

## BORING #69

GROUND SURFACE ELEV. 566.0

| | | |
|---|---|---|
| 1'6" | LOAM, TRACE SAND | 7 |
| 3'0" | FIRM FINE SAND, SOME INORG. SILT, TRACE OF LOAM | 24 |
| | VERY HARD FINE SAND, SOME GRAVEL, LITTLE INORGANIC SILT | 60<br>55 |
| 9'0" | | |
| 555.87' | V. HARD FINE SAND, SOME GRAVEL, LITTLE INORGANIC SILTY CLAY | 118 * |
| 11'0" | | 122 * |
| | VERY HARD FINE SAND, SOME GRAVEL, LITTLE INORGANIC SILTY CLAY | |
| 15'0" | | |

NO WATER ENCOUNTERED

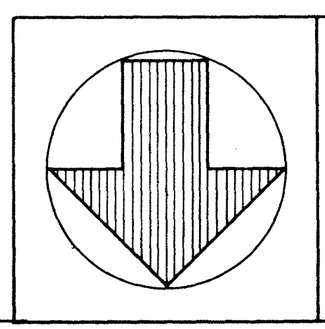
DATE STARTED 11-25-70
DATE COMPLETED 11-25-70

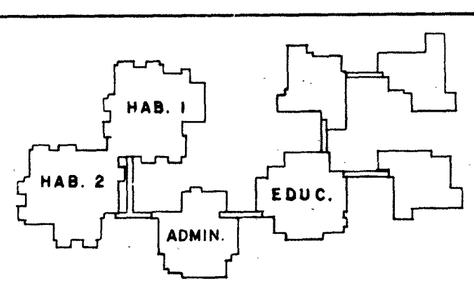
* USED "A" ROD WITH 140 LB. WEIGHT

## LEGEND

▽ WATER LEVEL (TRAPPED OR NATURAL)

0.0½ BOTTOM OF FOOTING






| REVISIONS | | |
|---|---|---|
| NO. | DESCRIPTION | DATE |
| | | |

PROJECT M67-8 WORCESTER SCHOOL FOR TH
MENTALLY RETARDED SHREWSBURY, MAS

THE COMMONWEALTH OF MASSACHUSETTS
BUREAU OF BUILDING CONSTRUCTION
DEPARTMENT OF MENTAL HEALTH

**BORING LOGS SHEET Nº1**

PLAN N
S-O

COMMONWEALTH OF MASSACHUSETTS
NISSO T. ALADJEM
No. 5554
REGISTERED PROFESSIONAL ENGINEER

HOYLE, DORAN AND BERR
ARCHITECTS BOSTO

DRAWN
TRACED
CHECKED

SCALE: NO SCALE
DATE: MAY 27, 1971

# APPENDIX B - Logs of LGCI's Borings

# BORING LOG

**B-1**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 7/30/18 **DATE COMPLETED:** 7/30/18
**BORING LOCATION:** Southwestern corner of northern parking lot
**COORDINATES:** NA
**SURFACE El.:** 566 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
**WEATHER:** 70s / Sunny
**GROUNDWATER LEVELS:**
**DURING DRILLING:** -
**AT END OF DRILLING:** Not encountered (NE)
**OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Justin Stevens
**DRILLING METHOD:** Hollow Stem Augers 3-1/4" I.D.
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** GW **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | 565.0 | 0 | S1 | 3-10-9-6 (19) | 24/22 | | Topsoil | 0.5 565.5 | S1 - Top 6": Silty SAND (SM), fine, trace medium, 25-30% fines, trace organic fines, trace roots, trace grass, dark brown, moist |
| | | | | | | | Fill | | Bot. 16": Silty SAND with Gravel (SM), fine to coarse, ~15% fines, 20-25% fine to coarse gravel, trace organic fines, trace asphalt, trace roots, brown, moist |
| | | 2 | S2 | 3-2-4-7 (6) | 24/9 | | | | S2 - Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 15-20% fine to coarse gravel, brown, moist |
| | | 4 | S3 | 3-42-31-13 (73) | 24/15 | | | | S3 - Silty SAND with Gravel (SM), fine, trace medium to coarse, ~15% fines, 15-20% fine to coarse gravel, trace organic fines, angular stone fragments in tip, brown, moist (appears re-worked) |
| 5 | 560.0 | 6 | S4 | 36-52-20-17 (72) | 24/18 | | | 7.0 559.0 | S4 - Top 12": Similar to S3, 25-30% fine to coarse gravel |
| | | 8 | | | | | Sand | | Bot. 6": Silty SAND (SM), fine, trace medium to coarse, 15-20% fines, trace fine gravel, gray to light brown, moist |
| 10 | 555.0 | 10 | S5 | 7-10-9-14 (19) | 24/23 | | | | S5 - Similar to Bot. 6" of S4, 20-25% fines |
| | | 12 | | | | | | | |
| 15 | 550.0 | 15 | S6 | 8-7-8-8 (15) | 24/24 | | | | S6 - Silty SAND (SM), fine, trace medium to coarse, 20-25% fines, trace fine gravel, light brown to gray, wet |
| | | 17 | | | | | | | |
| 20 | 545.0 | 20 | S7 | 7-8-11-13 (19) | 24/24 | | | | S7 - Silty SAND with Gravel (SM), fine, trace medium to coarse, 15-20% fines, 15-20% fine gravel, gray to light brown, moist |
| | | 22 | | | | | | 22.0 | Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings. |
| 25 | | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.
2. Offset boring 15 feet north of proposed boring location due to utility conflict.

# BORING LOG

**B-2**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 7/30/18 **DATE COMPLETED:** 7/30/18
**BORING LOCATION:** Western edge of northern parking lot
**COORDINATES:** NA
**SURFACE El.:** 566 ft. (see note 1) **TOTAL DEPTH:** 21 ft.
**WEATHER:** 80s / Sunny
**GROUNDWATER LEVELS:**
**DURING DRILLING:** -
**AT END OF DRILLING:** NE
**OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Justin Stevens
**DRILLING METHOD:** Hollow Stem Augers 3-1/4" I.D.
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** GW **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | 565.0 | 0 | S1 | 1-3-7-8 (10) | 24/15 | | Topsoil | 2.0 | S1 - Silty SAND (SM), fine, trace medium, 25-30% fines, trace organic fines, trace roots, trace grass, angular stone fragments in tip, dark brown, moist |
| | | 2 | S2 | 5-12-24-51 (36) | 24/10 | | Fill | 564.0 | S2 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine, trace medium to coarse, 10-15% fines, 15-20% fine to coarse gravel, trace roots, angular stone fragments, brown, moist |
| 5 | | 4 | S3 | 4-8-43-22 (51) | 24/16 | 1 | | | S3 - Silty SAND with Gravel (SM), fine to medium, trace coarse, 20-25% fines, 15-20% fine to coarse gravel, gray, moist<br>REMARK 1: Auger refusal at 5 feet. Offset boring 5 feet north and advanced auger to 4 feet. Obtained a sample from 4 feet to 6 feet. |
| | 560.0 | 6 | S4 | 19-30-16-19 (46) | 24/20 | | | 7.2 | S4 - Top 14": Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, trace coarse, 10-15% fines, 20-25% fine gravel, light brown, moist |
| | | 8 | | | | | Sand | 558.8 | Bot. 6": Silty SAND with Gravel (SM), fine, trace medium to coarse, 20-25% fines, 15-20% fine gravel, brown to gray, moist |
| 10 | | 9 | S5 | 14-22-11-12 (33) | 24/18 | | | | S5 - Silty SAND (SM), fine, trace medium to coarse, 20-25% fines, 5-10% fine gravel, brown, moist |
| | 555.0 | 11 | | | | | | | |
| 15 | | 14 | S6 | 81-15-14-12 (29) | 24/18 | | | | S6 - Similar to S5, angular rock fragments |
| | 550.0 | 16 | | | | | | | |
| 20 | | 19 | S7 | 6-12-11-12 (23) | 24/19 | | | | S7 - Similar to S5, angular rock fragments |
| | 545.0 | 21 | | | | | | 21.0 | Bottom of borehole at 21.0 feet. Backfilled borehole with drill cuttings. |
| 25 | | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-3**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 7/30/18 **DATE COMPLETED:** 7/30/18
**BORING LOCATION:** Western side of northern parking lot
**COORDINATES:** NA
**SURFACE El.:** 568.5 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
**WEATHER:** 80s / Sunny
**GROUNDWATER LEVELS:**
**DURING DRILLING:** -
**AT END OF DRILLING:** NE
**OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Justin Stevens
**DRILLING METHOD:** Hollow Stem Augers 3-1/4" I.D.
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** GW **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | S1 | 1-6-14-8 (20) | 24/17 | | Topsoil | 0.5 568.0 | S1 - Top 6": Silty SAND (SM), fine, trace medium, 25-30% fines, trace organic fines, trace roots, trace grass, dark brown, moist |
| | | 2 | S2 | 3-15-25-63 (40) | 24/16 | | Fill | 4.0 | Bot. 11": Silty SAND with Gravel (SM), fine to coarse, ~25% fines, 15-20% fine to coarse gravel, trace roots, brown, moist<br>S2 - Similar to Bot. 11" of S1, 15-20% fines, angular stone fragments at tip, no roots (appears re-worked) |
| 5 | 565.0 | 4 | S3 | 16-17-19-23 (36) | 24/17 | | Sand | 564.5 | S3 - Silty SAND (SM), fine, trace medium to coarse, 20-25% fines, 10-15% fine to coarse gravel, angular stone fragments, light brown to gray, moist |
| | 560.0 | 6 | | | | | | | |
| 10 | | 10 | S4 | 15-42-16-15 (58) | 24/18 | | | | S4 - Silty SAND (SM), fine, trace medium to coarse, 20-25% fines, 0-5% fine to coarse gravel, angular stone fragments, light brown, moist |
| | 555.0 | 12 | | | | | | | |
| 15 | | 15 | S5 | 14-20-18-28 (38) | 24/11 | | | | S5 - Similar to S4, angular stone fragments at tip, gray to orange mottles |
| | 550.0 | 17 | | | | | | | |
| 20 | | 20 | S6 | 5-13-38-24 (51) | 24/17 | | | | S6 - Similar to S4 |
| | 545.0 | 22 | | | | | | 22.0 | Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings. |
| 25 | | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-4**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 7/30/18 **DATE COMPLETED:** 7/30/18
**BORING LOCATION:** Eastern side of northern parking lot
**COORDINATES:** NA
**SURFACE El.:** 572 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
**WEATHER:** 80s / Sunny
**GROUNDWATER LEVELS:**
**DURING DRILLING:** -
**AT END OF DRILLING:** NE
**OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Justin Stevens
**DRILLING METHOD:** Hollow Stem Augers 3-1/4" I.D.
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** GW **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | S1 | 1-7-11-13 (18) | 24/22 | | Topsoil | 0.8 571.2 | S1 - Top 9": Silty SAND (SM), fine, trace medium, 25-30% fines, trace organic fines, trace roots, trace grass, dark brown, moist |
| | | | | | | | Fill | 2.0 570.0 | Bot. 13": Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, trace coarse, 10-15% fines, 15-20% fine to coarse gravel, light brown, moist |
| | 570.0 | 2 | S2 | 8-10-13-18 (23) | 24/24 | | Sand | | S2 - Silty SAND (SM), fine to medium, trace coarse, 20-25% fines, trace fine to coarse gravel, brown to gray, moist |
| | | 4 | S3 | 9-9-9-13 (18) | 24/21 | | | | S3 - Similar to S2, 5-10% fine to coarse gravel |
| 5 | | 6 | S4 | 10-16-11-11 (27) | 24/20 | | | | S4 - Silty SAND (SM), fine to medium, trace coarse, 25-30% fines, 5-10% fine to coarse gravel, brown to gray, moist |
| | 565.0 | 8 | | | | | | | |
| 10 | | 10 | S5 | 5-11-13-17 (24) | 24/23 | | | | S5 - Similar to S4 |
| | 560.0 | 12 | | | | | | | |
| 15 | | 15 | S6 | 13-13-13-20 (26) | 24/22 | | | | S6 - Similar to S4, angular stone fragments at tip |
| | 555.0 | 17 | | | | | | | |
| 20 | | 20 | S7 | 6-10-10-11 (20) | 24/24 | | | | S7 - Similar to S4, angular stone fragments at tip, gray |
| | 550.0 | 22 | | | | | | 22.0 | Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings. |
| 25 | | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-5**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 7/31/18 **DATE COMPLETED:** 7/31/18
**BORING LOCATION:** Southeastern corner of northern parking lot
**COORDINATES:** NA
**SURFACE El.:** 576 ft. (see note 1) **TOTAL DEPTH:** 21.8 ft.
**WEATHER:** 80s / Sunny
**GROUNDWATER LEVELS:**
**DURING DRILLING:** -
**AT END OF DRILLING:** NE
**OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Andy Miller
**DRILLING METHOD:** Hollow Stem Augers 3-1/4" I.D.
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** GW **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | 575.0 | 0 | S1 | 2-2-3-10 (5) | 24/9 | | Topsoil | 2.0 | S1 - Silty SAND (SM), fine, trace medium to coarse, ~25% fines, 5-10% fine to coarse gravel, trace organic fines, trace roots, trace grass, dark brown, moist |
| | | 2 | S2 | 12-14-16-18 (30) | 24/3 | | Sand | 574.0 | S2 - Silty SAND (SM), fine, trace medium to coarse, 15-20% fines, 10-15% fine to coarse gravel, angular stone fragments, brown to gray, moist |
| 5 | | 4 | S3 | 7-9-14-14 (23) | 24/24 | | | | S3 - Silty SAND (SM), fine, trace medium to coarse, 20-25% fines, 5-10% fine to coarse gravel, brown to gray, moist |
| | 570.0 | 6 | S4 | 43-24-15-19 (39) | 24/24 | | | | S4 - Similar to S3, 0-5% fine gravel, gray |
| | | 8 | | | | | | | |
| 10 | | 10 | S5 | 5-9-13-17 (22) | 24/17 | | | | S5 - Silty SAND (SM), fine, trace medium, 30-35% fines, 10-15% fine gravel, gray, moist |
| | 565.0 | 12 | | | | | | | |
| 15 | | 15 | S6 | 5-10-13-21 (23) | 24/24 | | | | S6 - Similar to S5, no gravel |
| | 560.0 | 17 | | | | | | | |
| 20 | | 20 | S7 | 7-14-16-120/3" (30) | 21/21 | | | | S7 - Similar to S5, 10-15% fine to coarse gravel |
| | 555.0 | 21.8 | | | | | | 21.8 | Bottom of borehole at 21.8 feet. Backfilled borehole with drill cuttings. |
| 25 | | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-6-OW**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 7/31/18 **DATE COMPLETED:** 7/31/18
**BORING LOCATION:** Northwestern corner of existing baseball field
**COORDINATES:** NA
**SURFACE El.:** 554 ft. (see note 1) **TOTAL DEPTH:** 27 ft.
**WEATHER:** 80s / Sunny
**GROUNDWATER LEVELS:**
- **DURING DRILLING:** 16.8 ft. / El. 537.2 ft. based on sample moisture
- **AT END OF DRILLING:** 20.5 ft. / El. 533.5 ft.
- **OTHER:** 13.0 ft. / El. 541.0 ft. measured on 8/3/18

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Andy Miller
**DRILLING METHOD:** Hollow Stem Augers 3-1/4" I.D.
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** GW **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | S1 | 2-6-6-11 (12) | 24/14 | | Topsoil | 0.3 553.7 | S1 - Top 4": Silty SAND (SM), fine, trace medium, 25-30% fines, trace organic fines, trace roots, trace grass, dark brown, moist |
| | | | | | | | Fill | 2.0 552.0 | Bot. 10": Silty SAND (SM), fine to medium, trace coarse, 15-20% fines, 5-10% fine to coarse gravel, angular stone fragments, light brown, moist |
| | | 2 | S2 | 11-16-18-32 (34) | 24/18 | | Sand | | S2 - Silty SAND (SM), fine, trace medium to coarse, 20-25% fines, 10-15% fine to coarse gravel, light brown to gray, moist |
| | 550.0 | 4 | S3 | 22-22-12-12 (34) | 24/12 | | | | S3 - Similar to S2, angular stone fragments |
| 5 | | 6 | S4 | 8-9-11-14 (20) | 24/9 | | | | S4 - Similar to S2, 25-30% fines, angular stone fragments |
| | 545.0 | 8 | | | | | | | |
| 10 | | 10 | S5 | 7-13-11-12 (24) | 24/24 | | | | S5 - Silty SAND (SM), fine, trace medium to coarse, 20-25% fines, 10-15% fine to coarse gravel, light brown, moist |
| | | 12 | | | | | | | |
| | 540.0 | | | | | | | | |
| 15 | | 15 | S6 | 8-14-16-17 (30) | 24/24 | | | | S6 - Similar to S5, 25-30% fines, Bot. 2" was wet |
| | | 17 | | | | | | | |
| | 535.0 | | | | | | | | |
| 20 | | 20 | S7 | 9-14-17-19 (31) | 24/24 | | | | S7 - Similar to S5, 25-30% fines, gray, wet |
| | | 22 | | | | | | | |
| | 530.0 | | | | | | | | |
| 25 | | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-6-OW**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | | 25 | S8 | 16-21-34-21 (55) | 24/24 | | Sand | 552.0 | S8 - Silty SAND (SM), fine, trace medium, ~40% fines, 0-5% fine gravel, gray to light brown, wet |
| | | 27 | | | | | | 27.0 | Bottom of borehole at 27.0 feet. Installed groundwater observation well at 27 feet. |
| | 525.0 | | | | | | | | |
| 30 | | | | | | | | | |
| | 520.0 | | | | | | | | |
| 35 | | | | | | | | | |
| | 515.0 | | | | | | | | |
| 40 | | | | | | | | | |
| | 510.0 | | | | | | | | |
| 45 | | | | | | | | | |
| | 505.0 | | | | | | | | |
| 50 | | | | | | | | | |
| | 500.0 | | | | | | | | |
| 55 | | | | | | | | | |
| | 495.0 | | | | | | | | |
| 60 | | | | | | | | | |

LGCI
Lahlaf Geotechnical Consulting, Inc.

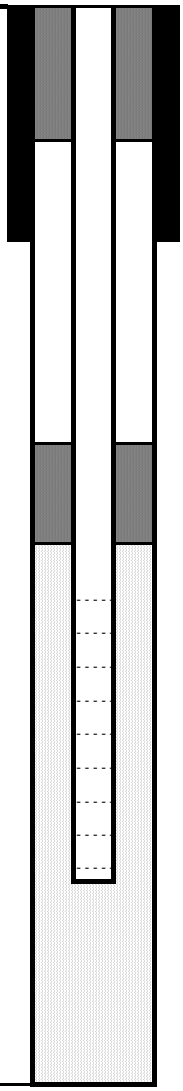
# GROUNDWATER OBSERVATION WELL INSTALLATION REPORT

Boring No. : **B-6-OW**



| | | | |
|---|---|---|---|
| Project Name: | **Proposed Beal Early Childhood Development Center School, Glavin Site, Shrewsbury, Massachusetts** | | |
| LGCI Project Number: | **1806** | | |
| Client: | **Lamourex Pagano & Associates, Inc.** | | |
| Drilling Subcontractor: | Northern Drill Services, Inc. | Date Started: | 7/31/18 |
| Drilling Foreman: | Andy Miller | Date Completed: | 7/31/18 |
| LGCI Engineer: | Gabriel Ward | Location: | Northwestern corner of existing baseball field |
| Ground Surface Elevation: | | Total Depth of Boring: | 27 feet |
| Ground Water Depth: | ~20.5 ft. at end of drilling | Drill Rig Type: | Mobile B-59 Truck Rig |
| | ~16.8 ft. based on sample moisture | Drilling Method: | Hollow Stem Augers 3-1/4" I.D. |

GENERAL SOIL CONDITIONS (not to scale)



Riser Stickup ~0' above ground surface

| | |
|---|---|
| THICKNESS OF SURFACE SEAL | 10 inch |
| TYPE OF SURFACE SEAL | Concrete |
| TYPE OF SURFACE CASING | Roadway Box |
| ID OF SURFACE CASING | 4 inch- cast aluminum |
| DEPTH TO BOTTOM OF CASING | 10 inch |
| ID OF RISER PIPE | 2 inch |
| TYPE OF RISER PIPE | Schedule 40 PVC |
| TYPE OF BACKFILL AROUND RISER PIPE | Type 1S Holliston Sand |
| DEPTH TO TOP OF SEAL | 10.5 |
| TYPE OF SEAL | Bentonite chips |
| DEPTH TO BOTTOM OF SEAL | 13.5 |
| DEPTH TO TOP OF PERVIOUS SECTION | 15 feet |
| TYPE OF PERVIOUS SECTION | Schedule 40 PVC |
| DESCRIBE OPENINGS | 0.01 inch slots |
| ID OF PERVIOUS SECTION | 2 inch |
| TYPE OF BACKFILL AROUND PERVIOUS SECTION | Type 1S Holliston Sand |
| DEPTH TO BOTTOM OF PERVIOUS SECTION | 25 feet |
| DEPTH TO BOTTOM OF SAND COLUMN | 27 feet |
| TYPE OF BACKFILL BELOW PERVIOUS SECTION | Type 1 S Holliston Sand |
| DIAMETER OF BOREHOLE | 8 inch |
| DEPTH TO BOTTOM OF BOREHOLE | 27 feet |

NOTES:

# BORING LOG

**B-7**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 7/31/18 **DATE COMPLETED:** 7/31/18
**BORING LOCATION:** Southwestern corner of existing baseball field
**COORDINATES:** NA
**SURFACE El.:** 549.5 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
**WEATHER:** 80s / Sunny
**GROUNDWATER LEVELS:**
**DURING DRILLING:** 4.9 ft. / El. 544.6 ft. based on sample moisture
**AT END OF DRILLING:** NE
**OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Andy Miller
**DRILLING METHOD:** Hollow Stem Augers 3-1/4" I.D.
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** GW **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | S1 | 2-4-6-6 (10) | 24/19 | | Topsoil | 0.3 | S1 - Top 4": Silty SAND (SM), fine, trace medium to coarse, 20-25% fines, trace fine gravel, trace organic fines, trace roots, trace grass, brown, moist<br>Bot. 15": Silty SAND (SM), fine, trace medium to coarse, ~20% fines, 0-5% fine to coarse gravel, light brown, moist |
| | | 2 | S2 | 6-8-9-10 (17) | 24/20 | | | | S2 - Similar to Bot. 15" of S1, light brown to gray |
| | 545.0 | 4 | S3 | 6-11-11-13 (22) | 24/21 | | | | S3 - Top 11": Similar to Bot. 15" of S1, light brown with orange to gray mottles<br>Bot. 10": Silty SAND (SM), fine, trace medium, ~35% fines, light brown, wet |
| 5 | | 6 | | | | | | | |
| | 540.0 | | | | | | | | |
| 10 | | 10 | S4 | 15-23-27-37 (50) | 24/24 | | Sand | | S4 - Silty SAND with Gravel (SM), fine, trace medium to coarse, 20-25% fines, ~15% fine to coarse gravel, light brown to gray, moist |
| | | 12 | | | | | | | |
| | 535.0 | | | | | | | | |
| 15 | | 15 | S5 | 23-32-56-68 (88) | 24/24 | | | | S5 - Similar to S4, 15-20% fine to coarse gravel, angular stone fragments |
| | | 17 | | | | | | | |
| | 530.0 | | | | | | | | |
| 20 | | 20 | S6 | 21-25-23-31 (48) | 24/24 | | | | S6 - Similar to S4, gray |
| | | 22 | | | | | | 22.0 | Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings. |
| | 525.0 | | | | | | | | |
| 25 | | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-8**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 7/31/18 **DATE COMPLETED:** 8/1/18
**BORING LOCATION:** Between the existing baseball fields
**COORDINATES:** NA
**SURFACE El.:** 554.5 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
**WEATHER:** 80s / Sunny
**GROUNDWATER LEVELS:**
- **DURING DRILLING:** -
- **AT END OF DRILLING:** NE
- **OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Andy Miller
**DRILLING METHOD:** Hollow Stem Augers 3-1/4" I.D.
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** GW / MC **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | S1 | 1-5-6-10 (11) | 24/18 | | Topsoil | 0.7 553.8 | S1 - Top 8": Silty SAND (SM), fine, trace medium, 20-25% fines, trace fine gravel, trace organic fines, trace roots, trace grass, dark brown, moist<br>Bot. 10": Silty SAND with Gravel (SM), fine, trace medium to coarse, 15-20% fines, 15-20% fine to coarse gravel, trace roots, light brown, moist |
| | | 2 | S2 | 9-12-10-8 (22) | 24/12 | | Fill | | S2 - Similar to Bot. 10" of S1, no roots |
| 5 | 550.0 | 4 | S3 | 6-5-5-9 (10) | 24/19 | | | | S3 - Silty SAND (SM), fine, trace medium, 15-20% fines, 5-10% fine gravel, trace organic fines, light brown, moist |
| | | 6 | S4 | 8-10-12-23 (22) | 24/16 | | | 6.0 548.5 | S4 - Silty SAND (SM), fine, trace medium, 15-20% fines, ~10% fine gravel, light brown, moist |
| | | 8 | | | | | | | |
| 10 | 545.0 | 10 | S5 | 9-10-6-7 (16) | 24/19 | | | | S5 - Silty SAND with Gravel (SM), fine, 20-25% fines, ~15% fine gravel, light brown, moist (damp at tip of spoon) |
| | | 12 | | | | | | | |
| 15 | 540.0 | 15 | | | | 1 | Sand | | REMARK 1: Heavy auger chattering from 14.5 feet to 15.5 feet due to cobbles. |
| | | 15 | S6 | 120/0" | 0/0 | | | | S6 - No recovery |
| 20 | 535.0 | 20 | S7 | 9-13-18-22 (31) | 24/22 | | | | S7 - Silty SAND with Gravel (SM), fine, ~25% fines, 15-20% fine gravel, gray, moist |
| | | 22 | | | | | | 22.0 | Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings. |
| 25 | 530.0 | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-9**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 8/1/18 **DATE COMPLETED:** 8/1/18
**BORING LOCATION:** Grass island north of Glavin Regional Center
**COORDINATES:** NA
**SURFACE El.:** 554 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
**WEATHER:** 70s / Cloudy
**GROUNDWATER LEVELS:**
**DURING DRILLING:** -
**AT END OF DRILLING:** NE
**OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Andy Miller
**DRILLING METHOD:** Hollow Stem Augers 3-1/4" I.D.
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** MC **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | S1 | 2-5-11-15 (16) | 24/17 | | Topsoil | 0.7 553.3 | S1 - Top 8": Silty SAND (SM), fine, trace medium, 25-30% fines, trace fine gravel, trace organic fines, trace roots, dark brown, moist<br>Bot. 8": Silty SAND with Gravel (SM), fine to medium, trace coarse, ~15% fines, 25-30% fine gravel, trace roots, light brown, moist |
| | | 2<br>2.5 | S2 | 120 | 6/2 | 1 | Fill | | S2 - Silty SAND (SM), fine, trace medium, ~15% fines, ~10% fine gravel, light brown to brown, moist<br>REMARK 1: Heavy auger chattering from 2.5 feet to 3.5 feet. |
| | 550.0 | 4 | S3 | 20-30-23-18 (53) | 24/17 | | | | S3 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, 10-15% fines, ~20% fine gravel, light brown, moist |
| 5 | | 6 | S4 | 12-44-11-11 (55) | 24/20 | | | | S4 - Top 12": Silty SAND with Gravel (SM), fine to medium, trace coarse, ~15% fines, 15-20% fine gravel, trace roots, light brown, moist<br>Bot. 8": Silty SAND with Gravel (SM), fine, ~20% fines, 20-25% fine gravel, light brown to gray, moist |
| | | 8 | | | | | | | |
| | 545.0 | 9 | S5 | 6-10-12-70 (22) | 24/15 | | | | S5 - Silty SAND with Gravel (SM), fine, trace medium, ~20% fines, ~15% fine gravel, trace roots, light brown, moist |
| 10 | | 11 | | | | 2 | | 11.0 543.0 | REMARK 2: Heavy auger chattering from 11 feet to 12 feet. |
| | | | S6 | 6-8-12-14 (20) | 24/6 | | Sand | | S6 - Silty SAND (SM), fine, trace medium, 15-20% fines, ~5% fine gravel, light brown to gray, moist |
| | | 13 | | | | | | | |
| | 540.0 | | | | | | | | |
| 15 | | 15 | S7 | 9-10-12-22 (22) | 24/20 | | | | S7 - Silty SAND with Gravel (SM), fine, trace medium to coarse, 20-25% fines, ~15% fine gravel, light brown, moist |
| | | 17 | | | | | | | |
| | 535.0 | | | | | | | | |
| 20 | | 20 | S8 | 7-11-28-19 (39) | 24/17 | | | | S8 - Similar to S7, ~30% fines, ~20% fine gravel |
| | | 22 | | | | | | 22.0 | Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings. |
| | 530.0 | | | | | | | | |
| 25 | | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-10**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 8/1/18 **DATE COMPLETED:** 8/1/18
**BORING LOCATION:** Grass area north of Glavin Regional Center
**COORDINATES:** NA
**SURFACE El.:** 555 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
**WEATHER:** 70s / Cloudy
**GROUNDWATER LEVELS:**
**DURING DRILLING:** 20.0 ft. / El. 535.0 ft. based on sample moisture
**AT END OF DRILLING:** -
**OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Andy Miller
**DRILLING METHOD:** Hollow Stem Augers 3-1/4" I.D.
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** MC **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | S1 | 1-4-11-12 (15) | 24/13 | | Topsoil | 0.5 554.5 | S1 - Top 6": Silty SAND (SM), fine, ~30% fines, trace fine to coarse gravel, trace organic fines, trace roots, trace grass, dark brown, moist<br>Bot. 7": Silty SAND with Gravel (SM), fine to medium, trace coarse, ~15% fines, ~20% fine gravel, trace roots, brown, moist |
| | | 2 | S2 | 13-10-10-15 (20) | 24/15 | | Fill | 4.0 551.0 | S2 - Silty SAND with Gravel (SM), fine, trace medium, ~20% fines, 20-25% fine gravel, light brown, moist |
| 5 | 550.0 | 4 | S3 | 12-13-14-12 (27) | 24/15 | | Sand | | S3 - Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 25-30% fine to coarse gravel, angular stone fragments, brown, moist |
| | | 6 | S4 | 22-14-14-12 (28) | 24/16 | | | | S4 - Similar to S3 |
| | | 8 | | | | | | | |
| 10 | 545.0 | 9 | S5 | 8-7-8-6 (15) | 24/10 | | | | S5 - Similar to S3 |
| | | 11 | | | | | | | |
| 15 | 540.0 | 15 | S6 | 7-9-10-16 (19) | 24/22 | | | | S6 - Silty SAND with Gravel (SM), fine, trace medium to coarse, 25-30% fines, ~15% fine gravel, light brown, moist |
| | | 17 | | | | | | | |
| 20 | 535.0 | 20 | S7 | 5-8-12-18 (20) | 24/22 | | | | S7 - Top 20": Silty SAND (SM), fine, trace medium, 35-40% fines, slightly plastic, 5-10% fine gravel, light brown, wet<br>Bot. 2": Well Graded SAND with Silt (SW-SM), fine to coarse, 10-15% fines, 5-10% fine gravel, light brown, wet |
| | | 22 | | | | | | 22.0 | Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings. |
| 25 | 530.0 | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-11**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 8/1/18 **DATE COMPLETED:** 8/1/18
**BORING LOCATION:** Grass area near northern parking lot
**COORDINATES:** NA
**SURFACE El.:** 560 ft. (see note 1) **TOTAL DEPTH:** 22 ft.
**WEATHER:** 70s / Cloudy
**GROUNDWATER LEVELS:**
- **DURING DRILLING:** -
- **AT END OF DRILLING:** NE
- **OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Andy Miller
**DRILLING METHOD:** Hollow Stem Augers 3-1/4" I.D.
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** MC **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | S1 | 1-6-10-21 (16) | 24/20 | | Topsoil | 1.0 | S1 - Top 12": Silty SAND (SM), fine, trace medium, 25-30% fines, 5-10% fine gravel, trace organic fines, trace roots, dark brown, moist |
| | | 2 | S2 | 18-16-21-22 (37) | 24/16 | | Fill | 559.0 | Bot. 8": Silty SAND with Gravel (SM), fine, trace medium to coarse, 15-20% fines, 25-30% fine to coarse gravel, trace roots, light brown, moist<br>S2 - Similar to Bot. 8" of S1 |
| | | 4 | S3 | 8-7-5-6 (12) | 24/18 | | Sand | 4.0<br>556.0 | S3 - Silty SAND with Gravel (SM), fine, trace medium, ~30% fines, ~20% fine gravel, light brown, moist |
| 5 | 555.0 | 6 | S4 | 12-12-26-19 (38) | 24/14 | | | | S4 - Similar to S3 |
| | | 8 | | | | | | | |
| 10 | 550.0 | 10 | S5 | 6-5-11-10 (16) | 24/13 | | | | S5 - Silty SAND (SM), fine, trace medium, 30-35% fines, ~10% fine gravel, brown to gray, moist |
| | | 12 | | | | | | | |
| 15 | 545.0 | 15 | S6 | 4-5-8-13 (13) | 24/17 | | | | S6 - Similar to S5 |
| | | 17 | | | | | | | |
| 20 | 540.0 | 20 | S7 | 5-8-11-13 (19) | 24/16 | | | | S7 - Silty SAND with Gravel (SM), fine, trace medium, 30-35% fines, 15-20% fine gravel, brown with orange mottles, moist |
| | | 22 | | | | | | 22.0 | Bottom of borehole at 22.0 feet. Backfilled borehole with drill cuttings. |
| 25 | 535.0 | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-12**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 8/2/18 **DATE COMPLETED:** 8/2/18
**BORING LOCATION:** Center of proposed building footprint
**COORDINATES:** NA
**SURFACE El.:** 556.5 ft. (see note 1) **TOTAL DEPTH:** 31 ft.
**WEATHER:** 90s / Sunny
**GROUNDWATER LEVELS:**
- ▽ **DURING DRILLING:** 19.0 ft. / El. 537.5 ft. based on sample moisture
- ▼ **AT END OF DRILLING:** 4.0 ft. / El. 552.5 ft.
- ▼ **OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Andy Miller
**DRILLING METHOD:** Drive and wash with 4-inch casing
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** MC **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | S1 | 9-13-11-11 (24) | 24/20 | | Topsoil | 0.5 556.0 | S1 - Top 6": Silty SAND (SM), fine, trace medium to coarse, ~20% fines, trace fine gravel, trace organic fines, trace roots, trace grass, brown, moist |
| | 555.0 | | | | | | Fill | | Bot. 14": Silty SAND with Gravel (SM), fine, 15-20% fines, ~15% fine gravel, trace organic fines, brown to light brown, moist |
| | | 2 | S2 | 9-8-6-5 (14) | 24/13 | | | | S2 - Poorly Graded SAND with Silt and Gravel (SP-SM), fine to medium, trace coarse, 10-15% fines, ~15% fine gravel, brown, moist |
| | | 4 | S3 | 4-5-5-6 (10) | 24/8 | | | | ▼ S3 - Silty SAND (SM), fine to coarse, 20-25% fines, 5-10% fine gravel, brown, moist |
| 5 | | | | | | | | 6.0 550.5 | |
| | 550.0 | 6 | S4 | 6-10-15-21 (25) | 24/14 | | Sand | | S4 - Silty SAND with Gravel (SM), fine, trace medium to coarse, 20-25% fines, ~15% fine gravel, light brown to gray, moist |
| | | 8 | | | | | | | |
| | | 9 | S5 | 17-21-23-26 (44) | 24/20 | | | | S5 - Similar to S4, 20-25% fine gravel |
| 10 | 545.0 | 11 | | | | | | | |
| | | 14 | S6 | 10-15-53-36 (68) | 24/14 | | | | S6 - Silty SAND with Gravel (SM), fine, trace medium, 30-35% fines, 25-30% fine gravel, gray, moist to wet |
| 15 | 540.0 | 16 | | | | | | | |
| | | 19 | S7 | 9-14-21-17 (35) | 24/9 | | | | ▽ S7 - Silty SAND with Gravel (SM), fine to medium, 25-30% fines, ~15% fine gravel, gray, wet |
| 20 | 535.0 | 21 | | | | | | | |
| | | 24 | | 10-13-18-19 | | | | | S8 - Similar to S7, angular stone fragments |
| 25 | | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-12**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | | 24–26 | S8 | (31) | 24/6 | | Sand | 550.5 | |
| | 530.0 | | | | | | | | |
| 30 | | 29–31 | S9 | 8-10-13-16 (23) | 24/19 | | | | S9 - Silty SAND with Gravel (SM), fine, trace medium, 25-30% fines, ~15% fine gravel, gray, moist |
| | 525.0 | | | | | | | 31.0 | Bottom of borehole at 31.0 feet. Backfilled borehole with drill cuttings and one and a half bags of gravel. |
| 35 | | | | | | | | | |
| | 520.0 | | | | | | | | |
| 40 | | | | | | | | | |
| | 515.0 | | | | | | | | |
| 45 | | | | | | | | | |
| | 510.0 | | | | | | | | |
| 50 | | | | | | | | | |
| | 505.0 | | | | | | | | |
| 55 | | | | | | | | | |
| | 500.0 | | | | | | | | |
| 60 | | | | | | | | | |

# BORING LOG

**B-13**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 8/2/18 **DATE COMPLETED:** 8/2/18
**BORING LOCATION:** Northern side of proposed roadway
**COORDINATES:** NA
**SURFACE El.:** 603 ft. (see note 1) **TOTAL DEPTH:** 16 ft.
**WEATHER:** 90s / Sunny
**GROUNDWATER LEVELS:**
**DURING DRILLING:** -
**AT END OF DRILLING:** NE
**OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Andy Miller
**DRILLING METHOD:** HSA (3-1/4" I.D.) then 4-inch casing
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** MC **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | S1 | 2-3-5-11 (8) | 24/12 | | Topsoil | 0.5 | S1 - Top 6": Silty SAND (SM), fine, trace medium, 20-25% fines, trace organic fines, trace roots, trace grass, dark brown, moist<br>Bot. 6": Silty SAND with Gravel (SM), fine, trace medium, ~20% fines, 15-20% fine gravel, trace organic fines, trace roots, brown, moist |
| | 600.0 | 2 | S2 | 7-18-18-10 (36) | 24/19 | | Fill | 4.0 | S2 - Silty SAND (SM), fine, trace medium, ~20% fines, ~10% fine gravel, trace roots, angular stone fragments, light brown, moist |
| 5 | | 4<br>5.4<br>5 | S3 | 6-8-112/5" | 17/15 | 1 | | | REMARK 1: Heavy auger chattering at 4 feet. Observed rock fragments in drill cuttings. Offset boring 3 feet north and encountered auger refusal at 4 feet. Switched to 4-inch casing and advanced roller bit from 4 feet to 5 feet through boulder. |
| | | | S4 | 9-14-14-15 (28) | 24/20 | | | | S3 - Silty SAND with Gravel (SM), fine, trace medium, ~25% fines, 15-20% fine gravel, light brown, moist<br>S4 - Similar to S3, 20-25% fine gravel, light brown to gray |
| | 595.0 | 7 | | | | | | | |
| 10 | | 9<br>11 | S5 | 7-16-22-23 (38) | 24/14 | | Sand | | S5 - Silty SAND with Gravel (SM), fine, trace medium, 20-25% fines, ~25% fine gravel, light brown to gray, moist |
| | 590.0 | | | | | | | | |
| 15 | | 14<br>16 | S6 | 32-26-34-24 (60) | 24/12 | | | 16.0 | S6 - Silty SAND with Gravel (SM), fine, trace medium, ~35% fines, 25-30% fine to coarse gravel, light brown to gray, moist to wet |
| | 585.0 | | | | | | | | Bottom of borehole at 16.0 feet. Backfilled borehole with drill cuttings and one and a half bags of gravel. |
| 20 | | | | | | | | | |
| | 580.0 | | | | | | | | |
| 25 | | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-14**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 8/2/18 **DATE COMPLETED:** 8/2/18
**BORING LOCATION:** Proposed roadway near abandoned building
**COORDINATES:** NA
**SURFACE El.:** 600 ft. (see note 1) **TOTAL DEPTH:** 16 ft.
**WEATHER:** 90s / Sunny
**GROUNDWATER LEVELS:**
**DURING DRILLING:** -
**AT END OF DRILLING:** NE
**OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Andy Miller
**DRILLING METHOD:** Drive and wash with 4-inch casing
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** MC **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | S1 | 2-3-3-7 (6) | 24/15 | | Topsoil | 0.5 / 599.5 | S1 - Top 6": Silty SAND (SM), fine to medium, ~25% fines, ~5% fine gravel, trace organic fines, trace roots, dark brown, moist<br>Bot. 9": Silty SAND (SM), fine, 25-30% fines, 10-15% fine gravel, trace organic fines, trace roots, brown, moist |
| | | 2 | S2 | 12-12-9-9 (21) | 24/19 | | Fill | | S2 - Silty SAND with Gravel (SM), fine, trace medium, ~20% fines, ~15% fine gravel, light brown to gray, moist (appears re-worked) |
| 5 | 595.0 | 4 | S3 | 8-8-11-20 (19) | 24/18 | | | | S3 - Silty SAND with Gravel (SM), fine, trace medium to coarse, 15-20% fines, ~15% fine gravel, light brown to gray, moist |
| | | 6 | S4 | 16-22-25-25 (47) | 24/6 | | Sand | 6.0 / 594.0 | S4 - Silty SAND with Gravel (SM), fine to medium, ~30% fines, 15-20% fine gravel, light brown to gray, moist to wet |
| | | 8 | | | | | | | |
| 10 | 590.0 | 9 / 9.8 | S5 | 8-112/4" | 10/5 | 1 | | | S5 - Similar to S4<br>REMARK 1: Heavy drill chattering from 9.5 feet to 11 feet. |
| 15 | 585.0 | 14 | S6 | 16-28-26-33 (54) | 24/22 | | | | S6 - Silty SAND with Gravel (SM), fine to medium, trace coarse, ~25% fines, 20-25% fine gravel, gray, moist |
| | | 16 | | | | | | 16.0 | Bottom of borehole at 16.0 feet. Backfilled borehole with drill cuttings and one and a half bags of gravel. |
| 20 | 580.0 | | | | | | | | |
| 25 | 575.0 | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-15**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 8/2/18 **DATE COMPLETED:** 8/2/18
**BORING LOCATION:** Proposed roadway near abandoned building
**COORDINATES:** NA
**SURFACE El.:** 585.5 ft. (see note 1) **TOTAL DEPTH:** 16 ft.
**WEATHER:** 90s / Sunny
**GROUNDWATER LEVELS:**
**DURING DRILLING:** -
**AT END OF DRILLING:** 4.0 ft. / El. 581.5 ft.
**OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Andy Miller
**DRILLING METHOD:** Drive and wash with 4-inch casing
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** MC **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | 585.0 | 0 | S1 | 1-2-1-3 (3) | 24/10 | | Topsoil | 2.0 | S1 - Silty SAND (SM), fine, trace medium, 25-30% fines, ~5% fine gravel, trace organic fines, trace roots, trace grass, dark brown, moist |
| | | 2 | S2 | 2-3-7-10 (10) | 24/15 | | Fill | 583.5 | S2 - SILT with Sand (ML), 30-35% fine, trace medium to coarse sand, 0-5% fine gravel, trace organic fines, trace roots, light brown, moist |
| | | 4 | S3 | 5-8-112/4" | 16/13 | 1 | | | S3 - Similar to S2, moist to wet<br>REMARK 1: Heavy drill chattering from 5 feet to 7 feet. Advanced roller bit through boulder from 5 feet to 7 feet. |
| 5 | 580.0 | 5.3 | | | | | | 7.0 | |
| | | | | | | | Sand | 578.5 | |
| | | 9 | S4 | 6-12-20-17 (32) | 24/18 | | | | S4 - Silty SAND with Gravel (SM), fine to medium, 25-30% fines, ~15% fine to coarse gravel, light brown to gray, moist |
| 10 | 575.0 | 11 | | | | | | | |
| | | 14 | S5 | 8-13-16-18 (29) | 24/18 | | | | S5 - Similar to S4, 20-25% fine to coarse gravel |
| 15 | 570.0 | 16 | | | | | | 16.0 | |
| | | | | | | | | | Bottom of borehole at 16.0 feet. Backfilled borehole with drill cuttings and one and a half bags of gravel. |
| 20 | 565.0 | | | | | | | | |
| 25 | | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-16**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 8/3/18 **DATE COMPLETED:** 8/3/18
**BORING LOCATION:** Grass area near northeastern corner of building
**COORDINATES:** NA
**SURFACE El.:** 561 ft. (see note 1) **TOTAL DEPTH:** 21 ft.
**WEATHER:** 80s / Partly Cloudy
**GROUNDWATER LEVELS:**
- **DURING DRILLING:** 15.0 ft. / El. 546.0 ft. based on sample moisture
- **AT END OF DRILLING:** -
- **OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Justin Stevens
**DRILLING METHOD:** Hollow Stem Auger 3-1/4" I.D.
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** MC **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | 560.0 | 0 | S1 | 2-6-10-15 (16) | 24/17 | | Topsoil | 0.5 / 560.5 | S1 - Top 6": Silty SAND (SM), fine, trace medium, 25-30% fines, ~5% fine gravel, trace organic fines, trace roots, dark brown, moist |
| | | 2 | S2 | 8-11-8-13 (19) | 24/10 | | Fill | | Bot. 11": Silty SAND with Gravel (SM), fine to medium, 15-20% fines, ~15% fine gravel, trace roots, light brown, moist<br>S2 - Silty SAND with Gravel (SM), fine, trace medium to coarse, 15-20% fines, 15-20% fine gravel, light brown, moist |
| 5 | 555.0 | 4 | S3 | 7-14-15-60 (29) | 24/20 | 1 | Sand | 4.0 / 557.0 | S3 - Silty SAND with Gravel (SM), fine, ~20% fines, ~15% fine gravel, light brown, moist<br>REMARK 1: Auger chattered from 6 feet to 8 feet. Observed rock fragments in drill cuttings. |
| 10 | 550.0 | 8 | S4 | 6-9-11-13 (20) | 24/20 | | | | S4 - Silty SAND with Gravel (SM), fine, 20-25% fines, 20-25% fine gravel, light gray, moist |
| 15 | 545.0 | 15 | S5 | 8-19-17-38 (36) | 24/6 | | | | ∇ S5 - Silty SAND with Gravel (SM), fine, 20-25% fines, 30-35% fine angular gravel, light gray, wet |
| | | 17 | S6 | 21-12-19-21 (31) | 24/18 | | | | S6 - Similar to S5, 20-25% fine gravel |
| 20 | 540.0 | 19 | S7 | 17-19-20-23 (39) | 24/22 | | | | S7 - Similar to S5 |
| | | 21 | | | | | | 21.0 | Bottom of borehole at 21.0 feet. Backfilled borehole with drill cuttings. |
| 25 | | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-17**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 8/3/18 **DATE COMPLETED:** 8/3/18
**BORING LOCATION:** Grass area near edge of southern parking lot
**COORDINATES:** NA
**SURFACE El.:** 561.5 ft. (see note 1) **TOTAL DEPTH:** 17 ft.
**WEATHER:** 80s / Partly Cloudy
**GROUNDWATER LEVELS:**
**DURING DRILLING:** -
**AT END OF DRILLING:** NE
**OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Justin Stevens
**DRILLING METHOD:** Hollow Stem Auger 3-1/4" I.D.
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** MC **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | S1 | 1-22-11-22 (33) | 24/13 | | Topsoil | 0.5 561.0 | S1 - Top 6": Silty SAND (SM), fine, trace medium, trace organic fines, trace roots, trace grass, dark brown, moist |
| | 560.0 | 2 | S2 | 24-20-33-23 (53) | 24/20 | | Fill | 4.0 | Bot. 7": Silty SAND with Gravel (SM), fine, trace medium to coarse, ~15% fines, 25-30% fine angular gravel, light brown, moist<br>S2 - Silty SAND with Gravel (SM), fine, 15-20% fines, ~15% fine subrounded to angular gravel, light brown, moist |
| 5 | | 4 | S3 | 5-9-10-13 (19) | 24/20 | | Sand | 557.5 | S3 - Silty SAND with Gravel (SM), fine, trace medium, 20-25% fines, 15-20% fine subrounded gravel, light brown, moist |
| | 555.0 | 6 | S4 | 16-22-24-26 (46) | 24/20 | | | | S4 - Similar to S3, 25-30% fine to coarse subrounded to angular gravel |
| 10 | | 8 | | | | | | | |
| | 550.0 | 10 | S5 | 7-22-16-21 (38) | 24/20 | | | | S5 - Similar to S3, light brown to gray |
| | | 12 | | | | | | | |
| 15 | 545.0 | 15 | S6 | 18-32-19-26 (51) | 24/14 | | | | S6 - Silty SAND with Gravel (SM), fine, trace medium to coarse, ~25% fines, ~30% fine subrounded to angular gravel, light brown to gray, moist |
| | | 17 | | | | | | 17.0 | Bottom of borehole at 17.0 feet. Backfilled borehole with drill cuttings. |
| 20 | 540.0 | | | | | | | | |
| 25 | | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# BORING LOG

**B-18**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 8/3/18 **DATE COMPLETED:** 8/3/18
**BORING LOCATION:** Near northeastern corner of building by gazebo
**COORDINATES:** NA
**SURFACE El.:** 578 ft. (see note 1) **TOTAL DEPTH:** 17 ft.
**WEATHER:** 80s / Partly Cloudy
**GROUNDWATER LEVELS:**
**DURING DRILLING:** -
**AT END OF DRILLING:** NE
**OTHER:** -

**DRILLING SUBCONTRACTOR:** Northern Drill Service, Inc.
**DRILLING FOREMAN:** Justin Stevens
**DRILLING METHOD:** Hollow Stem Auger 3-1/4" I.D.
**DRILL RIG TYPE/MODEL:** Mobile B-59 Truck Rig
**HAMMER TYPE:** Automatic
**HAMMER WEIGHT:** 140 lb. **HAMMER DROP:** 30 in.
**SPLIT SPOON DIA.:** 1.375 in. I.D., 2 in. O.D.
**CORE BARREL SIZE:** NA
**LOGGED BY:** MC **CHECKED BY:** NB

| Depth (ft.) | El. (ft.) | Sample Interval (ft.) | Sample Number | Blow Counts (N Value) | Pen./Rec. (in.) | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | S1 | 1-6-8-7 (14) | 24/16 | | Topsoil | 0.6 577.4 | S1 - Top 7": Silty SAND (SM), fine, trace medium, 25-30% fines, trace fine angular gravel, trace organic fines, trace roots, dark brown, moist |
| | | | | | | | Fill | | Bot. 9": Well Graded SAND with Silt and Gravel (SW-SM), fine to coarse, ~10% fines, 15-20% fine angular gravel, trace roots, brown, moist |
| | | 2 | S2 | 6-8-4-4 (12) | 24/12 | | | | S2 - Similar to Bot. 9" of S1, 20-25% fine gravel |
| | 575.0 | 4 | S3 | 3-7-3-3 (10) | 24/0 | | | | S3 - No recovery |
| 5 | | 6 | S4 | 5-8-5-12 (13) | 24/10 | | | 6.0 572.0 | S4 - Silty SAND with Gravel (SM), fine, 20-25% fines, 15-20% fine subrounded gravel, light gray, moist |
| | 570.0 | 8 | | | | | Sand | | |
| 10 | | 10 | S5 | 10-12-30-23 (42) | 24/20 | | | | S5 - Similar to S4 |
| | 565.0 | 12 | | | | | | | |
| 15 | | 15 | S6 | 5-15-11-24 (26) | 24/18 | | | | S6 - Similar to S4 |
| | 560.0 | 17 | | | | | | 17.0 | Bottom of borehole at 17.0 feet. Backfilled borehole with drill cuttings. |
| 20 | | | | | | | | | |
| | 555.0 | | | | | | | | |
| 25 | | | | | | | | | |

**GENERAL NOTES:**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# APPENDIX C - Logs of LGCI's Test Pits

# TEST PIT LOG

**TP-1**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 7/26/18 **DATE COMPLETED:** 7/26/18
**TEST PIT LOCATION:** Northern entrance of parking lot
**COORDINATES:** NA
**SURFACE EL.:** 570.5 ft. (see note 1) **TOTAL DEPTH:** 11 ft.
**GROUNDWATER LEVELS:**
**DURING EXCAVATION:** -
**AT END OF EXCAVATION:** Not encountered (NE)

**EXCAVATION SUBCONTRACTOR:** Hoffman Environmental Services, Inc.
**EXCAVATION FOREMAN:** Joe Lap
**EXCAVATOR TYPE/MODEL:** CAT 430F2
**WEATHER:** 70s / Cloudy
**TEST PIT DIMENSIONS:** 4 ft. x 13 ft.
**LOGGED BY:** AJ **CHECKED BY:** NB

| Depth (ft) | El. (ft) | Excavation Effort | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|
| | 570.0 | E | | Topsoil | 1.7 568.8 | 0 ft. - 1.7 ft.: Silty SAND (SM), fine to medium, 30-35% fines, trace organic fines, trace roots, brown moist |
| 2.5 | 567.5 | M | | Fill | | 1.7 ft. - 7 ft.: Silty SAND with Gravel (SM), fine to medium, trace coarse, 20-25% fines, 20-25% fine to coarse gravel, trace organic fines, trace roots, trace cobbles up to 10 inches in diameter, light brown to gray, moist |
| 5.0 | 565.0 | D | | | 7.0 563.5 | |
| 7.5 | 562.5 | V | | Sand | | 7 ft. - 11 ft.: Silty SAND with Gravel (SM), fine to coarse, 15-20% fines, 25-30% fine to coarse rounded gravel, 5-10% cobbles/boulders up to 3 feet in diameter, gray, moist |
| 10.0 | 560.0 | | | | 11.0 | |
| | | | | | | Bottom of test pit at 11.0 feet. Backfilled test pit with excavated material and compacted in 1 to 2-foot lifts with the excavator bucket. |

**GENERAL COMMENTS:** **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# TEST PIT LOG

**TP-2**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 7/26/18 **DATE COMPLETED:** 8/1/18
**EXCAVATION SUBCONTRACTOR:** Hoffman Environmental Services, Inc.
**TEST PIT LOCATION:** Edge of driveway on northwestern corner of site
**EXCAVATION FOREMAN:** Joe Lap
**COORDINATES:** NA
**EXCAVATOR TYPE/MODEL:** CAT 430F2
**SURFACE EL.:** 555.5 ft. (see note 1) **TOTAL DEPTH:** 12 ft.
**WEATHER:** 70s / Cloudy
**GROUNDWATER LEVELS:**
**TEST PIT DIMENSIONS:** 4 ft. x 20 ft.
**DURING EXCAVATION:** -
**LOGGED BY:** AJ / GW **CHECKED BY:** NB
**AT END OF EXCAVATION:** NE

| Depth (ft) | El. (ft) | Excavation Effort | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|
| | 555.0 | E | | Topsoil | 0.5 555.0 | 0 ft. - 0.5 ft.: Silty SAND (SM), fine to medium, 30-35% fines, trace organic fines, trace roots, trace fine gravel, brown, moist |
| 2.5 | 552.5 | E | | Fill | | 0.5 ft. - 5 ft.: Silty SAND with Gravel (SM), fine to coarse, 20-25% fines, 30-35% fine to coarse gravel, brown to gray, moist |
| 5.0 | 550.0 | M | | | | 5 ft. - 6 ft.: Well Graded SAND with Silt (SW-SM), fine to coarse, 10-15% fines, 10-15% fine to coarse gravel, light brown, moist |
| 7.5 | 547.5 | D | | | | 6 ft. - 10 ft.: Silty SAND with Gravel (SM), fine to medium, trace coarse, 20-25% fines, ~15% fine to coarse gravel, trace roots, trace wood, 5-10% cobbles/boulders up to 1.5 feet in diameter, light brown to gray, moist |
| 10.0 | | V | | | 10.0 545.5 | |
| | 545.0 | V | | Sand | 12.0 | 10 ft. - 12 ft.: Silty SAND (SM), fine to medium, trace coarse, 30-35% fines, 10-15% fine to coarse gravel, trace wood, 0-5% cobbles/boulders up to 2 feet in diameter, light brown to gray, moist |
| | | | | | | Bottom of test pit at 12.0 feet. Backfilled test pit with excavated material and compacted in 1 to 2-foot lifts with the excavator bucket. |

**GENERAL COMMENTS:** **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.
2. Terminated test pit at a depth of 6 feet on 7/26/18 due to an excavator malfunction. Backfilled test pit with excavated material and compacted with the excavator bucket. On 8/1/18, the test pit was advanced to 6 feet without sampling before continuing explorations.

# TEST PIT LOG

**TP-3**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 8/1/18 **DATE COMPLETED:** 8/1/18
**EXCAVATION SUBCONTRACTOR:** Hoffman Environmental Services, Inc.
**TEST PIT LOCATION:** Center of proposed building footprint
**EXCAVATION FOREMAN:** Joe Lap
**COORDINATES:** NA
**EXCAVATOR TYPE/MODEL:** CAT 430F2
**SURFACE EL.:** 558 ft. (see note 1) **TOTAL DEPTH:** 12 ft.
**WEATHER:** 70s / Cloudy
**GROUNDWATER LEVELS:**
**TEST PIT DIMENSIONS:** 4 ft. x 18 ft.
**DURING EXCAVATION:** -
**LOGGED BY:** GW **CHECKED BY:** NB
**AT END OF EXCAVATION:** NE

| Depth (ft) | El. (ft) | Excavation Effort | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|
| | 557.5 | E | | Topsoil | 0.4 557.6 | 0 ft. - 0.4 ft.: Silty SAND (SM), fine, trace medium, 25-30% fines, trace organic fines, trace roots, dark brown, moist |
| | | E | | Fill | | 0.4 ft. - 2.5 ft.: Silty SAND with Gravel (SM), fine to medium, trace coarse, 45-50% fines, 15-20% fine to coarse gravel, trace roots, trace brick, 0-5% cobbles, gray, moist |
| | | M | | | | |
| 2.5 | | D | | | 2.5 555.5 | |
| | 555.0 | D | | Sand | | 2.5 ft. - 10 ft.: Silty SAND (SM), fine, trace medium to coarse, ~25% fines, 10-15% fine to coarse gravel, 0-5% cobbles/boulders up to 1.5 feet in diameter, light brown, moist |
| 5.0 | | | | | | |
| | 552.5 | | | | | |
| 7.5 | | | | | | |
| | 550.0 | | | | | |
| 10.0 | | | | | | |
| | 547.5 | D | | | 12.0 | 10 ft. - 12 ft.: Silty SAND with Gravel (SM), fine to coarse, 20-25% fines, 15-20% fine to coarse gravel, trace roots, 0-5% cobbles/boulders up to 2 feet in diameter, light brown, moist |
| | | | | | | Bottom of test pit at 12.0 feet. Backfilled test pit with excavated material and compacted in 1 to 2-foot lifts with the excavator bucket. |

**GENERAL COMMENTS:** **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# TEST PIT LOG

**TP-4**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 8/1/18 **DATE COMPLETED:** 8/1/18
**EXCAVATION SUBCONTRACTOR:** Hoffman Environmental Services, Inc.
**TEST PIT LOCATION:** Between the baseball fields
**EXCAVATION FOREMAN:** Joe Lap
**COORDINATES:** NA
**EXCAVATOR TYPE/MODEL:** CAT 430F2
**SURFACE EL.:** 555 ft. (see note 1) **TOTAL DEPTH:** 12 ft.
**WEATHER:** 70s / Cloudy
**GROUNDWATER LEVELS:**
**TEST PIT DIMENSIONS:** 4 ft. x 18 ft.
**DURING EXCAVATION:** -
**LOGGED BY:** GW **CHECKED BY:** NB
**AT END OF EXCAVATION:** NE

| Depth (ft) | El. (ft) | Excavation Effort | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|
| | | M | | Topsoil | 0.5 554.5 | 0 ft. - 0.5 ft.: Silty SAND (SM), fine, trace medium, 25-30% fines, trace organic fines, trace roots, dark brown, moist |
| | | M | | Fill | 2.0 553.0 | 0.5 ft. - 2 ft.: Silty SAND with Gravel (SM), medium to coarse, trace fine, ~20% fines, 20-25% fine to coarse gravel, trace organic fines, trace roots, 0-5% cobbles, brown, moist |
| 2.5 | 552.5 | D | | Sand | | 2 ft. - 10 ft.: Silty SAND (SM), fine to medium, trace coarse, 45-50% fines, 5-10% fine gravel, 0-5% cobbles/boulders up to 1 foot in diameter, light brown to gray, moist |
| 5.0 | 550.0 | D | | Sand | | |
| 7.5 | 547.5 | D | | Sand | | |
| 10.0 | 545.0 | V | | Sand | | |
| | | V | | Sand | 12.0 | 10 ft. - 12 ft.: Silty SAND with Gravel (SM), fine, trace medium to coarse, 30-35% fines, 15-20% fine to coarse gravel, 0-5% cobbles/boulders up to 1.5 feet in diameter, light brown to gray, moist |
| | | | | | | Bottom of test pit at 12.0 feet. Backfilled test pit with excavated material and compacted in 1 to 2-foot lifts with the excavator bucket. |

**GENERAL COMMENTS:** **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# TEST PIT LOG

**TP-5**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 8/1/18 **DATE COMPLETED:** 8/1/18
**EXCAVATION SUBCONTRACTOR:** Hoffman Environmental Services, Inc.
**TEST PIT LOCATION:** Southern side of eastern baseball field
**EXCAVATION FOREMAN:** Joe Lap
**COORDINATES:** NA
**EXCAVATOR TYPE/MODEL:** CAT 430F2
**SURFACE EL.:** 556.5 ft. (see note 1) **TOTAL DEPTH:** 12 ft.
**WEATHER:** 70s / Cloudy
**GROUNDWATER LEVELS:**
**TEST PIT DIMENSIONS:** 4 ft. x 18 ft.
**DURING EXCAVATION:** -
**LOGGED BY:** GW **CHECKED BY:** NB
**AT END OF EXCAVATION:** NE

| Depth (ft) | El. (ft) | Excavation Effort | Remark | Strata | Depth / El.(ft.) | Material Description |
|---|---|---|---|---|---|---|
| | | E | | Topsoil | 0.4 / 556.1 | 0 ft. - 0.4 ft.: Silty SAND (SM), fine, trace medium, 25-30% fines, trace organic fines, trace roots, dark brown, moist |
| | | E | | Fill | | 0.4 ft. - 1.5 ft.: Silty SAND (SM), fine to medium, trace coarse, 20-25% fines, 10-15% fine to coarse gravel, 0-5% cobbles, brown, moist |
| | 555.0 | M | | | | |
| | | M | | | 2.0 / 554.5 | 1.5 ft. - 2 ft.: Poorly Graded SAND with Silt and Gravel (SP-SM), medium to coarse, trace fine, 10-15% fines, 35-40% fine to coarse gravel, brown, moist |
| 2.5 | | D | | Sand | | 2 ft. - 10 ft.: Silty SAND (SM), fine, trace medium to coarse, 20-25% fines, 10-15% fine to coarse gravel, 0-5% cobbles/boulders up to 2 feet in diameter, light brown, moist |
| | 552.5 | | | | | |
| 5.0 | | | | | | |
| | 550.0 | | | | | |
| 7.5 | | | | | | |
| | 547.5 | | | | | |
| | | V | | | | |
| 10.0 | | | | | | |
| | | V | | | | 10 ft. - 12 ft.: Silty SAND (SM), fine, trace medium to coarse, 30-35% fines, 10-15% fine to coarse gravel, 0-5% cobbles/boulders up to 2 feet in diameter, brown to gray, moist |
| | 545.0 | | | | 12.0 | |
| | | | | | | Bottom of test pit at 12.0 feet. Backfilled test pit with excavated material and compacted in 1 to 2-foot lifts with the excavator bucket. |

**GENERAL COMMENTS:** **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# TEST PIT LOG

**TP-6**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 8/1/18 **DATE COMPLETED:** 8/1/18
**EXCAVATION SUBCONTRACTOR:** Hoffman Environmental Services, Inc.
**TEST PIT LOCATION:** Proposed roadway east of Lake Street
**EXCAVATION FOREMAN:** Joe Lap
**COORDINATES:** NA
**EXCAVATOR TYPE/MODEL:** CAT 430F2
**SURFACE EL.:** 567 ft. (see note 1) **TOTAL DEPTH:** 7 ft.
**WEATHER:** 70s / Cloudy
**GROUNDWATER LEVELS:**
**TEST PIT DIMENSIONS:** 4 ft. x 14 ft.
**DURING EXCAVATION:** -
**LOGGED BY:** GW **CHECKED BY:** NB
**AT END OF EXCAVATION:** NE

| Depth (ft) | El. (ft) | Excavation Effort | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|
| | | E | | Topsoil | 0.3 566.7 | 0 ft. - 0.3 ft.: Silty SAND (SM), fine, trace medium, 25-30% fines, trace organic fines, trace roots, dark brown, moist |
| | | E | | Organic Fill | | 0.3 ft. - 1.5 ft.: Silty SAND (SM), fine, trace medium, 20-25% fines, trace organic fines, trace roots, trace fine gravel, brown, moist |
| | | M | | | 1.5 | |
| | 565.0 | M | | Buried Subsoil | | 1.5 ft. - 2.5 ft.: Silty SAND (SM), fine, trace medium to coarse, 35-40% fines, trace organic fines, trace roots, trace fine gravel, light brown, moist |
| 2.5 | | | | | 2.5 564.5 | |
| | | M | | Sand | | 2.5 ft. - 7 ft.: Silty SAND (SM), fine, trace medium to coarse, 25-30% fines, 10-15% fine to coarse gravel, 0-5% cobbles/boulders up to 2 feet in diameter, light brown to gray, moist |
| | 562.5 | D | | | | |
| 5.0 | | | | | | |
| | | V | | | | |
| | 560.0 | | 1 | | 7.0 | REMARK 1: Encountered refusal on large boulder at 7 feet. |
| | | | | | | Bottom of test pit at 7.0 feet. Backfilled test pit with excavated material and compacted in 1 to 2-foot lifts with the excavator bucket. |

**GENERAL COMMENTS:** **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# TEST PIT LOG

**TP-7**



LGCI
Lahlaf Geotechnical Consulting, Inc.

**CLIENT:** Lamoureux Pagano & Associates, Inc.
**PROJECT NAME:** Proposed Beal Early Childhood Center School
**LGCI PROJECT NUMBER:** 1806
**PROJECT LOCATION:** Glavin Site, Shrewsbury, Massachusetts

**DATE STARTED:** 8/1/18 **DATE COMPLETED:** 8/1/18
**TEST PIT LOCATION:** Proposed roadway east of Lake Street
**COORDINATES:** NA
**SURFACE EL.:** 609 ft. (see note 1) **TOTAL DEPTH:** 10 ft.
**GROUNDWATER LEVELS:**
**DURING EXCAVATION:** -
**AT END OF EXCAVATION:** NE

**EXCAVATION SUBCONTRACTOR:** Hoffman Environmental Services, Inc.
**EXCAVATION FOREMAN:** Joe Lap
**EXCAVATOR TYPE/MODEL:** CAT 430F2
**WEATHER:** 70s / Cloudy
**TEST PIT DIMENSIONS:** 4 ft. x 16 ft.
**LOGGED BY:** GW **CHECKED BY:** NB

| Depth (ft) | El. (ft) | Excavation Effort | Remark | Strata | Depth El.(ft.) | Material Description |
|---|---|---|---|---|---|---|
| | | E | | Topsoil | 0.7 | 0 ft. - 0.7 ft.: Silty SAND (SM), fine, trace medium, 25-30% fines, trace organic fines, trace roots, trace fine gravel, dark brown, moist |
| | 607.5 | E | | Subsoil | 1.5 607.5 | 0.7 ft. - 1.5 ft.: Silty SAND (SM), fine, trace medium to coarse, 20-25% fines, 0-5% fine gravel, trace organic fines, trace roots, brown, moist |
| | | E | | Sand | | 1.5 ft. - 9 ft.: Silty SAND (SM), fine, trace medium to coarse, 30-35% fines, 10-15% fine to coarse gravel, 0-5% cobbles/boulders up to 2 feet in diameter, gray to light brown, moist |
| 2.5 | | M | | | | |
| | 605.0 | | | | | |
| 5.0 | | | | | | |
| | 602.5 | V | | | | |
| 7.5 | | | | | | |
| | 600.0 | | | | | |
| 10.0 | | V | 1 | | 10.0 | 9 ft. - 10 ft.: Silty SAND with Gravel (SM), fine, trace medium to coarse, 30-35% fines, ~15% fine to coarse gravel, 5-10% cobbles/boulders up to 2.5 feet in diameter, light brown to gray, moist<br>REMARK 1: Encountered refusal on large boulder at 10 feet. |

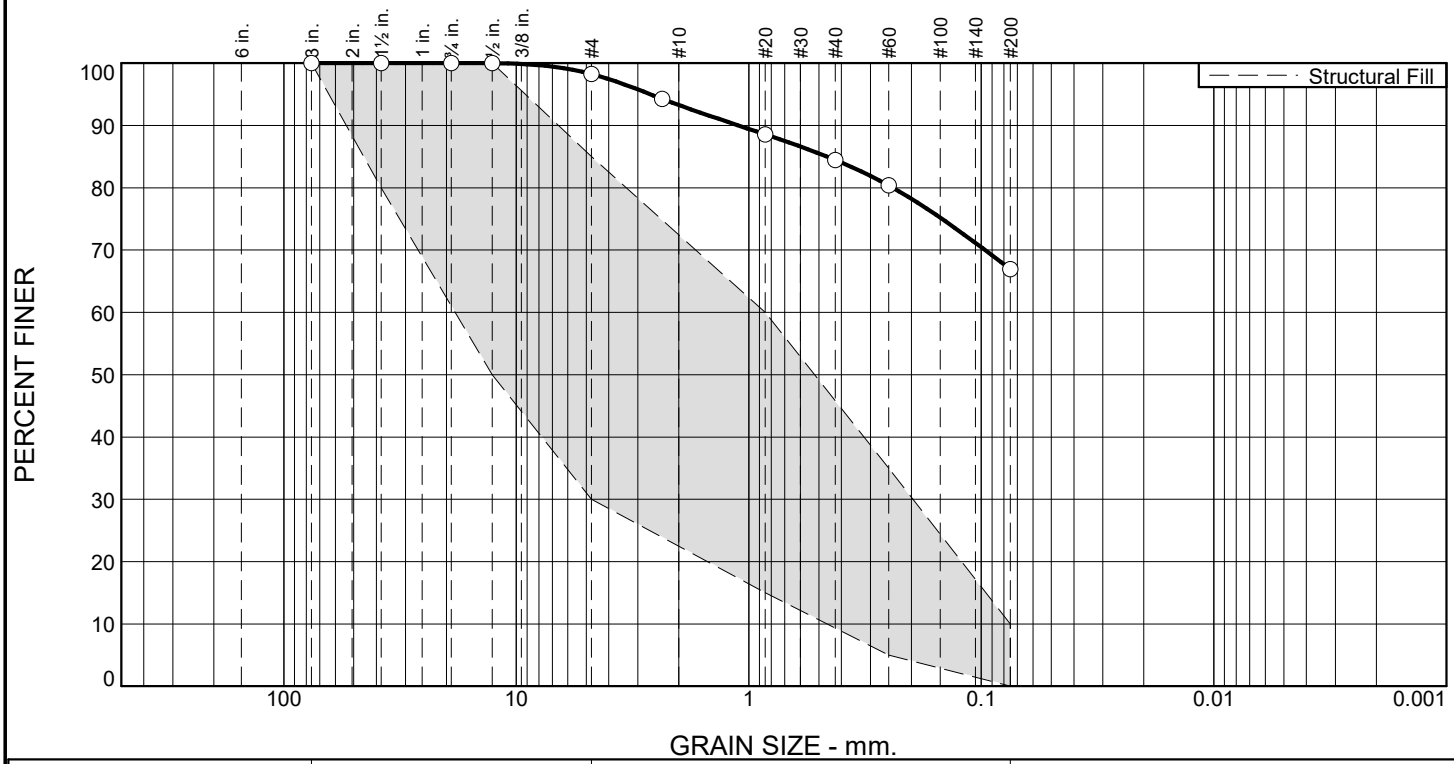
Bottom of test pit at 10.0 feet. Backfilled test pit with excavated material and compacted in 1 to 2-foot lifts with the excavator bucket.

**GENERAL COMMENTS:** **E = Easy, M - Moderate, D = Difficult, V = Very Difficult**

1. The ground surface elevation was interpolated to the nearest 1/2 foot based on a plan titled: "Existing Condition Plan, Beal Elementary School, Shrewsbury Public Schools, Shrewsbury, Massachusetts, Sheets EX1.1 to EX1.4," provided to LGCI by Lamoureux Pagano Associates, Inc. via e-mail on August 16, 2018.

# APPENDIX C - Laboratory Test Results

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |
| 0.0 | 0.0 | 1.7 | 5.0 | 8.8 | 17.5 | 67.0 |

**TEST RESULTS**

| Opening Size | Percent Finer | Spec.* (Percent) | Pass? (X=Fail) |
|---|---|---|---|
| 3" | 100.0 | 100.0 | |
| 1.5" | 100.0 | 80.0 - 100.0 | |
| 0.75" | 100.0 | | |
| 0.5" | 100.0 | 50.0 - 100.0 | |
| #4 | 98.3 | 30.0 - 85.0 | X |
| #8 | 94.3 | | |
| #20 | 88.6 | 15.0 - 60.0 | X |
| #40 | 84.5 | | |
| #60 | 80.4 | 5.0 - 35.0 | X |
| #200 | 67.0 | 0.0 - 10.0 | X |

* Structural Fill

## Material Description

ASTM (D 2488) Classification: SILT with Sand (ML), 30-35% fine, trace medium to coarse sand, 0-5% fine gravel, trace organic fines, trace roots, light brown, moist

**Atterberg Limits (ASTM D 4318)**

**PL=** **LL=** **PI=**

**Classification**

**USCS (D 2487)=** **AASHTO (M 145)=**

**Coefficients**

$D_{90}$= 1.1069 $D_{85}$= 0.4603 $D_{60}$=
$D_{50}$= $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Remarks**

Fill sample.

**Date Received:** 8/3/18 **Date Tested:** 8/13/18

**Tested By:** NB

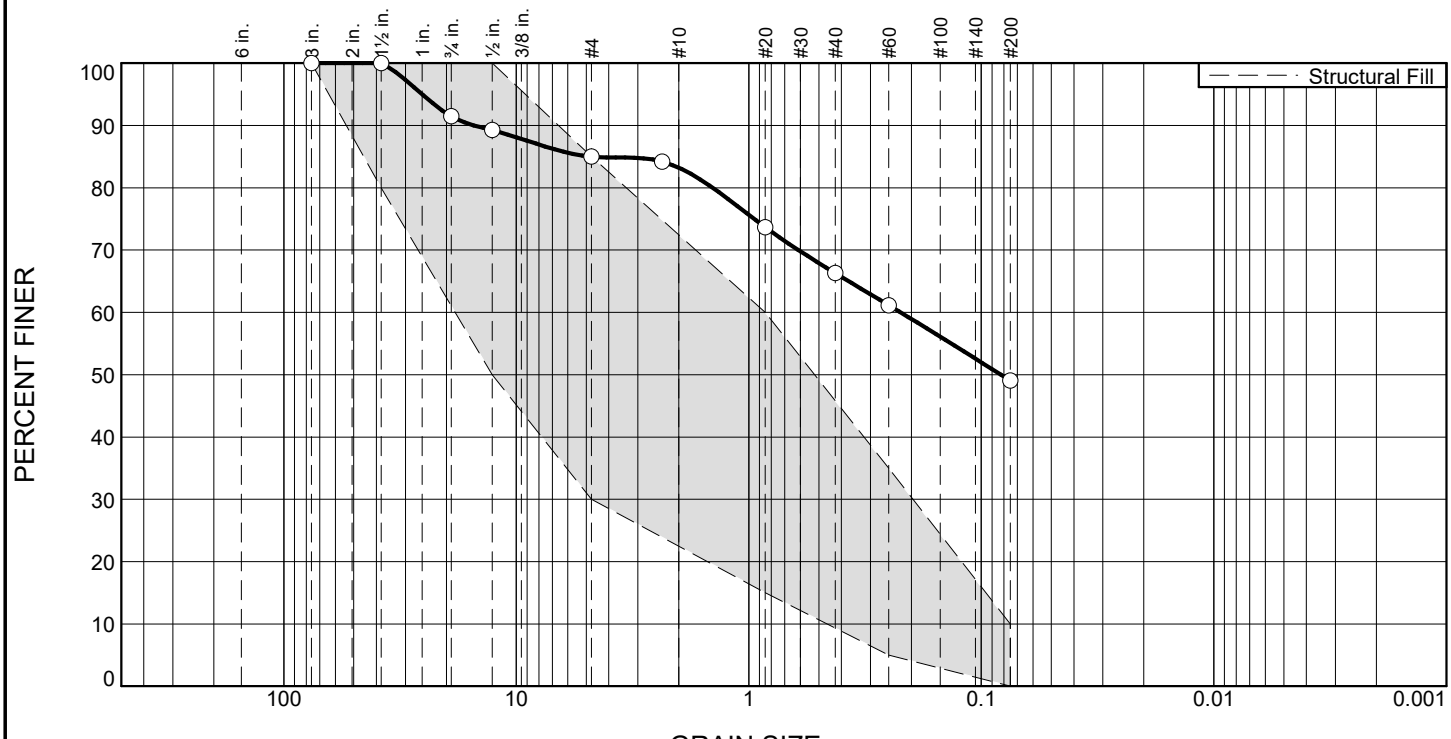
**Checked By:** MC

**Source of Sample:** Boring B-15 **Depth:** 2' - 4' **Date Sampled:** 8/2/18
**Sample Number:** S2

LGCI
Lahlaf Geotechnical Consulting, Inc.

**Client:** Lamoureux Pagano & Associates, Inc.
**Project:** Proposed Beal Early Childhood Center School, Glavin Site, Shrewsbury, Massachusetts
**Project No:** 1806

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |
| 0.0 | 8.5 | 6.5 | 1.8 | 16.9 | 17.2 | 49.1 |

**TEST RESULTS**

| Opening Size | Percent Finer | Spec.* (Percent) | Pass? (X=Fail) |
|---|---|---|---|
| 3" | 100.0 | 100.0 | |
| 1.5" | 100.0 | 80.0 - 100.0 | |
| 0.75" | 91.5 | | |
| 0.5" | 89.3 | 50.0 - 100.0 | |
| #4 | 85.0 | 30.0 - 85.0 | |
| #8 | 84.2 | | |
| #20 | 73.7 | 15.0 - 60.0 | X |
| #40 | 66.3 | | |
| #60 | 61.2 | 5.0 - 35.0 | X |
| #200 | 49.1 | 0.0 - 10.0 | X |

* Structural Fill

## Material Description

ASTM (D 2488) Classification: Silty SAND with Gravel (SM), fine to medium, trace coarse, 45-50% fines, 15-20% fine to coarse gravel, trace roots, trace brick, 0-5% cobbles, gray, moist

**Atterberg Limits (ASTM D 4318)**

**PL=** **LL=** **PI=**

**Classification**

**USCS (D 2487)=** **AASHTO (M 145)=**

**Coefficients**

$D_{90}$= 15.1707 $D_{85}$= 4.7500 $D_{60}$= 0.2222
$D_{50}$= 0.0823 $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Remarks**

Fill sample.

**Date Received:** 8/3/18 **Date Tested:** 8/13/18

**Tested By:** NB

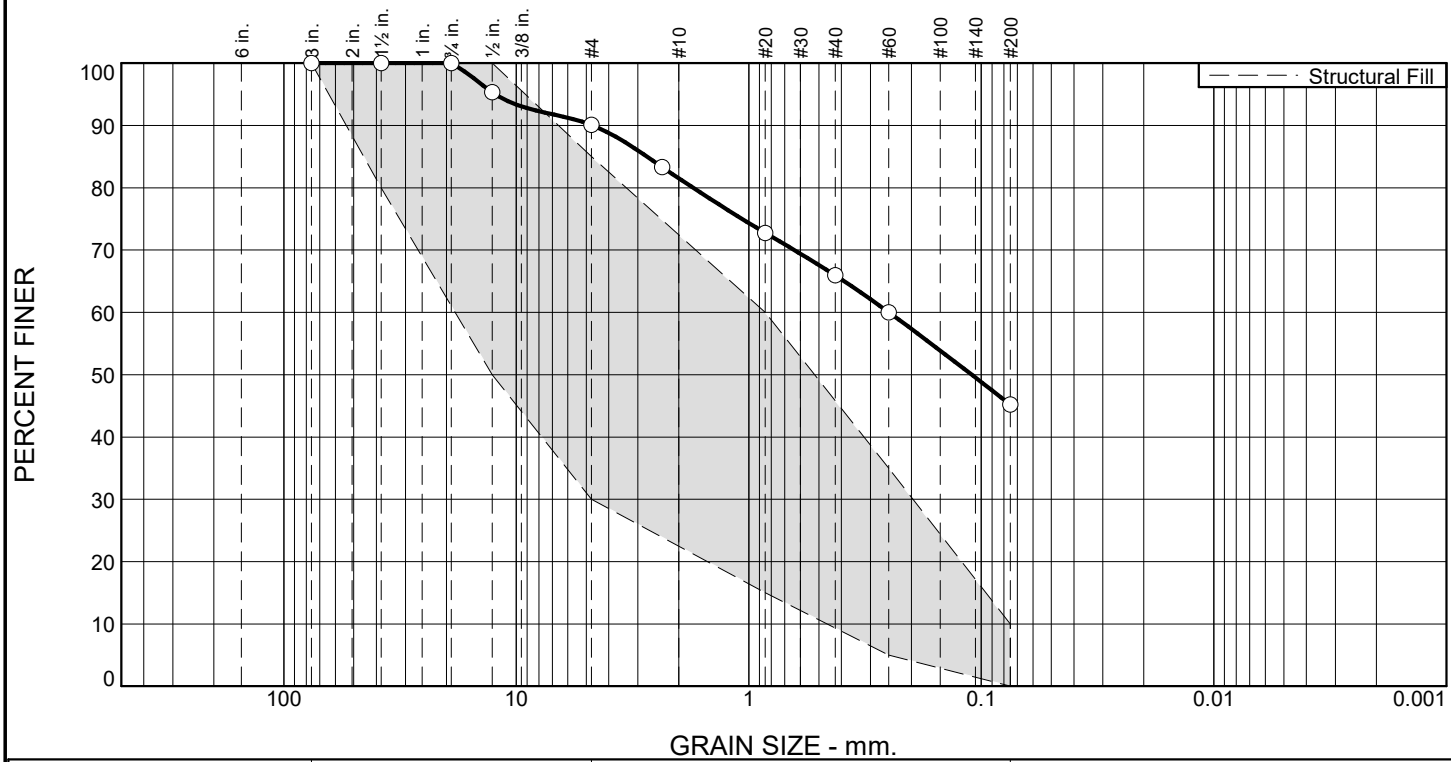
**Checked By:** MC

**Source of Sample:** Test Pit TP-3 **Depth:** 0.4' - 2.5' **Date Sampled:** 8/1/18
**Sample Number:** S1

LGCI
Lahlaf Geotechnical Consulting, Inc.

**Client:** Lamoureux Pagano & Associates, Inc.
**Project:** Proposed Beal Early Childhood Center School, Glavin Site, Shrewsbury, Massachusetts
**Project No:** 1806

# Particle Size Distribution Report




| % +3" | % Gravel | | % Sand | | | % Fines |
|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | |
| 0.0 | 0.0 | 9.9 | 8.6 | 15.5 | 20.8 | 45.2 |

**TEST RESULTS**

| Opening Size | Percent Finer | Spec.* (Percent) | Pass? (X=Fail) |
|---|---|---|---|
| 3" | 100.0 | 100.0 | |
| 1.5" | 100.0 | 80.0 - 100.0 | |
| 0.75" | 100.0 | | |
| 0.5" | 95.4 | 50.0 - 100.0 | |
| #4 | 90.1 | 30.0 - 85.0 | X |
| #8 | 83.3 | | |
| #20 | 72.8 | 15.0 - 60.0 | X |
| #40 | 66.0 | | |
| #60 | 60.0 | 5.0 - 35.0 | X |
| #200 | 45.2 | 0.0 - 10.0 | X |

* Structural Fill

## Material Description

ASTM (D 2488) Classification: Silty SAND (SM), fine to medium, trace coarse, 45-50% fines, 5-10% fine gravel, 0-5% cobbles/boulders up to 1 foot in diameter, light brown to gray, moist

**Atterberg Limits (ASTM D 4318)**

**PL=** **LL=** **PI=**

**Classification**

**USCS (D 2487)=** **AASHTO (M 145)=**

**Coefficients**

$D_{90}$= 4.6832 $D_{85}$= 2.7410 $D_{60}$= 0.2494
$D_{50}$= 0.1099 $D_{30}$= $D_{15}$=
$D_{10}$= $C_u$= $C_c$=

**Remarks**

Natural sand sample.

**Date Received:** 8/3/18 **Date Tested:** 8/13/18

**Tested By:** NB

**Checked By:** MC

**Source of Sample:** Test Pit TP-4 **Depth:** 2' - 10' **Date Sampled:** 8/1/18
**Sample Number:** S2

LGCI
Lahlaf Geotechnical Consulting, Inc.

**Client:** Lamoureux Pagano & Associates, Inc.
**Project:** Proposed Beal Early Childhood Center School, Glavin Site, Shrewsbury, Massachusetts
**Project No:** 1806

# 4.1.2 SCHEMATIC DESIGN BINDER

## F. Code Analysis

1. Code Analysis
2. Code Report
3. Permitting Requirements

LPA contracted consultant RW Sullivan to prepare a Code Assessment of the schematic design for the Beal project which is included in the following section of this binder. The largest issue that was raised through the analysis, was the updated code section that has a more stringent view of assembly use spaces after hours for community use where they are required to be A-3 Use Group occupancy. The result is an option for 1B construction throughout or incorporating 2 fire wall separations.

For Schematic Design, the fire wall option was developed and incorporated into the estimates. Further review of the construction type options will be considered during Design Development to determine the best option in terms of the use of the building, constructability, and overall budget.

RWS

Code

.

HVAC

.

Electrical

.

Plumbing

.

Fire Protection

.

Commissioning

# Beal Elementary School

## Shrewsbury, Massachusetts

# Code Report

## August 29, 2018

**Prepared By:** Samantha Sinapi
**Reviewed By:** Donald E. Contois, P.E.

Sullivan Code Group
R.W. Sullivan Engineering
617.523.8227
www.rwsullivan.com

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**Introduction**

This project includes the construction of a new elementary school in Shrewsbury, MA. This code summary is based on the proposed architectural drawings received August 17, 2018. The following is a list of applicable codes:

| Code Type | Applicable Code (Model Code Basis) |
|---|---|
| **Building** | 780 CMR: Massachusetts State Building Code, 9th Edition<br>(2015 International Building Code) |
| **Fire Prevention** | 527 CMR: Massachusetts Fire Prevention Regulations<br>(2015 NFPA 1)<br>M.G.L. Chapter 148 Section 26G – Sprinkler Protection |
| **Accessibility** | 521 CMR: Massachusetts Architectural Access Board Regulations |
| **Electrical** | 527 CMR 12.00: Massachusetts Electrical Code<br>(2017 National Electrical Code) |
| **Elevators** | 524 CMR: Massachusetts Elevator Code<br>(2004 ASME A17.1)<br>(2013 ASME A17.1)[A] |
| **Mechanical** | 2015 International Mechanical Code (IMC) |
| **Plumbing** | 248 CMR: Massachusetts Plumbing Code |
| **Energy Conservation** | 2015 International Energy Conservation Code & Stretch Energy Code |

A. Elevator permits filed after June 1,2018 and before December 1, 2018 can either comply with the version of 524 CMR effective June 1, 2018 or the previous version of 524 CMR prior to June 1, 2018. Permits filed after December 1, 2018 must comply with the new version.

## 1. Occupancy Classification:

Mixed uses

- Use Group E (Classrooms)
- Use Group A-3 (Cafeteria and Gymnasium)

*Since the Gymnasium and Cafeteria could be used for non-school events, they have been classified as Use Group A-3 Occupancy (780 CMR 303.1.3).*

*Note that hazardous materials will be maintained below the exempt limits per control area and therefore there is no Use Group H within the building (780 CMR 307.1, 414)*

## 2. Min. Construction Type:

- Type IB as a single building

  ***OR***

- Type IIB Construction (noncombustible) with firewall separations

## 3. Height and Area Limitations:

The following table summarizes the height and area limitations for non-separated Use Group E and A-3 based on Type IB construction.

| Code Reference | Type IB Construction | | | |
|---|---|---|---|---|
| | Use Group E | | Use Group A-3 | |
| | Height | Area | Height | Area |
| 780 CMR Tables 504.3, 504.4 & 506.2: Tabular Value | 6 St. (180 ft) | UL | 12 St. (180 ft) | UL |
| 780 CMR Section 506.3 Frontage Increase | - | - | - | - |
| **Height and Area Allowed** | **6 St. (180 ft)** | **UL** | **12 St. (180 ft)** | **UL** |
| **Actual Height and Area** | **2 St.** | **~92,000 ft$^2$** | **2 St.** | **~92,000 ft$^2$** |

***OR***

The following table summarizes the height and area limitations for Use Group E and A-3 based on Type IIB construction. Due to the size of the structure, it will be separated by two fire walls into three buildings.

| Code Reference | Building 1 | | Building 2 | | | | Building 3 | |
|---|---|---|---|---|---|---|---|---|
| | Use Group E | | Use Group E | | Use Group A-3 | | Use Group E | |
| | Height | Area | Height | Area | Height | Area | Height | Area |
| 780 CMR Tables 504.3, 504.4 & 506.2: Tabular Value | 3 St. (75 ft) | 43,500 ft$^2$ | 3 St. (75 ft) | 43,500 ft$^2$ | 3 St. (75 ft) | 28,500 ft$^2$ | 3 St. (75 ft) | 43,500 ft$^2$ |
| 780 CMR Section 506.3 Frontage Increase | - | 9,061 ft$^2$ | - | 6,753 ft$^2$ | - | 4,424 ft$^2$ | - | 7,991 ft$^2$ |
| **Height and Area Allowed** | **3 St. (75 ft)** | **52,561 ft$^2$** | **3 St. (75 ft)** | **50,253 ft$^2$** | **3 St. (75 ft)** | **32,924 ft$^2$** | **3 St. (75 ft)** | **51,491 ft$^2$** |
| **Actual Height and Area** | **2 St.** | **~27,275 ft$^2$** | **2 St.** | **~23,515 ft$^2$** | **2 St.** | **~15,915 ft$^2$** | **2 St.** | **~24,600 ft$^2$** |

As the occupancies in Building 2 will be separated, the building area must be such that the sum of the ratios of the floor area of each use group divided by the allowable area for each use group does not exceed one. This calculation is shown in the following:

**Separated Use Calculation**

$$\frac{\text{Use Group E}}{\text{Actual Area: 23,515 / Allowed Area: 50,253}} + \frac{\text{Use Groups A-3}}{\text{Actual Area: 15,915 / Allowed Area: 32,924}} = 0.95 < 1 \text{ as required by 780 CMR 508.4.2}$$

Note that the uses can be considered separated uses without providing a fire resistance rated separation per 780 CMR Table 508.4.

**4. Fire Department Access:**

All newly constructed facilities, buildings, or portions thereof are required to be provided with a fire department access road which may consist of roadways, fire lanes, parking lot lanes, or some combination thereof (527 CMR 1 Section 18.2.3.1). These access roads must have the following features,

- Must extend to within 50' of an exterior door that can be opened from the outside and provide access to the interior of the building
- No portion of the facility or exterior wall on the first story of a building is greater than 150' from fire department access roads measured along an approved route (250' if protected by NFPA 13 sprinkler system)
- Multiple access roads can be required by the AHJ if it is determined that a single road can be significantly impaired by external factors
- Unobstructed minimum width of 20' unless constructed boulevard-style which a 10' minimum width is permitted
- Unobstructed vertical clearance of 13'-6"

If access roads cannot be provided due to location, topography, waterways, etc. the AHJ has the authority to require additional fire protection features (527 CMR 1 Section 18.2.3.1.4).

**5. Fire Resistance Ratings:**

The following fire resistance ratings are required in accordance with 780 CMR Table 601 and various sections of the code.

| Building Element | Fire Resistance Rating (Hrs) | |
|---|---|---|
| | Type IB | Type IIB |
| Primary Structural Frame[A] | 2[B,C] | 0[C] |
| Exterior Bearing Walls | 2 | 0 |
| Interior Bearing Walls | 2[B,C] | 0[C] |
| Exterior Non-Bearing Walls | Based on FSD | Based on FSD |
| Interior Non-Bearing Walls | 0 | 0 |
| Floor Construction | 2[B] | 0[B] |
| Roof Construction (not including Primary Structural Frame) | 1[D] | 0 |

A. Includes beams, trusses, floor members, etc. having a direct connection to the columns (780 CMR 202).

B. Fire resistance ratings of structural frame and bearing walls are permitted to be reduced by one hour but not less than 1 hour rated where supporting a roof only (780 CMR Table 601).

C. Not less than the rating supported (780 CMR 707.5.1, 708.4. and 711.2.3).
D. Fire protection of structural members shall not be required, including protection of roof framing and decking where every part of the roof construction is 20 feet or more above any floor immediately below. Note that this exception does not apply to the structural members that are considered part of the primary structural frame as defined by 780 CMR 202.

| Building Element | | | Fire Resistance Rating (Hrs) | Opening Protectives (Hrs) |
|---|---|---|---|---|
| Exit Access Corridors (780 CMR Table 1020.1) | | | 0 | 0 |
| Fire Wall Separation (780 CMR Table 706.4) | | | 2 | 1½ |
| Exit Stair Shafts (780 CMR 1023.2) | | | Type IB: 2[A]<br>Type IIB: 1[A] | Type IB: 1½<br>Type IIB: 1 |
| Enclosures Under Stairs (780 CMR 1011.7.3) | | | Type IB: 2[A]<br>Type IIB: 1[A] | Type IB: 1½<br>Type IIB: 1 |
| Other Shafts (780 CMR 713.4) | | | Type IB: 2[B]<br>Type IIB: 1[C] | Type IB: 1½<br>Type IIB: 1 |
| Fire Pump Room (780 CMR 913.2.1)[D] | | | 1 | ¾ |
| Elevator Machine Room (780 CMR 3005.4) | | | 1 | 1 |
| Emergency Electrical Room (527 CMR 12.00 700-10(D)(2)) | | | 2[E] | 1½ |
| Electrical Rooms | With Sprinklers | | 0 | |
| | Without Sprinklers (NFPA 13) | | 2 | |
| Diesel Generator Fuel Storage (780 CMR Table 508.4, NFPA 37 Section 6.3.5 & 6.3.6) | | >480 gal. | 1 | ¾ |
| | | >1320 gal | 3 | 3 |
| Furnace room where any piece of equipment is over 400,000 Btu per hour input | | | Smoke Resistant | |
| Rooms with boilers where the largest piece of equipment is over 15 psi and 10 horsepower | | | Smoke Resistant | |
| Waste and linen collection rooms over 100 square feet in other than ambulatory care facilities or Group I-2 | | | Smoke Resistant | |

A. If exterior walls expose the stair at an angle of less than 180 degrees either the stair wall or adjacent wall must be 1 hour rated with 3/4 hour opening protectives for a distance of 10 feet from the stair wall (780 CMR Section 1023.7)
B. In lieu of rated shaft enclosure, if the duct connects not more than two stories, the annular space around the penetrating duct may be protected by approved noncombustible material that resists the passage of flames and smoke. The duct also needs to have fire dampers installed at each floor line (780 CMR 717.6.1).
C. In lieu of rated shaft enclosure, if the duct connects not more than two stories, the annular space around the penetrating duct may be protected by approved

noncombustible material that resists the passage of flames and smoke. If the duct connects not more than three stories, the duct also needs to have fire dampers installed at each floor line (780 CMR 717.6.3).

D. Location and access to the fire pump room shall be pre-planned with the fire department. The room must have direct access to the exterior or through a passageway the same rating of the room (NFPA 20 Section 4.12.2.1).

E. No rating is required for the room when fully sprinklered, however a 2-hr rating is still required for the emergency feeder-circuit wiring and rooms containing an emergency generator (NFPA 110 Section 7.2.1.1).

Fire walls, fire barriers, fire partitions, smoke barriers, and smoke partitions, or any other wall required to have protected openings or penetrations must be identified with signs or stenciling within accessible concealed spaces (i.e. floor-ceiling, attic spaces) at 30 ft intervals with at least 3" letters stating: "FIRE AND/OR SMOKE BARRIER – PROTECT ALL OPENINGS" or similar wording (780 CMR 703.7).

**6. Exterior Wall Openings & Fire Resistance Rating:**

The non-bearing exterior wall rating requirements and opening limitations are based on the fire separation distance for each wall. The fire separation distance is measured perpendicular to the exterior wall to the centerline of a public street, an interior lot line, or an imaginary lot line between two buildings on the same lot (780 CMR 202.0). Where the fire separation distance is more than 10 ft the wall is not required to be rated and the allowable area of openings is not limited (780 CMR Table 602 note g and Table 705.8). Note that openings are not permitted where the fire separation distance is less than 3 ft. Also, where the fire separation distance is 10 ft or less, the exterior walls must be rated for exposure to fire from both sides (780 CMR 705.5).

*If the building is constructed as a single building of Type IB Construction, the exterior walls have a fire separation distance of 20 feet or greater, therefore the exterior walls do not require a fire rating and can have unlimited openings.*

***OR***

*If the building is constructed as multiple buildings of Type IIB Construction, imaginary lot lines must be provided between the buildings. Therefore, portions of the exterior walls will have a fire separation distance that is less than 10 feet and the exterior walls will require a fire rating with limited openings. The diagrams in Appendix A include potential locations for the imaginary lot lines and the portions of the exterior walls that would require a fire resistance rating and limited openings.*

**7. Vertical Floor Openings**

Vertical openings are required to comply with 780 CMR 712. All vertical openings appear to be enclosed based on the plans reviewed with the exception of an unenclosed stair connecting the ground floor to the main floor level. This unenclosed stair is permitted per 780 CMR 1019.3(1). This

exception allows for the stair to be unenclosed and used for egress if the opening only connects two stories.

8. **Finishes:**

**Interior Finish**

The interior finish of walls and ceilings must comply with the table below.

**Walls & Ceilings (IBC Table 803.11) - Sprinklered**

| Building Component | Use Group E | Use Group A-3 |
|---|---|---|
| Exit Enclosures and Passageways | Class B | Class B |
| Corridors | Class C | Class B |
| Rooms & Enclosed Spaces | Class C | Class C |

*Note that where exit stairs and exit access corridors serve all use groups, the most restrictive interior finish is required.*

<u>New Floor Finishes</u>
Since the building will be equipped with an automatic sprinkler system, traditional floor coverings such as wood, vinyl and other resilient floor coverings as well as carpeting passing the DOC FF-1 pill test are allowed throughout the building, including all exits, exit passageways and exit access corridors (780 CMR Section 804.4.2).

**Exterior Finish**
Exterior wall finishes must fully comply with the requirements of 780 CMR 14. Combustible materials are permitted to be used as an exterior wall finish for this building in accordance with 780 CMR Section 1406; however, all exterior wall finishes and architectural trim located greater than 40 feet above grade plane must be constructed of approved noncombustible materials and must be secured to the wall with metal or other approved noncombustible brackets (780 CMR Section 1406.2.1). Additionally, combustible exterior wall finish is limited to 10% of the exterior wall surface area where the fire separation distance is 5 ft or less.

The use of plastic materials as part of the exterior wall assembly (i.e. foam plastic insulation, exterior coatings and facings) must comply with 780 CMR 26 (780 CMR 1404.8). The wall assembly must be tested in accordance with NFPA 285 (780 CMR 2603.5.5). Note that this test standard is a full scale assembly test. We recommend confirming with the manufacturer that the foam plastic insulation is part of an approved NFPA 285 assembly or complies with one of the alternative standards listed in 780 CMR Section 2604.1. The current MA amendments to the IBC include an exception stating that buildings providing sprinkler protection in accordance with NFPA 13 do not have to comply with NFPA 285 if a fire flow analysis is performed (without sprinkler decrease allowance) and it shows adequate water is available.

## 9. Means of Egress:

The calculated occupant load for the proposed floor plans, the corresponding required number of exits, the provided number of exits, and the provided egress capacity are summarized below (780 CMR Table 1004.1.2, Table 1006.3.1, and Section 1005.3). See Appendix A of this report for detailed egress calculations.

**Means of Egress**

| Floor | Occupant Load | Number of Exits | | Exit Capacity (persons) |
|---|---|---|---|---|
| | | Required | Provided | |
| Ground | 1,397 | 4 | 6 | 2320 |
| Main | 2,299 | 4 | 6 | 2877 |

*As shown in the table above and detailed egress analysis in Appendix A, the building is provided with sufficient exit capacity for the proposed occupant load.*

General Egress Requirements:

- The required maximum exit travel distances for a fully sprinklered building are listed below (780 CMR Table 1017.2, Table 1006.2.1, and 1020.4).

| Occupancy | Exit Travel Distance | Common Path of Travel | Dead-End |
|---|---|---|---|
| A-3 | 250 ft. | 75 ft. | 20 ft. |
| E | 250 ft. | 75 ft. | 50 ft. |

- Maximum dead-end corridor length cannot exceed the value above or 2.5 times the least width of space (780 CMR 1020.4).

- All rooms or spaces an occupant load greater than 49 people or a travel distance greater than the value in the table above must be provided with two egress doors swinging in the direction of egress and illuminated exit signs at each exit (780 CMR Table 1006.2.1 & Sections 1010.1.2.1 & 1013.1). Boiler rooms require two means of egress if the room is greater than 500 sqft. and includes individual fuel-fired equipment greater than 400,000 Btuh input capacity. Also one of the two required exit access doorways is permitted to be a fixed ladder or alternating tread device (780 CMR Section 1006.2.2.1).

- Doors serving assembly or educational rooms with more than 49 people and doors along the path of egress travel from such rooms must be provided with panic hardware (780 CMR 1010.1.10). Doors from main electrical rooms must swing in the direction of egress with panic hardware where required by the Electrical Code (NFPA 70).

- All means of egress lighting and exit signs throughout the building must be provided with an emergency power supply to assure continued illumination

for not less than 1.5 hours in case of primary power loss (780 CMR 1008.2 & 1008.3.4).

- Remote means of egress must be separated by ⅓ of the diagonal dimension of the room or space they serve (780 CMR 1007.1.1). The distance between exits must be measured in a straight line between exit doors.

- All exits must discharge to the exterior of the building except that a maximum of 50% of the number and capacity of the exit enclosures are allowed to exit through areas on the level of discharge if the exit enclosures discharge to a free and unobstructed path of travel to an exterior exit that is readily visible from the discharge of the exit enclosure; the entire area of the level of exit discharge is separated from areas below by construction consistent with the rating of the exit enclosure; and the egress path and all areas open to the egress path on the level of exit discharge must be fully sprinklered (780 CMR 1028.1).

**10. Required Fire Protection Systems:**

- NFPA 13 sprinkler system (780 CMR Table 903.2 & M.G.L. c148 s26G)
- Voice fire alarm system (780 CMR 907.2.3)
- Fire extinguishers (*527 CMR 1, Table 13.6.2(a) &* 780 CMR 906.1).

  *Fire extinguishers must be located throughout the building so that the maximum travel distance to an extinguisher is less than 75 feet (527 CMR 1, Table 13.6.2(a)).*
- Carbon monoxide detection in accordance with 780 CMR 915 and 527 CMR 1 chapter 13.
- Emergency responder radio coverage (780 CMR 916)

**11. Energy Code Provisions**

The project is subject to the provisions of the 2015 International Energy Conservation Code or ANSI/ASHRAE/IESNA 90.1 with Massachusetts Amendments (Massachusetts Energy Code). The town of Shrewsbury has also adopted the Stretch Energy Code (780 CMR Appendix AA). The 9th Edition states that the Stretch Code applies to non-residential buildings over 100,000 sqft. and new supermarkets, laboratories and conditioned warehouses over 40,000 sqft. (780 CMR AA103.2). Since the aggregate area of the building is over 100,000 sqft the stretch code does not apply. The Stretch Code requires the building demonstrate energy use per square foot at least 10% below the energy requirements of ANSI/ASHRAE/IESNA 90.1 APPENDIX G Performance Rating Method on either a site or source energy basis.

## 12. Accessibility for Persons with Disabilities

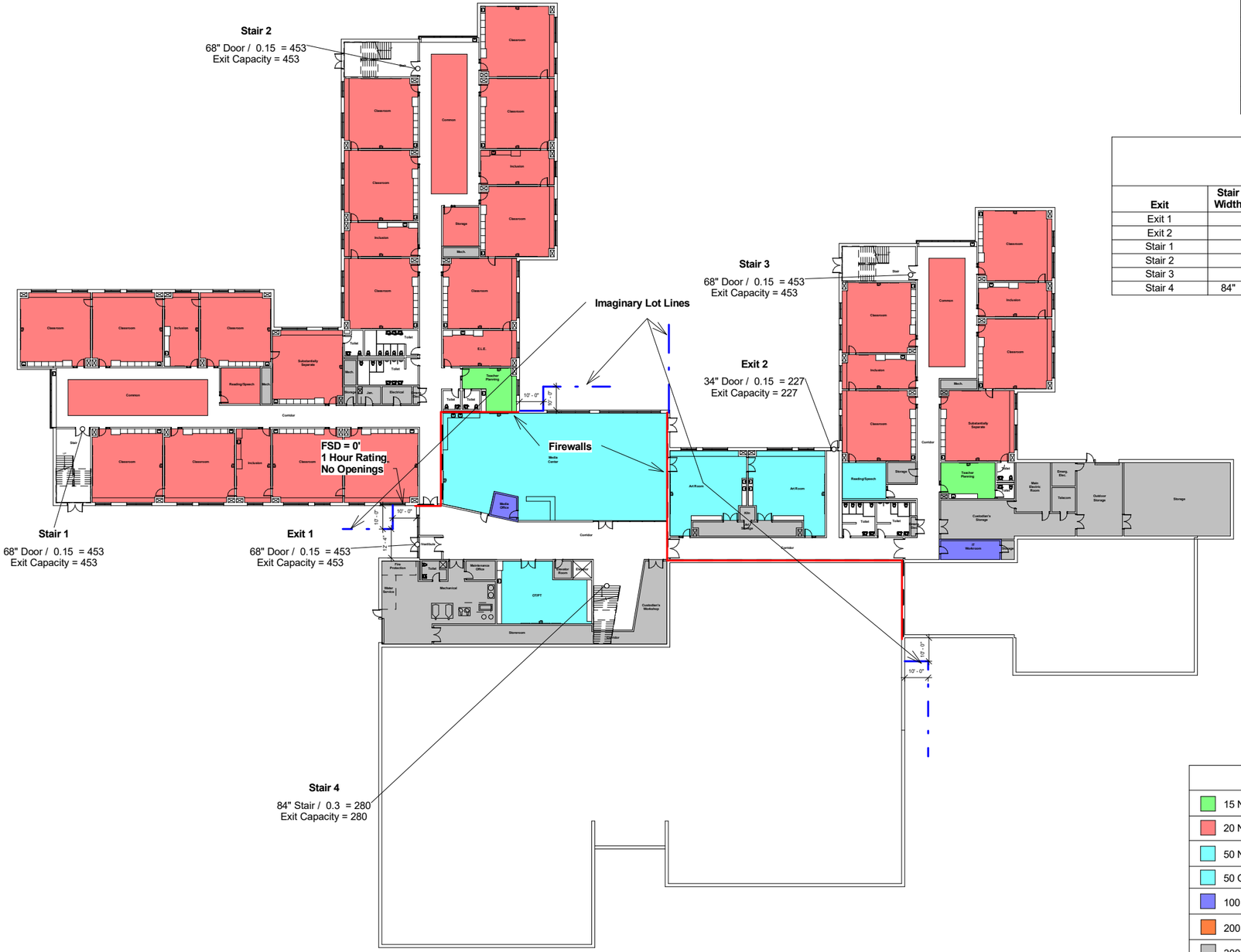
Massachusetts Architectural Access Board Regulations
All areas open to the general public (residents, students, etc.) are required to comply with the requirements of the Massachusetts Architectural Access Board (521 CMR). This section includes the following major provisions:

- All public entrances must be accessible (521 CMR 25.1).
- All public and common use areas must be accessible and provided with an accessible route thereto (521 CMR Section 12.2.2 and 20.1).
- Accessible toilet rooms must be provided where toilet rooms are provided to the public (521 CMR 30.1).
- The maximum slope of a ramp cannot exceed 1:12 (8.3%) in accordance with 521 CMR 24.2.1.
- Study desk and carols must be comply with 521 CMR 12.2.2.

American's with Disabilities Act
The ADA Guidelines are not enforced by the Commonwealth of Massachusetts, they can only be enforced through a civil lawsuit or complaint filed with the U.S. Department of Justice.

*Although the provisions of the MAAB do not apply to employee only areas, the ADAAG requires that employee only work spaces must be designed to allow employees to approach, enter, and exit the work area. However, the work areas are not required be provided with accessible features (i.e. shelves, etc.).*

**APPENDIX A: Egress Plans**




**Occupant Load Level Ground**

| Use | Floor Area | Floor Area Per Occupant (SF / OCC) | Occupant Load |
|---|---|---|---|
| Art | 1898 SF | 50 | 38.0 |
| Classroom | 23623 SF | 20 | 1181.2 |
| Media Center | 4133 SF | 50 | 82.7 |
| Office | 353 SF | 100 | 3.5 |
| OT/PT | 1150 SF | 50 | 23.0 |
| Storage/ Mechanical | 7438 SF | 300 | 24.8 |
| Teacher Planning | 649 SF | 15 | 43.2 |
| | 39243 SF | | 1396.4 |

**Exit Capacity Level Ground (780 CMR 1005.3)**

| Exit | Stair Width | Stair Exit Allowance (in / person) | Stair Capacity (persons) | Door Width | Door Exit Allowance (in / person) | Door Capacity (persons) | Exit Capacity (persons) |
|---|---|---|---|---|---|---|---|
| Exit 1 | | | | 68" | 0.15 | 453 | 453 |
| Exit 2 | | | | 34" | 0.15 | 227 | 227 |
| Stair 1 | | | | 68" | 0.15 | 453 | 453 |
| Stair 2 | | | | 68" | 0.15 | 453 | 453 |
| Stair 3 | | | | 68" | 0.15 | 453 | 453 |
| Stair 4 | 84" | 0.3 | 280 | | | | 280 |
| | | | | | | | 2320 |

**Occupant Load Densities (780 CMR TABLE 1004.1.2)**

| | |
|---|---|
| 15 Net S.F. / Occ. | Assembly without Fixed Seats - Unconcentrated (Tables and Chairs) |
| 20 Net S.F. / Occ. | Classrooms |
| 50 Net S.F. / Occ. | Educational - Shops and Laboratories |
| 50 Gross S.F. / Occ. | Exercise and Fitness Areas |
| 100 Gross S.F. / Occ. | Office Areas |
| 200 Gross S.F. / Occ. | Residential; Parking; Kitchen |
| 300 Gross S.F. / Occ. | Storage / Mechanical |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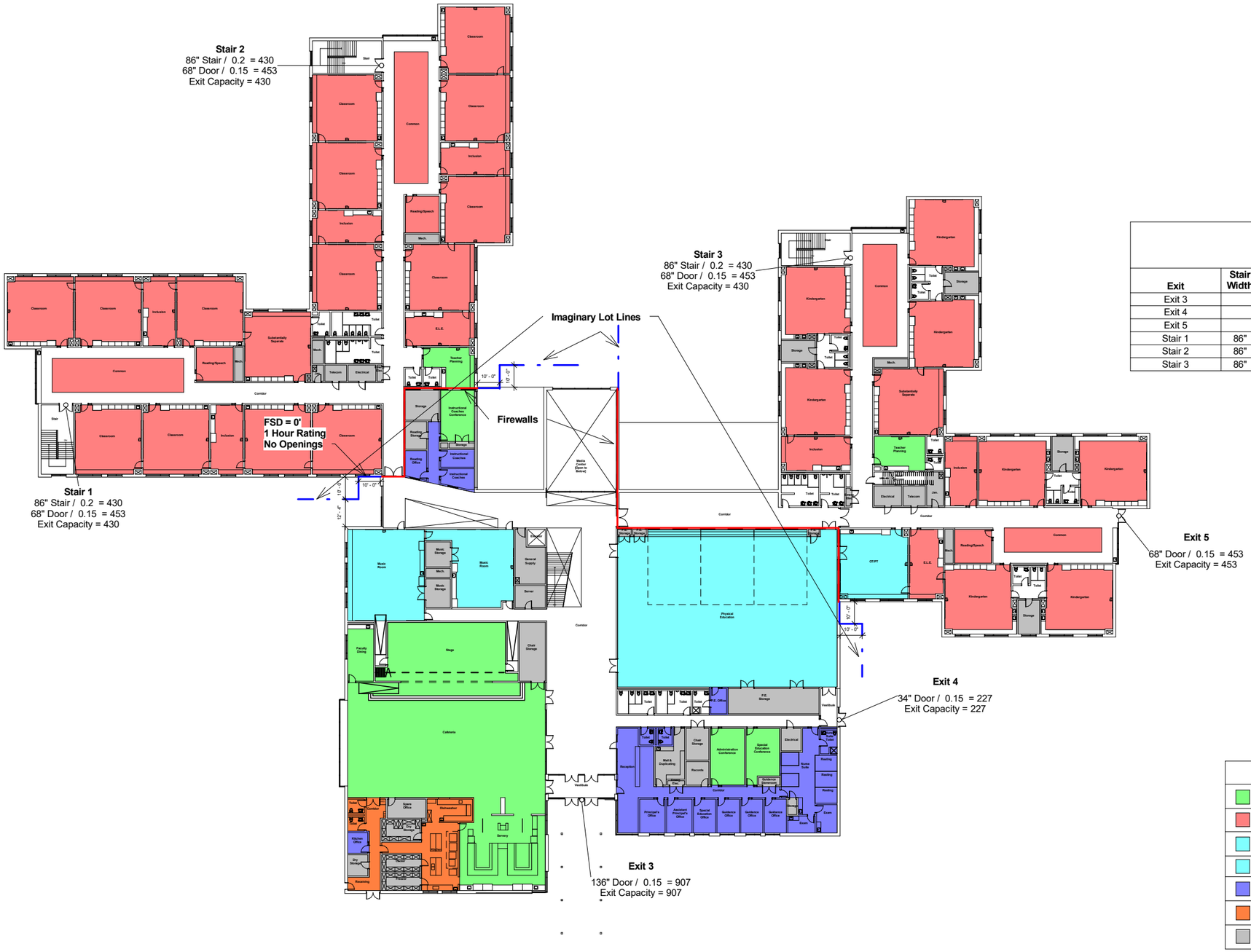
RWS JOB # **180266**


# Project: Beal Elementary School

**Date:** August 29, 2018

**Scale:** N.T.S.

# Level Ground Egress




**Occupant Load Level Main**

| Use | Floor Area | Floor Area Per Occupant (SF / OCC) | Occupant Load |
|---|---|---|---|
| Classroom | 27909 SF | 20 | 1395.4 |
| Conference | 1101 SF | 15 | 73.4 |
| Dining | 5768 SF | 15 | 384.5 |
| Gym | 7024 SF | 50 | 140.5 |
| Kitchen | 1299 SF | 200 | 6.5 |
| Music | 2417 SF | 50 | 48.3 |
| Office | 3950 SF | 100 | 39.5 |
| OT/PT | 905 SF | 50 | 18.1 |
| Stage | 1938 SF | 15 | 129.2 |
| Storage/ Mechanical | 5818 SF | 300 | 19.4 |
| Teacher Planning | 649 SF | 15 | 43.2 |
| | 58777 SF | | 2298.1 |

**Exit Capacity Level Main (780 CMR 1005.3)**

| Exit | Stair Width | Stair Exit Allowance (in / person) | Stair Capacity (persons) | Door Width | Door Exit Allowance (in / person) | Door Capacity (persons) | Exit Capacity (persons) |
|---|---|---|---|---|---|---|---|
| Exit 3 | | | | 136" | 0.15 | 907 | 907 |
| Exit 4 | | | | 34" | 0.15 | 227 | 227 |
| Exit 5 | | | | 68" | 0.15 | 453 | 453 |
| Stair 1 | 86" | 0.2 | 430 | 68" | 0.15 | 453 | 430 |
| Stair 2 | 86" | 0.2 | 430 | 68" | 0.15 | 453 | 430 |
| Stair 3 | 86" | 0.2 | 430 | 68" | 0.15 | 453 | 430 |
| | | | | | | | 2877 |

**Occupant Load Densities (780 CMR TABLE 1004.1.2)**

| | |
|---|---|
| 15 Net S.F. / Occ. | Assembly without Fixed Seats - Unconcentrated (Tables and Chairs) |
| 20 Net S.F. / Occ. | Classrooms |
| 50 Net S.F. / Occ. | Educational - Shops and Laboratories |
| 50 Gross S.F. / Occ. | Exercise and Fitness Areas |
| 100 Gross S.F. / Occ. | Office Areas |
| 200 Gross S.F. / Occ. | Residential; Parking; Kitchen |
| 300 Gross S.F. / Occ. | Storage / Mechanical |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# Project: Beal Elementary School

**Date:** August 29, 2018

**Scale:** N.T.S.

# Level Main Egress

| # | AGENCY | PERMIT/ISSUE | COMMENTS | STATUS | FEE |
|---|---|---|---|---|---|
| 1 | US EPA | Stormwater Pollution Protection Plan (SWPPP) approval | Required per Order of Conditions; required prior to NPDES NOI filing. | CM to file prior to beginning of construction | NA |
| 2 | US EPA | NPDES NOI for Discharge Associated with Construction Activity and Notice of Termination (NOT) | Filed by Contractor (NOI system) prior to construction and at project completion | Pending; NOI at least 10 days prior to beginning of construction | NA |
| 3 | Environmental Notification Form (ENF) 301cmr 11.00 | Executive Office of Energy and Environmental Affairs MEPA | Section 11.03: Review Thresholds were reviewed an none of the thresholds are approached | Not required | NA |
| 4 | Environmental Impact Report (EIR) 301cmr 11.00 | Executive Office of Energy and Environmental Affairs MEPA | Section 11.03: Review Thresholds were reviewed an none of the thresholds are approached | Not required | NA |
| 5 | Project Notification Form for Historic Buildings or Archeological MHC 950 CMR | Massachusetts Historical Commission MHD | No thresholds are approached | Not required | NA |
| 6 | Massachusetts DEP | Sewer Extension Permit | | Not required | N/A |
| 7 | Shrewsbury Hydrant flow test | Water/Fire Department | | Was conducted and filed in the SD w/ the Fire Protection Narrative | Paid |
| 8 | Shrewsbury | Site Plan Review | | Application to be submitted with DD drawings | NA |
| 9 | DCAMM | Transfer of Glavin Center Property to the Town of Shrewsbury | Legislative and Governor approval complete summer 2018 | To be completed following project funding authorization anticipated 11/18 | TBD |
| 10 | Massachusetts DEP | Asbestos Removal Permit & Notifications | Requirements outlined in Asbestos Report. | Pending; beginning of construction or demolition | TBD |
| 11 | Massachusetts AAB Architectural Access Board | Application for Variance (if required) | No Variance or relief from requirements are foreseen with a new building | Not required | $50 |
| 12 | Shrewsbury | Building Permit, Certificate of Occupancy | Filed by Contractor prior to construction. | | TBD |

Note: Shaded item numbers indicate permitting requirements applicable to this project

# 4.1.2 SCHEMATIC DESIGN BINDER

## G. Utility Analysis

1. Utility Analysis
2. Flow Test

This is an acknowledgement that the project design team has contacted all applicable utility companies/agencies and confirmed that building utilities are available in sufficient capacity to meet the needs of the proposed Beal Elementary School. Required building utilities include the following:

- Domestic water
- Fire protection water
- Sanitary sewer
- Electrical power
- Data/Communications cabling

Flow tests were conducted as part of this phase and the test results are published with this filing, there is sufficient water pressure and volume to serve the site for fire protection, and no fire pump is required.

The gas service is on Lake Street is a 2 inch line that terminates at the the proposed building site. The loads anticipated loads were given to the gas company and they confirmed there is sufficient capacity to service the new building.

Both the Data/Communications and Electric services are provided by the municipal owned utility company called SELCO. SELCO stated that there will be no issues providing the services needed for a facility of this scale at this particular site.

Memos, relevant to utilities, are included in the section 4.1.2 I. Narratives of Building Systems.

**Fire Protection Specialists**
22 Canterbury Street • Worcester, MA 01610
Tel: (508) 753-0015 • Fax: (508) 753-5629
**www.cogswellsprinkler.com**

Date: 7/6/18


# FLOW TEST INFORMATION SHEET

1. Reason for Test: Bid Information ☐ Design Base ☑
   Other_____
2. Location of Property 214 Lake Street (Address) Shrewsbury (City) MA (State) USA (County)
3. Date & Time of Test: Date: 7/06/18 Time: 9:00 (am) ◉ (pm) ◯
4. Test Conducted By: Jon Flamand (Name) Designer (Title) Cogswell Sprinkler Co., Inc. (Affiliation)
5. Test Witnessed By: Lily Barak (Name) Engineer (Title) (Affiliation)
6. Source of Water Supply: Gravity ☑ Pump ☐ Other: City
7. Name of Water District Shrewsbury Fire District Shrewsbury
8. Is water supply provided with PRV STA's Yes ☐ No ☑
   (If so what is PRV outlet setting? _____ PSIG
9. **Area Map:** (Draw a sketch showing property location; bounding streets and names, north arrow, hydrant locations and identification numbers, distances from hydrants to property elevations of hydrants and property floors or grade, all water mains and sizes and interconnection valves, etc.)

| | | | | | | |
|---|---|---|---|---|---|---|
| I<br>-- N --<br>I | | | | | | |
| | | | | | | |
| | See attached site plan | | | | | |
| | | | | | | |
| | | | | | | |

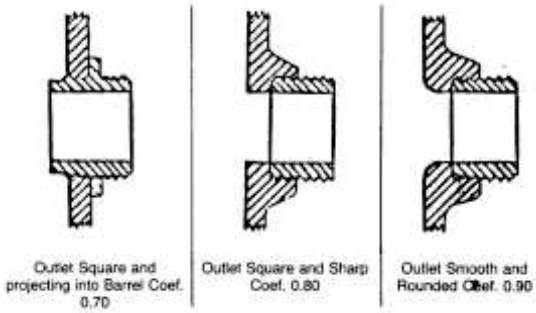
10. Flow Test Data

| FLOW AT HYDR. NO. | STATIC AT HYDR. NO. | STATIC PSIG | RESIDUAL PSIG | FLOW GPM | OUTLET COEFFICIENT | ADJUSTED GPM |
|---|---|---|---|---|---|---|
| 1 | | 92 | 62 | | | |
| 2 | 58 | | | | .9 | 1278 |
| | | | | | | |
| | | | | | | |

11. See reverse side for graph

12. Signed Jon Flamand

    Witness_____



# WATER FLOW TEST SUMMARY SHEET

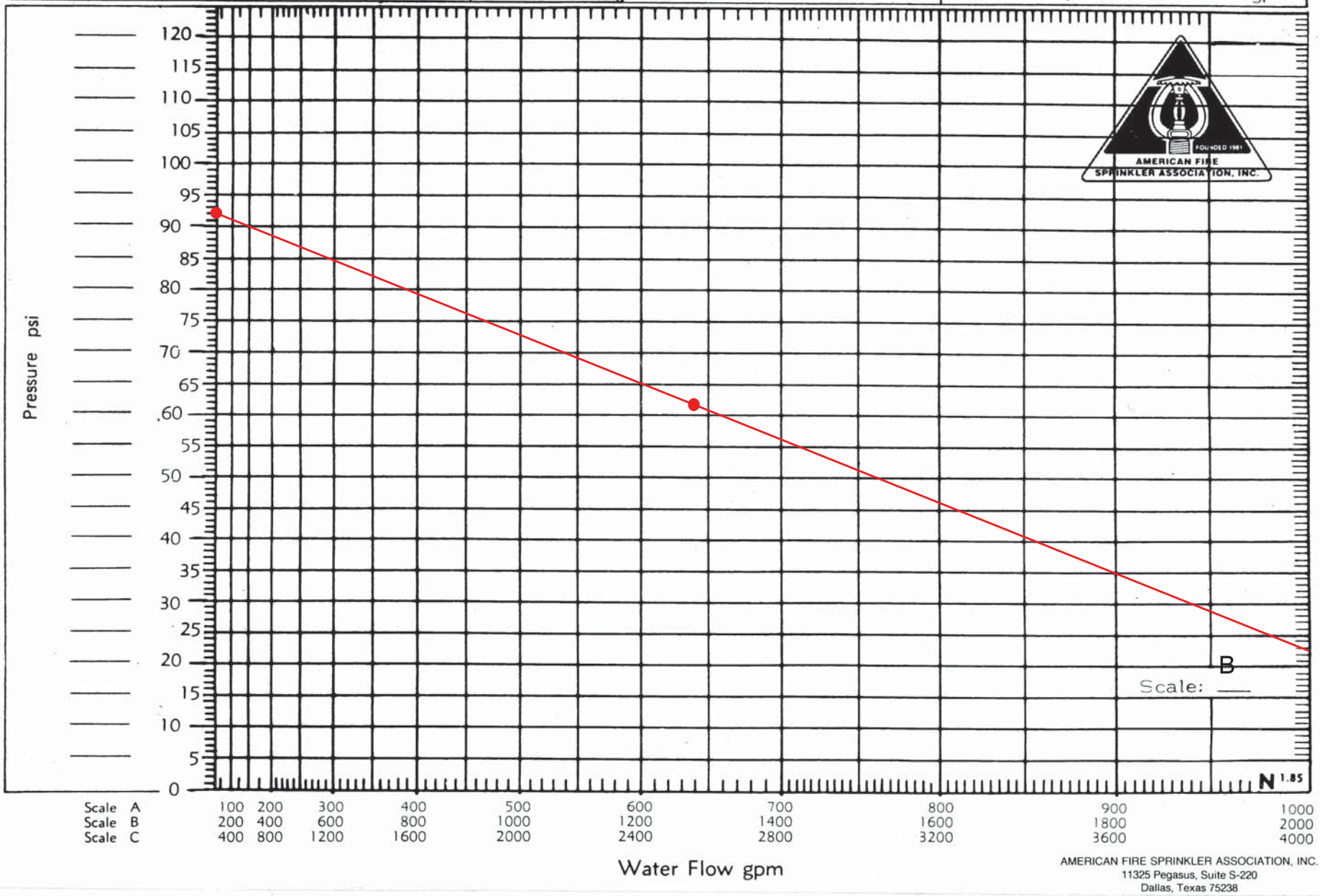
| Hydrant No. | Outlet I.D. inches | Pitot Press. psi | Flow gpm | Residual psi |
|---|---|---|---|---|
| 1 | | 92 | | 62 |
| 2 | 2.5 | 58 | 1278 | |
| 3 | | | | |
| Total Flow | | | 1278 | |

Date: 7/06/18 Time: 9:00AM Cont. No. S-460-1

Cont. Name: Beal Elementary

Address: 214 Lake Street Shrewsbury, MA

Static Press: 92 psi Flow @ 20 psi 2050 gpm




AMERICAN FIRE SPRINKLER ASSOCIATION, INC.
11325 Pegasus, Suite S-220
Dallas, Texas 75238

# Flow Test 214 Lake Street

Write a description for your map.

# 4.1.2 SCHEMATIC DESIGN BINDER

## H. Massing Study

PROPOSED AERIAL VIEW FROM EAST

EXISTING AERIAL VIEW FROM EAST

Beal Elementary School

# 4.1.2 SCHEMATIC DESIGN BINDER

I. Narrative Building Systems

1. Architectural
2. Structural
3. Fire Protection
4. Plumbing
5. HVAC
6. Electrical
7. Civil
8. Landscape
9. Food Services

**DESCRIPTION:** The former Glavin Center site will require demolition of the existing campus of institutional buildings on the site followed by new construction of the elementary school and associated site features. Since the buildings would be abandoned prior to construction, there would be no significant phasing or contractor isolation requirements for the project. Due to sight line issues at the access points to the site, realignment of Lake Street is included in the scope of work. The new elementary school design features a terraced regrading of the site resulting in an upper level main entry to the building and two story academic wings.

- **New Construction = ± 141,600 GSF**
- **Demolition (existing building) = +/- 100,000 GSF**
- **Hazardous material abatement of existing buildings:**
- **Site: Paved play area (overflow parking), irrigated play field, two fenced tot lots, 160 space parking lots, 2640lf parent pick up driveway, 1600 lf bus loop and drop off, service drive**
- **Realignment of Lake St. 1000lf**

NEW CONSTRUCTION SCOPE OF WORK:

**General:**

- Demolition and hazardous material abatement of the existing campus of buildings followed by construction of the new 2 story facility.

**Site**

Provide full site accessibility to comply with 521 CMR including:

  - Provide an accessible route, via new sidewalks and curb cuts, from Lake Street to the Main Entry
  - Provide accessible route to all tot lots and play areas
  - Provide new signed accessible parking spaces, including at least one van-accessible space, distributed throughout the site
- Provide new parking areas, sidewalks, driveways, bus and parent drop-off/pick-up areas, granite curbs, service/receiving areas, fenced playground areas and playground equipment, and other required areas throughout including all associated earthwork and infrastructure
- Provide new MA-DEP-compliant storm water management infrastructure throughout
- Provide new exterior lighting throughout
- Provide exterior wayfinding and directional signage

- New site utilities for Fire Protection, Plumbing, Natural Gas and Electrical/Data systems throughout
- Regrading to accommodate new building and site plan
- Provide new landscaping throughout including protection of north entry beech tree and new play field
- Demolish existing site amenities as required for new construction

**Building Exterior/Interior:**

- Provide new construction as follows
  - Exterior walls: High performance rain screen system including metal stud back-up walls, glass fiber reinforced gypsum board, self-adhered air/vapor barrier (AVB), AVB transitions to window/door openings and roof systems, rigid insulation, thermally broken standoff clips, metal furring, joint sealants and combination masonry/ metal wall panel system
  - Roofing: Adhered 90 ml EPDM roofing system throughout, including all membrane/flashing, roof edging, sheet metal work, insulation, roof vapor barrier, wood blocking and other roof accessories (ladders, hatches, etc.) as required
  - Windows, Storefront and Curtainwall: Thermally broken aluminum systems, including high performance insulating glass, perimeter joint sealants, insulated panels, screens, operable hardware, sheet metal work, air/vapor barrier (AVB) transitions, solar shading devices, window treatments and other accessories as required
  - Interior partitions: Metal stud and Gypsum Wall Board (GWB) assemblies as required for structural and acoustical requirements.
  - Doors, Frames and Hardware: Interior: Hollow metal and solid-core wood veneer doors; custom welded steel frames and borrowed lites; and lever type mortise hardware. Exterior: Aluminum frame and doors, electrified at exterior entries
  - Millwork/Casework:
    - Classroom units with storage shelving, tall wardrobe and material storage units, and lockable low storage cabinets
    - Custom cabinetry at main Administrative offices, Media Center, Cafeteria and other locations as required
  - Finishes:
    - Corridors, Stairs and Cafeteria/Servery: Linoleum flooring and resilient base, resilient stair treads, ceramic wall tile to 5′ (7′ at cafeteria/servery) with painted GWB above, ACT

- Classrooms: Linoleum flooring, resilient base, painted GWB, ACT
- Kitchen: Quarry tile, FRP wall paneling, washable ceiling tile system
- Administrative Offices and Media Center: Carpet flooring, resilient base, painted GWB, ACT
- Gymnasium: Resilient tongue and groove maple flooring system, resilient base, wall padding, acoustical wall panels, painted acoustical cellular roof deck

- Provide Food Service equipment at Kitchen

**Fixtures, Furnishings & Equipment (FF&E)/Technology (Project Budget Items):**

- Provide new FF&E throughout including furnishings, equipment, maintenance items, etc. Provide new Technology throughout including student/teacher computers, laptop carts, etc.

**Hazardous Materials:**

- Abate entire existing building complex prior to demolition
- Naturally occurring arsenic soil

**Structural:**

- Provide concrete foundations, retaining walls, steel framing, deck and accessories at new construction as required

**Fire Protection:**

- Provide automatic fire sprinkler system throughout
- Provide miscellaneous Fire Protection items as required

**Plumbing:**

- Provide plumbing fixtures
- Provide domestic hot water (HW) heating system
- Provide overflow roof drainage system
- Provide domestic water distribution system
- Provide above and below-grade sanitary waste and vent system
- Provide above and below-grade storm drainage system
- Provide sand/gas trap system as required
- Provide miscellaneous Plumbing items as required

**HVAC:**

- Provide Energy Management System (EMS) control system
- Provide gas-fired high-efficiency condensing boiler plant
- Provide 2-pipe Hot Water (HW) hydronic distribution piping and equipment (pumps, coils, fan coil units, finned tube radiation, unit heaters, etc.)
- Provide packaged rooftop air handling units for 100% air-conditioned cooling and ventilation
- Provide ductless split systems at new Telcom Rooms
- Provide Kitchen ventilation systems
- Provide HVAC duct system including all diffusers, grilles, insulation, hangers, etc.
- Provide miscellaneous HVAC items as required

**Electrical:**

- Provide main electrical service, switchgear and distribution including new branch panels
- Provide exterior emergency/standby generator
- Provide emergency/egress lighting fixtures
- Provide lighting fixtures with LED lamps and daylighting control system
- Provide addressable Fire Alarm (FA) system
- Provide public safety radio Distributed Antenna System (DAS)
- Provide Data/Communications cabling infrastructure
- Provide wired and wireless data communications equipment
- Provide VOIP telephone system
- Provide public address and clock systems
- Provide local sound systems at Classrooms, Auditorium, Cafeteria, Media Center, and Gymnasium
- Provide video surveillance, access control and intrusion detection systems
- Provide lightning protection system
- Provide miscellaneous Electrical items as required

BDI BOLTON & DiMARTINO, INC.
CONSULTING STRUCTURAL ENGINEERS
100 Grove Street Worcester, MA 01605
Tel. 508-756-8972

August 1, 2018

Ms. Katie Crockett
Lamoureux Pagano and Associates, Architects
108 Grove Street
Worcester, MA 01608

Re: Schematic Design- Structural Narrative
Beal Elementary School
Shrewsbury, MA

Dear Ms. Crockett,

The Beal Elementary School consists of about 141,600 sq. ft. of one- and two-story buildings. The project conforms to Type 2B Construction.

It is assumed that the foundations will be spread footings supported on natural glacial till or compacted structural fill with a bearing capacity of 4 ksf. The perimeter concrete foundation walls will have a width sufficient to eliminate the need for forming wall pilasters. Our assumptions are based on 1971 Construction Documents prepared by “Hoyle, Doran and Berry,” for the existing buildings on the site. Geotechnical investigations are currently on-going and geotechnical recommendations will be incorporated to the foundation design as they become available. The foundation also includes fourteen-foot high, cantilevered retaining wall between the Ground Floor level and Main Floor level within the footprint of the building.

The slab-on-grade will be a 5” thick concrete slab-on-grade reinforced with welded-wire fabric (6x6-W2.9 W2.9). Rigid insulation under the slab provides the necessary properties to satisfy the Massachusetts Energy Code. Control joints, consisting of sawn cuts and construction joints, will be shown on the plans, and will be located at about 12 feet on center to minimize shrinkage cracks in the slab.

The framed slabs will be a 5½” thick concrete composite slab supported on steel beams. 3"-18 Gauge composite metal deck will be specified and the slab will be reinforced with welded wire fabric (6x6-W2.9 W2.9). The composite concrete slab is made composite with the steel beams by using shear studs, and "partial composite design" is used for the economy of installing fewer shear studs. ASTM A992, with yield strength of 50 ksi, will be specified for the structural steel. However, the beams will be selected on serviceability requirements to reduce the problems of vibrations and deflections, so they will not necessarily be fully stressed.

The roof framing will incorporate steel beams and long-span open-web steel joists. Long-span joists will be limited to the Cafeteria and Gymnasium roofs. Concrete slabs will be placed

below HVAC roof units near classroom spaces to help with sound attenuation. The roof steel pitches to the roof drains to reduce the amount of tapered insulation, where possible. The roof metal deck will be 1-1/2"-20 Gauge, Type B. The metal deck over the Gymnasium will be 3" Cellular Acoustic to aid acoustic properties of the gymnasium. All roofs will be designed to support future photovoltaic equipment.

Wherever possible, hollow structural shapes will be selected for the columns. The Classroom Building will use HSS6x6 tubes that are easily concealed in the wall and partition framing eliminating the need for pilasters in the concrete foundation walls or interior partitions. The Gymnasium and Auditorium will use wide flange steel columns at exterior walls due to their length and wind loading requirements.

The lateral stability of the buildings will be achieved with concentrically braced steel frames throughout the building. Concrete floor diaphragms and metal deck roof diaphragms will collect the seismic loads at each level. Steel braces will typically be HSS5x5 tubes at the Classroom Buildings and HSS7x7 tubes at the Gymnasium and Cafetorium Buildings. The braces will resist the lateral loads in both tension and compression.

The buildings will be structurally isolated at two expansion joints/fire wall locations to isolate the two Classroom Wings from the Gymnasium/Cafetorium Building. The firewalls will consist of 8" concrete masonry unit (CMU) firewalls located between the buildings. The CMU will be reinforced, fully grouted, and attached to the buildings with zinc straps intended to melt during a fire event.

Please call this office if you wish to discuss these items or any other aspect of the project.

Bolton & DiMartino, Inc.

Christopher Tutlis, P.E.
Associate

**Beal Elementary School – Shrewsbury, Ma.**
**Schematic Phase FP Narrative**
**8-1-18**

## EXECUTIVE SUMMARY

This report summarizes the code required and recommended Fire Protection (FP) systems for an all-new elementary school at the Glavin Center site. It also includes several storage recommendations that will help minimize FP costs. The following work will be provided:

### Installations:

- Provide a new, NFPA 13 (2013) wet sprinkler system through-out, with 2, 4" sprinkler risers, 2, and a floor-valve station on each floor for each riser (4 zones total) .

- Sprinkler system will be sized primarily for non-combustible, un-obstructed construction.

- Protect small isolated cold areas (i.e. walk-in coolers, loading dock, and outside canopies with occupied space above) by "dry sprinklers" off of the wet system.

- Omit sprinklers under (other) outside roof overhangs, (except at loading dock and where there is occupied space above), as they are of completely non-or-limited combustible construction.

- Provide a hose-valve on both sides of the stage (stage is over 1,000 sqft.).

- Review available storage areas and storage needs. Re-organize storage to keep it confined to designated storage rooms, with appropriate FP coverage.

    1. Keep all storage heights less than 12', and top of storage a minimum of 18" below the sprinkler deflector level.
    2. Where large amounts of plastics or foam are stored (i.e. recycling room, gym storage or stage storage), avoid back-to-back shelving. Store materials in solid piles or single-row shelves, with top of storage under 5' high (for an OH2 hazard rating), or in enclosed room under 400 sqft. (to minimize impact of EH rating).

- Connect new FP system alarms to a new central Fire Alarm Control Panel (FACP), installed under Electrical.

- New Kitchen Exhaust Hood and Hood FP system will be provided under HVAC.

- Provide portable fire extinguishers, per NFPA 10.

### Maintenance:

- Train in-house personnel, and provide required, regular, sprinkler system and fire extinguisher inspections using in-house inspectors

- Provide additional required maintenance and testing of FP and fire extinguisher systems, alarms, and flow via maintenance contract.

## 1. BUILDING DESCRIPTION:

The new Beas Elementary School (BES) will be a split-level, 2-story building with type 2B non-combustible construction - primarily steel, block, and brick. Total proposed building area is approximately 148,000 square feet – approximately 55,000 square feet on the ground level, and 93,000 square feet on the main level.

The building is approximately 78% "light hazard", 21% “ordinary hazard”, and 1% “extra hazard”.

“Ordinary hazard” areas would include (group 1) the main kitchen and kitchen service areas, and (group 2) boiler room, mechanical rooms, exterior loading docks, most storage-areas, and the stage. The gym storage room (under 1% of the building), will contain group A plastics. We expect most plastics will be stored in plastic bins, stacked over 5’ in height, but not over 10’ height, resulting in an extra-hazard-group-2 area. As the design progresses, we will monitor plastic storage heights, and adjust the hazard-level if required.

Areas requiring special types of protection include the:

- stage (1 hose station on each side)
- kitchen hood exhausts (dry-agent packaged hood suppression by HVAC)

- storage areas with shelves (aisle to aisle) over 30” deep would be considered “rack storage”. Hazard level would depend on what materials are stored in that manner, and could vary from OH2 to EH2. As the design develops, we will look for any such areas, so they can be appropriately protected.

- There will be no combustible concealed spaces in the all-new building except for the under bleacher area in the gym. This area will be protected by extended coverage sidewalls spraying down the slope under the open-bleachers. Miscellaneous wood blocking used anywhere other than inside walls will specified to be Class A fire-retardant (NFPA 13 “limited combustible”). Combustible wood blocking inside otherwise non-combustible walls is permitted in limited quantities per NFPA 13.

Any flammable liquids such as paints and thinners will be stored in listed flammable-cabinets. There are no other known special hazards in the building,

## 2. DESIGN RESPONSIBILITY

The design engineer of record for the fire protection system is Lily Kara Barak – of Sensible Solutions – Hadley, Ma. The design engineer of record for the fire alarm system is Azim Rawji – of ART Engineering Inc. – Worcester, Ma.

## 3. APPLICABLE REGULATIONS

The Mass. Building Code and Fire Prevention regulations primarily define *where* fire protection systems are required and the required system components.

Massachusetts is currently governed by the 2015 International Building Code, with Mass. Amendments listed in 780 CMR 9th Edition. Current building code requires the following in a facility of this sort:

1. An Educational-use building over 12,000 square feet requires a sprinkler system "through-out" per NFPA 13. The system must be designed and installed per the 2013 edition of NFPA 13.

2. Water-sprinkler systems must be maintained per NFPA 25.

3. Class III standpipes are required if a building's top floor is more than 30' above the lowest (adjacent) Fire Department vehicle access. The top floor level in this building is well under 30 ft above lowest fire department access. Thus, stairwell standpipes ***are not*** required.

   A. Stages over 1,000 square feet require fire-hose stations on both sides of the stage. This stage is over 1,000 sqft, so stage hose stations ***will*** be provided.

   B. Class I standpipe hose stations are also required in the exit passageway of all areas containing "high-piled" (over 12') combustible storage. There will be no high-piled storage areas in the building.

4. Fire pumps (if required) must be installed in a dedicated 1-hour (2 hour if no sprinkler system) rated room, which meets the physical and environmental features required by NFPA 20. They also must be on an emergency power source. (A flow test will be provided as part of this schematic phase to determine if a fire pump will be required or not. See the **FIRE PROTECTION SERVICE AND FIRE-FIGHTING SUMMARY** section for further discussion.)

Minor requirements include:

5. Identification signs with specific text messages must be installed on all equipment, valves, etc. (See "Fire Protection Systems Provided")

6. All critical system components must be monitored by a listed Fire Alarm Control Panel (FACP), and all alarms, trouble signals, and supervisory signals must be automatically transmitted to the local fire dept. via approved means. Water flow alarms must also activate local Audio / visual alarms to trigger evacuation.

7. Kitchens with commercial cooking equipment under type 1 hood exhausts require fire suppression that also must be regularly tested and inspected.

8. Labeled, approved, and visible fire extinguishers are required in all E-use buildings. In buildings covered thru-out with quick response sprinklers, however, portable fire extinguishers are only required in the following locations:

   A. within 30' of commercial cooking equipment (type K);
   B. areas with flammable or combustible liquids; (type B)
   C. on each floor of structures under construction;
   D. special hazard areas listed in the code (that do not apply to the Beal school);
   E. as required by the local fire dept.

9. Areas where toxic gasses are used require gas leak detectors with distinct audio-visual emergency alarms, and automatic shut-down of gas supplies. We do not expect any toxic gas storage in the building. Natural gas will be used to power HVAC and kitchen equipment, but there will be no class-room gas supplies.

10. An unobstructed, readily accessible Fire Dept. Connection (FDC) that permits the Fire Dept. to pump extra water into the sprinkler system is required. The FDC must be located per the Fire Dept. direction, with threads compatible with the fire dept.'s pumping trucks. (4" Storz).

The NFPA standards primarily define *how* the Fire Protection Systems must perform and *how* they will be installed. Requirements vary greatly by hazard type and building combustibility and are only briefly summarized here.

**NFPA 13 2013 Edition – Sprinkler Systems**

1. Sprinklers are required "through-out", except where specifically permitted to be omitted. Throughout means not only occupied spaces, but in electrical / mechanical rooms, closets, walk-in-coolers, combustible concealed spaces, and several other spaces that the BES will ***not have*** such as attics and crawl-spaces.

2. Each Sprinkler "system" is limited to 52,000 sqft (light or ordinary hazard) or 40,000 sqft (extra hazard) on a single floor, per riser. This minimizes the area taken out of service in the event of an equipment failure or fire. Areas on different floors are *not* added together – for example, up to 52,000 sqft on each of two floors can be served by a single riser. BES will have 2 sprinkler risers, in order to cover it's 148,000 sqft.

3. The number and spacing of sprinklers in any room, and the minimum amount of water each sprinkler must discharge is defined based on the room's "hazard group". The basic hazard groups in NFPA 13 are

   a. "Light hazard (Light)",

   b. "Ordinary Hazard (OH1 or OH2) and
   c. "Extra Hazard (EH1 or EH2)".
   d. Spaces used for storage have special classifications depending on what materials are stored and how they are stored.

4. Sprinkler piping may be sized based on hydraulic calculations or using pre-defined pipe schedules. All piping in this building is hydraulically designed.

5. In addition to the hazard rating of an area, the fire protection requirements also depend on whether the construction is

   a. "combustible" or "non-combustible".
   b. "Obstructed" or "non-obstructed".

   This sprinkler system is designed for predominately non-combustible, non-obstructed construction.

6. Sprinkler systems can be "wet" (piping always filled with water), "dry" (piping always filled with air, except in a fire), or one of several specialty types. NFPA recommends wet systems be used where-ever possible, as they provide the fastest response to a fire. A wet-system is provided.

- Small isolated cold areas in BES will be sprinkled by "dry sprinklers" off of a wet system. This would apply to Walk-in freezers and coolers, the loading dock, and roof overhangs with occupied space above. Per the current design, all other canopies are non-or-limited-combustible construction, and Per NFPA 13, these canopies will not be sprinkled.

**NFPA 14 – 2013 Edition - Standpipes**

1. Stairwell standpipes (2-1/2" hose outlets *plus* 1-1/2" hose outlets located in all stairwells) ***are not*** required for this school, as the "top floor-level" is well under 30' above lowest fire dept. access.
2. The stage is more than 1,000 sqft in area, so a stage hose station will be provided on each side.

**NFPA 10 – Fire Extinguishers**

1. Selection of fire extinguishers is based on the type and size of fires expected to occur.

2. Classes of fires:

   a. A – ordinary combustibles – wood, paper, cloth, rubber, many plastics
   b. B – Flammable liquids, greases, tar, oil, paints, solvents, alcohols, gasses.

c. C - Energized electrical equipment
d. D – combustible metals
e. K - cooking oils

3. The size and quantity of extinguishers required is based on the room's hazard level. Room hazards are defined as:

    a. Light hazard if has normal amounts of Class A materials, with less than 1 gallon/room class B

    b. Ordinary Hazard if occasionally has more than normal amounts of Class A, and < 5 gal/room class B

    c. High hazard – storage, manufacturing, or packaging of Class As, or class B over 5 gal./room

4. Building structure is be protected by Class A extinguishers. Specific occupancies are protected by extinguishers with an appropriate class. Extinguishers can be "multi-purpose, for example, type ABC is very widely used.

5. Class B fires must be protected with large (over 10 lb) dry chemical medium, with minimum discharge of 1 lb/second.

6. Class K (cooking oil) fires must be protected with class K extinguisher. ID all K extinguishers "Activate FP system prior to using extinguisher"

7. Extinguishers should be inspected monthly to ensure they are in place, are full ("hefting" test), with no visible damage. They require annual minor maintenance and 6 and 12-year interval major maintenance / testing.

**NFPA 25 – FP Maintenance**

Current NFPA maintenance requirements are summarized below:

1. Annual, visual inspection (from the floor) of all sprinklers for: leaks; "loading" (accumulation of foreign materials such as grease, lint, paint, etc); corrosion; physical damage;

2. Annual visual inspection of the spare sprinkler cabinet to ensure it contains the proper type and quantity of sprinklers and wrenches.

3. Annual visual inspection (from the floor) of pipe and hangers for: leaks, corrosion, extra weight, damage.

4. Annual inspection (just before cold weather) of building to ensure all areas with water-filled piping have heat, and dampers, windows, etc are all closed.

5. Monthly inspection of pressure gages for normal pressures, and damage.

6. Quarterly inspection and operational test of alarm devices (flow switches)..

7. Quarterly inspection of the hydraulic name-plate to ensure it is in place.

8. Monthly inspection and annual test of control valves,

9. Monthly inspection and annual testing of the back-flow preventor

10. Quarterly inspection of fire dept connections.

11. Annual full-flow test out main drain.

12. Sprinkler testing – laboratory testing of a "representative sample (minimum 1% of total installed). Test after 20 years, then every 10 years there-after. If any tested samples fail – replace all sprinklers represented by that test sample.

Sprinkler system maintenance will increase the schools annual maintenance costs. This will be at least partially offset by the reduction in fire extinguisher maintenance, however, since far fewer extinguishers will be required once the sprinkler system is installed.

**NFPA 241:**

NFPA 241 has now been adopted by the State of Massachusetts (by State Building Code reference). Most of its requirements are common sense, but some will increase project costs. Requirements are summarized here:

1.2.4 A fire safety program shall be included in all constructions, alteration, or demolition contracts. Per 7.1 this shall include at minimum:

1. Good housekeeping
2. On-site security
3. Installation of new FP systems as construction progresses
4. Preservation of existing systems during demolition (no existing systems at LES)
5. Organization and training of an on-site fire-brigade
6. Development of a pre-fire plan with the local FD
7. Rapid communication
8. Consideration of special hazards resulting from prior occupancy
9. Protection of existing structures and equipment from exposure fires caused by construction, alternation or demolition operations.

4.3.1 Temporary Enclosures: Only non-combustible panels, flame resistant tarps or approved materials with equivalent fire-retarding capacity shall be used.

4.3.4.1 All Temporary enclosures shall be equipped with a minimum of 1 fire extinguisher suitable for all classes of fires expected inside the enclosure.

4.3.4.2 Travel distance to a fire extinguisher from anywhere in the construction area shall not exceed 50 ft.

5.1 Hot Work – defined as work involving burning, welding, or a similar operation that is capable of initiating fires or explosions.

5.1.1 FP precautions, permits, and fire watches shall be per NFPA 51B.

5.1.3.1 Fire watches shall be assigned no other duties.

5.5.1.1, 2 and 5 Storage and handling of Flammable and combustible liquids:
shall be per NFPA 30 – in approved safety containers, in areas posted "no smoking". Storage of class I and II liquids shall not exceed 60 gallons within 50 ft of the structure.

7.2.5: Guard service shall be provided where required by the local AHJ.
Security fences shall be provided where required by the local AHJ.
Entrances shall be secured where required by the AHJ

7.4 Fire Alarm reporting – There shall be a nearby, readily available public fire alarm box or telephone service with FD number and address conspicuously posted near each telephone.

7.5 Access for Fire Fighting: A command post with plans, emergency info, keys, communications, and equipment shall be provided at a suitable site location. The local AHJ may require an approved-type, locked key box installed in an accessible location.

7.5.5 Access roadways: The following may be relaxed by the local FD, if they feel fire-fighting / rescue operations would not be impaired:

Every building shall be accessible for FD apparatus. Min. standards: All-weather driving surface that can withstand live loads of FD trucks, min 240" wide, min 162" vertical clearance. The required width shall not be obstructed in any way – including by parked vehicles. Access roads shall extend to within 150 ft of all portions of the 1st floor exterior walls.

8.6.1.1 Fire walls and exit stairways – where required for the construction – shall be given priority for installation.

8.6.1.2 and .3 Fire doors with approved closing devices and hardware shall be installed as soon as is practicable, and shall not be obstructed from closing once installed.

## 4. FIRE PROTECTION SERVICE AND FIRE-FIGHTING SUMMARY

Water to the new school will be fed from a new site-main running from the existing 12" Lake St. main around the new building. As shown by hydraulic calculations, the FP service entrance main can (and will) be 8".

New site hydrants are planned. See site plans for exact location and number of new hydrants.

A 6-6-18 flow test performed by Cogswell Sprinkler at the Glavin Center showed a static pressure of 92 psi, and a residual pressure of 62 psi with 1292 gpm flowing. This is good flow and pressure.

Based on this data, ***fire pumps will not be required***. .The FP contractor will be required to provide a new flow test at the time of construction, to confirm that adequate flow and pressure still remain.
Emergency vehicle access will be excellent, - with 100% of the building accessible to apparatus.

## 5. FIRE PROTECTION SYSTEMS TO BE INSTALLED

A new "wet-type" system will be installed through-out per NFPA 13 (2013).

Sprinklers will be intermediate temperature throughout the building, except where a higher temperature rating is required by NFPA 13.

Halls and stairs (with ceilings) will utilize , quick response, K 5.6, *concealed*, pendants, which will minimize any vandalism potential..

Classrooms, offices, and other spaces with new hung ceilings will also utilize, concealed, quick response, pendants. Due to the square-shape of most classrooms, they will utilize extended coverage (EC) sprinklers. All extended coverage sprinklers will have a 3/4" (larger-than-standard) thread size, to prevent accidental replacing of any EC sprinkler with a standard coverage sprinkler.

Areas with no ceilings will utilize exposed piping, with fusible link, upright sprinklers.

Mechanical and electrical spaces, walk-in coolers with auto-defrost, and cooking areas will be covered by high temperature uprights, to prevent false activation in the event of a pressure relief valve blowing, electrical over-heating condition, or defroster / cooking heat,.

All exposed sprinklers in the gymnasium, mechanical spaces, storage areas, or installed under 12' AFF will have protective head-cages.

All above-ceiling spaces are non-or-limited-combustible, so no spaces require 2 levels of sprinklers. Space under the stage is a non-combustible-concealed space, so no sprinklers will be provided.

Walk-in coolers / freezers and the loading dock area are protected by dry sprinklers piped from wet-piping in heated space. The loading dock area will use ordinary-hazard-listed dry sidewalls – Tyco DS-3. Other dry sprinklers will be pendant or sidewall, standard or extended coverage, as required by the area covered.

A new kitchen exhaust-hood will be provided, and a new, dry-agent, packaged fire suppression system provided as part of the HVAC / hood package.

Interior piping systems will be schedule 40 threaded or grooved, black steel for pipe 2" and under, and schedule 10, grooved steel for pipe 2-1/2" and over. All pipe will be sized for a maximum water velocity of 25 fps.

Seismic bracing to be provided will include riser-4-way bracing and main-longitudinal sway bracing thru-out. Where possible, sprinkler main hanger rods will be less than 6" long from point of attachment to top of pipe, eliminating the need for lateral bracing. Where this is not possible, all mains, cross mains, and branches over 2-1/2" will have both lateral and longitudinal seismic bracing. Branch lines carrying 2 or more sprinklers will also have end-of-line restraints.

**Fire Protection Equipment and Controls Locations:**

The fire protection service entrance, and backflow preventor, will be located in the main mechanical room in the SE quadrant of the ground level. The 2 sprinkler wet-risers will also be located in the main mechanical room. Both will have a zone-control valve station for each of the 2 floors it serves. Zone control valve stations will all have a supervised control valve, check valve, pressure relief valve, pressure gages, flow-switch alarm, and test and drain per NFPA 13.

Per the Shrewsbury Fire Dept. (SFD) standards, a new, 4" Storz FDC will be provided to serve the sprinkler system. At the request of the local fire chief, a blue beacon and electric water-flow bell will be located above the FDC.

Cross-contamination will be prevented by a new, double check valve backflow preventer installed on the new FP service entrance.

There is no smoke control system or exhaust required for this building, and none is provided. The only alternative fire suppression system in the building is the kitchen hood dry-agent system, located in the main kitchen.

Identification signs per NFPA 13 and the 9$^{th}$ Edition Building Code will be provided on:

1. All control valves
2. All test and drain valves and all auxiliary drains
3. Fire Dept. connections
4. Hose valves
5. Fire Suppression Control Room door

6. Spare sprinkler cabinet (typed list of sprinklers and their characteristics and use)
7. Hydraulics calculations signs at the service entrance

**Sequence of Operations:** All control valves will have continuously monitored tamper switches, and all risers, the main service entrance, and all zone-control valve stations will have flow switches. Flow switch alarms will trigger all building notification devices and evacuation. Flow switches will also have tamper switches on their cover, to prevent disabling of any flow-switch device. Both tamper switch and flow switch activation will be communicated to the Shrewsbury fire dept. See fire alarm narrative for details.

## 6. ACCEPTANCE CRITERIA

The following written certifications shall be provided (by the person noted) to all local AHJs.

The Fire Suppression Engineers of record will certify that the systems have been installed in compliance with the construction documents, and that submittal data was reviewed and is acceptable.

The owner will certify that as-built drawings have been received from the contractors, and that the engineer(s) have confirmed their reasonable accuracy.

The sprinkler contractor will provide a completed NFPA 13 test and acceptance report, including the name, address, and telephone number of a person to contact for any system failures or emergencies.

If any portion of their system fails to operate satisfactorily, each contractor must repair or replace the faulty components. They must then retest those components individually, as well as retest all related system functions in the presence of the engineer and all AHJs.

The sprinkler contractor will also provide a signed letter certifying the sprinkler system is installed in full compliance with all laws, regulations, and the pre-approved narrative, and shall obtain written approval from all AHJs certifying that they have witnessed the final acceptance testing.

The site contractor (responsible for underground FP piping) shall also provide NFPA test and acceptance reports, certifying that their piping has been installed, flushed, and pressure tested per NFPA.

**SEAMAN ENGINEERING CORPORATION**
P: 508-865-1400
F: 508-865-1401
22 West St. Unit C, Millbury, MA 01527
seamanengineers.com

**Date:** August 1, 2018

**To:** Sean W. Brennan

**Co:** Lamoureux-Pagano Assoc. Architects, Inc.

**From:** Christopher Robinson P.E.

**Re:** Beal Elementary School: **Plumbing System Narrative – 100% SD Submission**

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## 1. PLUMBING

### Code Criteria Listing

International Building Code, 2015 Edition
International Mechanical Code, 2015 Edition
Massachusetts State Building Code Amendments, Ninth Edition, 780 CMR
Commonwealth of Massachusetts Fuel Gas & Uniform State Plumbing Code, 248 CMR

### Fixtures and Fixture Count

Number of plumbing fixtures will distributed throughout the proposed facility to accommodate a population of 395 male students, 395 female students and 100 faculty/staff and shall be in accordance with 248 CMR Paragraph 10.10, Table 1.

Plumbing fixtures will be equipped with the following water conserving features (for 30% indoor water use reduction per MA-CHPS WC 1.1)

| | |
|---|---|
| Water Closets: | Manual Water Closet Flush Valve @ 1.28 GPF (Sloan #111-1.28)<br>Manual Dual Flush Valve @ 1.6/1.1 GPF (Sloan #WES-111) |
| Urinals: | Manual Urinal Flush Valve @ 0.125 GPF (Sloan #186-0.125) |
| Lavatories: | Metering Faucets, manual actuated with mixing tee, 0.5 GPM (Chicago #3300-ABCP) |
| Countertop Sinks: | Manual Faucets, 0.5 GPM aerator if preferred (Chicago #201-E2805XK) |
| Shower: | ADA Compliant Hand Shower with 30” Glide Rail, Single Handle Shower Valve, 1.5 GPM (Leonard #96-515P(G)-30) |

Water closets and urinals will be commercial vitreous china, wall hung (ADA compliant where shown). Lavatories in restrooms will be commercial vitreous china, wall hung. Each floor includes a janitor’s closet with a floor mounted mop service basin. Toilet cores

on each floor will include alcove-recessed electric water cooler, in a high-low handicapped accessible configuration. Restrooms, kitchen and mechanical room will have floor drains with trap primer connections & valves.

Shower stalls where provided for staff use shall be by the G.C., however the Plumbing Contractor shall provide a shower drain and shower valve with a hand shower on slide bar (ADA compliant)

All classrooms will have self-rimming stainless steel sink with gooseneck type mixing faucets (Elkay #LK2439) and a water bubbler (Elkay #LK1141A). These sinks will have mixing valves to ensure that the water temperature is not above 110°F. Plumbing connections and faucets will provided to each kitchen appliances requiring plumbing work. Exterior non-freeze wall hydrants will be provided as requested by the owner as they are not required by code.

**Roof Storm Drainage System**

Roof is sloped to interior roof drains. The storm drain system will incorporate primary roof drains at low points and emergency overflow roof drains with 4” high water dams or internal standpipes in case the primary roof drain fails (roof drains could also be bi-functional). The primary roof drains will be piped to internal rain leaders and combine below grade to several exit locations to connect to the site drainage system. The emergency roof drains will be piped to discharge independently from the primary building storm system and shall terminate a minimum of 18” above grade.

**Sanitary Systems**

The sanitary sewer system within the building envelope to 10’ beyond the building foundation wall shall be service weight cast iron and will drain by gravity. External to the building, underground PVC piping shall be used or other material as dictated by the site engineer.

In addition to local grease traps at the dishwasher, pot sink and other fixtures requiring such, most of the waste from the kitchen shall be piped to a large (4,000 gallon+/-) exterior grease trap prior to discharge to the municipal sewer system. Kitchen piping not requiring treatment for grease includes piping for hand sinks, hot and cold food wells, freezer and cooler coil drains, mop sink and clothes washer.

Above ground sanitary drainage and will be piped in cast iron with “no-hub” joints. (3” or larger) . Piping smaller than 3 inch will be piped in copper. Piping below floor shall be service weight cast iron hub and spigot with rubber gaskets.

There are two overhead garage doors in this building. Trench drains will be provided near these doors and the effluent will be piped to interior oil-water separators. These will be independently vented with two 2" vents up through the roof.

The sanitary system shall be vented through the roof. At least one of the vent stack on each waste line exiting the building will be 4". The vent stacks through the roof will be located a minimum of 25 feet from the fresh air intakes of the rooftop units.

**Domestic Cold Water Service**

New main 4" domestic water supply in the mechanical room will enter from the site. Reduced Pressure Backflow Preventer will be provided to the main domestic water supply to protect the service (per the DEP regulation 310 CMR 22). Boiler water feed and make-up, and any other mechanical take-off's will branch off through a reduced pressure-principle backflow preventer. The dishwasher hot water feed and possibly the water feeds to for the 3-bay sink will need to be a protected water supply due to the addition of chemicals at these fixtures, therefore a reduced pressure backflow preventer will be installed in the mechanical room to service these fixtures.

The janitor's sinks may have chemical feed cleaning supply systems. Per the MA Plumbing Board, each connection to the janitor sink faucet shall have the following:

1. All dispensers shall have an Air Gap or, an alternative Certification of Listing under the ASSE 1055B Standard.
2. Dispensers shall include a dual check valve with an atmospheric vent device installed at the water inlet as a secondary backflow protection. If an external and open to the environment air gas separation is provided, a dual check valve with intermediate atmospheric vent will not be required.
3. A pressure bleeder device shall be provided which will visually free flow water through the atmosphere from the faucet connection to a sink or drain. The purpose of the bleeder device is to indicate that the water is running and should be shut off to prevent hot water migration. The bleeder device shall connect to the water source utilizing a quick disconnect coupling.
4. All external components will be permanently installed on the dispenser by the manufacturer and be ready for installation and use. External components include the dual check valve with atmospheric vent, hose and the pressure bleeder device.
5. The Device that attaches to the Faucet shall be so arranged, so it is one piece that will not allow the removal of the bleeder from the Quick disconnect portion of this device.

There are plans for a well/irrigation system for the multipurpose play fields only. will be no site irrigation system installed. Exterior sillcocks shall be provided around the building as requested, but are not required per code.

The domestic cold water piping inside the building will be distributed in “L” type copper tube with wrought or cast copper fittings. The piping will be insulated to prevent condensation. Piping installed can be joined by soldering or mechanical fittings.

**Domestic Hot Water Service**

Natural gas shall be the fuel source for a high efficiency (94%+) gas-fired condensing boiler coupled to two (2) 119 gallon storage tanks. This system shall be used to support the buildings domestic hot water needs. The domestic hot water distribution system will be recirculated from the furthest points in the school back to the storage tanks. There will be one hot water piping system serving the entire building. It shall operate at 125°F and will serve the other kitchen, classrooms, restrooms and appliances, as well as the mop sinks. Each lavatory faucet and classroom sink will reduce the hot water temperature to 110°F maximum or lower for younger grades as desired via local mixing valve stations and/or temperature limit stops.

The domestic hot water will be stored at 140°F. It will be reduced in temperature via a central thermostatic mixing valve in the mechanical room.

**Natural Gas System**

Natural gas system to the site shall be installed by the site contractor in conjunction with the natural gas supplier. The gas meter and initial gas pressure regulators shall be installed by the gas company. The Plumbers work will start at the outlet of the gas meter and be piping to the mechanical room, kitchen and ground floor science room to support various appliances and equipment.

The gas piping serving the kitchen hood will be connected to the hood dry chemical fire suppression system via a mechanical valve (i.e. valve with fusible link closure) and to a CO detection system in the kitchen. There will be a solenoid valve on the gas line that will keep the gas operational unless there is an elevated CO level detected. There can also be flammable gas sensors to ensure there is no build-up of flammable gas in the space (typically due to pilot light going out). The two CO detectors need to be mounted 15 feet away from the kitchen hood. Please note that the CO detection system will be independent of the fire alarm system due to false alarms on power outages.

Natural gas piping shall be screwed schedule 40 black steel piping on sizes 2” and under and welded on 2-1/2” and over.

**End of 100% SD Plumbing Narrative**

**ENERGY UTILITY RATE WORKAREA**

Using the appropriate information collected in preparation of the water conservation survey (highlighted in red in the introduction section), please complete the following questions regarding utility rates. All required information is indicated by the light blue shaded cells.

What type of energy do you use to heat your domestic hot water?

**2** **1=ELECTRICITY**
**2=NATURAL GAS**

***Electricity***

| | Total Usage (kWh) | Total Cost ($) |
|---|---|---|
| Month 1 | | |
| Month 2 | | |
| Month 3 | | |
| Month 4 | | |
| Month 5 | | |
| Month 6 | | |
| Month 7 | | |
| Month 8 | | |
| Month 9 | | |
| Month 10 | | |
| Month 11 | | |
| Month 12 | **1** | **$0** |
| Total | **1** | **$0** |
| Avg. Month | **0.083333333** | **$0** |

***Average Electricity Cost per kWh***
**$0.17**

***Natural Gas***

| | Total Usage (cu.ft.) | Total Cost ($) |
|---|---|---|
| Month 1 | | |
| Month 2 | | |
| Month 3 | | |
| Month 4 | | |
| Month 5 | | |
| Month 6 | | |
| Month 7 | | |
| Month 8 | | |
| Month 9 | | |
| Month 10 | | |
| Month 11 | | |
| Month 12 | **1** | **$1.20** |
| Total | **1** | **$1** |
| Avg. Month | **0.083333333** | **$0** |

***Average Natural Gas Cost per cu.ft.***
**$1.2000**

***Fuel Oil***

| | Total Usage (gal) | Total Cost ($) |
|---|---|---|
| Month 1 | **0** | **$0** |
| Month 2 | **0** | **$0** |
| Month 3 | **0** | **$0** |
| Month 4 | **0** | **$0** |
| Month 5 | **0** | **$0** |
| Month 6 | **0** | **$0** |
| Month 7 | **0** | **$0** |
| Month 8 | **0** | **$0** |
| Month 9 | **0** | **$0** |
| Month 10 | **0** | **$0** |
| Month 11 | **0** | **$0** |
| Month 12 | **0** | **0** |
| Total | **0** | **$0** |
| Avg. Month | **0** | **$0** |

***Average Fuel Oil Cost per gallon***
**$0.00**

## WATER UTILITY RATE WORKAREA

Using the appropriate information collected in preparation of the water conservation survey (highlighted in red in the infroduction section), please complete the following questions regarding utility rates.

**0** Enter 1 here if your water and wastewater/sewage bills are combined. Then enter combined data in the ***Water*** work area.

***Water***

| | Total Usage (gallons) | Total Cost ($) |
|---|---|---|
| Month 1 | | |
| Month 2 | | |
| Month 3 | | |
| Month 4 | | |
| Month 5 | | |
| Month 6 | | |
| Month 7 | | |
| Month 8 | | |
| Month 9 | | |
| Month 10 | | |
| Month 11 | | |
| Month 12 | **748** | **4** |
| Total | **748** | **$4** |
| Avg. Month | **62.33333333** | **$0** |

***Average Water Cost per gallon***

**$0.0049**

***Wastewater/Sewer***

| | Total Usage (gallons) | Total Cost ($) |
|---|---|---|
| Month 1 | | |
| Month 2 | | |
| Month 3 | | |
| Month 4 | | |
| Month 5 | | |
| Month 6 | | |
| Month 7 | | |
| Month 8 | | |
| Month 9 | | |
| Month 10 | | |
| Month 11 | | |
| Month 12 | **748** | **$7** |
| Total | **748** | **$7** |
| Avg. Month | **62.33333333** | **$1** |

***Average Wastewater/Sewer Cost per gallon***

**$0.0099**

*SAVEnergy Action Plans*

**Attachment A - Water**

| | | | | | |
|---|---|---|---|---|---|
| Prepared By: | **Seaman Engineering Corporation** | | | | |
| Agency: | | | | | |
| Facility: | **Beal Elementary School** | | | | |
| Contact Name: | | | | | |
| Address: | **214 Lake Street** | | | | |
| City | **Shrewsbury** | State: | **MA** | Zip: | **01545** |
| Phone/Fax: | | | | | |
| Date of Audit: | | | | | |
| Buildings included in Survey | **Beal Elementary School** | | | | |
| Water Provider(s): | **Shrewsbury Department of Public Works** | | | | |
| Number of Water Meters: | **1** | | | | |
| Account/Meter Numbers: | **N/A** | | | | |

## DOMESTIC WATER USE

### *Toilets*

| | Nameplate: | Fixture Type | GPF | Count | User Count Female | User Count Male | GPX | GPD |
|---|---|---|---|---|---|---|---|---|
| 1 | **P-1, 2 & 3** | **valve** | **1.6** | **62** | **455** | **455** | **46.96774194** | **2912** |
| 2 | | | | | | | **0** | **0** |
| 3 | | | | | | | **0** | **0** |
| 4 | | | | | | | **0** | **0** |
| 5 | | | | | | | **0** | **0** |
| 6 | | | | | | | **0** | **0** |
| | | | | | | | Total GPD= | **2912** |

Calculations:

GPF=Gallons per flush, estimated or measured
GPD=GPF x (3 x Female Count + 1 x Male Count)
= Average gallons per day for all toilets
GPX=GPD/Fixture Count
=Average gallons per day per fixture

### *Urinals*

| | Nameplate: | Fixture Type | GPF | Count | User Count Female | User Count Male | GPX | GPD |
|---|---|---|---|---|---|---|---|---|
| 1 | **P-4, 5 & 5H** | **valve** | **1.00** | **11** | | **455** | **82.72727273** | **910** |
| 2 | | | | | | | **0** | **0** |
| 3 | | | | | | | **0** | **0** |
| 4 | | | | | | | **0** | **0** |
| 5 | | | | | | | **0** | **0** |
| | | | | | | | Total GPD= | **910** |

Calculations:

GPD=GPF x (2 x Male Count)
=Average gallons per day urinals

### *Lavatory Sinks*

| | Nameplate: | Fixture Type | GPM | Count | User Count Female | User Count Male | Wash duration (min.) | GPD |
|---|---|---|---|---|---|---|---|---|
| 1 | **P-6, 7 & 8** | **faucet** | **0.8** | **46** | **455** | **455** | ***0.17*** | **433.16** |
| 2 | | | | | | | ***0.17*** | **0** |
| 3 | | | | | | | ***0.17*** | **0** |
| 4 | | | | | | | ***0.17*** | **0** |
| 5 | | | | | | | ***0.17*** | **0** |
| | | | | | | | Total Hand Washing GPD= | **433.16** |

Assume 3 hand washings per 8 hour work day per male, 4 per female.
Unless otherwise indicated, assume 10 sec. of flow per hand washing.

Calculations:

GPM=Measured gallons per minute of faucet flow
GPD= 0.17 GPM x (3 x Male Count + 4 x Female Count)
=Average gallons per day for hand washing

***Other Sinks (janitor's closet, laundry, kitchen, etc.)***

| | Nameplate: | Fixture Type | GPM | Count | Avg. time on Daily | | GPD |
|---|---|---|---|---|---|---|---|
| 1 | **Classroom** | **faucet** | **2.2** | **93** | **8** | min. | **1636.8** |
| 2 | **Service** | **faucet** | **3** | **5** | **10** | min. | **150** |
| 3 | **Kitchen Sink** | **faucet** | **2** | **4** | **15** | min. | **120** |
| 4 | **Hand Sinks** | **faucet** | **1.5** | **4** | **5** | min. | **30** |
| | | | | Total Non-Lavatory Washing GPD: | | | **1936.8** |

Calculations:

GPD=Time On x GPM x Fixture Count
=Average gallons per day for other sink use.

***Showers***

| | Location: | GPM | Count | Avg. Use per Day | | daily GPD |
|---|---|---|---|---|---|---|
| 1 | **P-11** | **2.5** | **3** | **30** | min. | **225** |
| 2 | | | | | min. | **0** |
| 3 | | | | | min. | **0** |
| 4 | | | | | min. | **0** |
| | | | | | Total GPD= | **225** |

***Known Leaks***

| | Location: | GPM | Count | Avg. Time On | | daily GPD |
|---|---|---|---|---|---|---|
| 1 | **None** | **1** | **0** | **2** | min. | **0** |
| 2 | | | | | min. | **0** |
| 3 | | | | | min. | **0** |
| 4 | | | | | min. | **0** |
| | | | | | Total GPD= | **0** |

Calculations:

GPD= Time on x GPM x Fixture Count
=Average gallons per day for leaks

## PLANT COOLING AND HEATING

### *Cooling Towers*

| | | | | |
|---|---|---|---|---|
| Number: | [redacted] | | | |
| Age: | [redacted] | years | | |
| Size: | [redacted] | | | |
| % Blow down: | [redacted] | | % Make-up | [redacted] |
| Water Treatment Method: | [redacted] | | | |

### *Evaporative Coolers*

| | | |
|---|---|---|
| Number: | [redacted] | |
| Age: | [redacted] | years |

### *Air Washers*

| | |
|---|---|
| Description: | [redacted] |

### *Humidifiers*

| | |
|---|---|
| Description: | [redacted] |

### *Boilers*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Number: | **1** | | | | | | |
| Age: | **0** | years | / | **1** | | **Electricity** |
| Fuel Source: | **2** | **<<<<<<<<** | **ENTER<** | **2** | **FOR** | **Nat. Gas** |
| Size: | **850** | | \ | **3** | | **Fuel Oil** |
| Lbs. Steam/hr. | **0.1** | | | | | |
| Pressure: | **200** | psi | | | | |
| % Condensate return: | **100%** | | | % Boiler Blow-down: | | **2%** |

### *Pumps*

| | | |
|---|---|---|
| Number: | [redacted] | |
| Age: | [redacted] | years |
| Size: | [redacted] | hp |

## ONCE-THROUGH COOLING

### *Air Conditioners*

| | | | |
|---|---|---|---|
| Number of Units: | [redacted] | | |
| Age: | [redacted] | years | |
| Size: | [redacted] | tons | **0** gallons |

### *Other Once Through* [redacted]

## OTHER

| | Quantity | Uses/day | Gallons/use | Total Usage per day |
|---|---|---|---|---|
| ***Dishwashers*** | **1** | **18** | **9** | **162** gal |
| ***Washing Machines*** | **1** | **1** | **23** | **23** gal |
| | | | | **185** gal |

## LANDSCAPE AND DECORATIVE USES

| | Square Ft | Acres | Ft water/acre/yr | Acre-ft/yr |
|---|---|---|---|---|
| ***Turf Area (square feet)*** | **0** | **0** | **10** | **0** |
| ***Landscaped Area (square feet)*** | **0** | **0** | **10** | **0** |

## SUMMARY

**TOTAL DAILY DOMESTIC WATER USAGE:** **6602** gal/day **does not include boiler use or landscape use.*

**TOTAL ANNUAL DOMESTIC WATER USAGE:** **1,716,510** gal/yr **assumes 260 operational days per year (see Inputs & Assumptions sheet to change).*

**Implementation Questions**

Do you want to look at Waterless or Low-Flow urinals?

| | |
|---|---|
| **2** | **1=WATERLESS** |
| | **2=LOW FLOW** |

Do you want to look at faucet replacement (with IR sensored faucets) or aerators only for restroom faucets?

| | |
|---|---|
| **1** | **1=AERATORS ONLY** |
| | **2=FAUCET REPLACEMENT** |

**Target Usage for Conserving Plumbing Fixtures**

| | | |
|---|---|---|
| ULF Toilet | **1.3** | Gallons per flush |
| ULF Urinal | **0.1** | Gallons per flush |
| Waterless Urinal | **0.001** | Gallons per use *(uses just 2-3 gallons HOT water for cleaning, every 8500 uses)* |
| Faucet | **0.4** | Gallons per minute |
| Showerhead | **1.5** | Gallons per minute |
| Dishwasher | **4.0** | Gallons per load |
| Washing Machine | **15.0** | Gallons per load |
| Faucet Aerator | **2.5** | Gallons per minute |

**Assumptions**

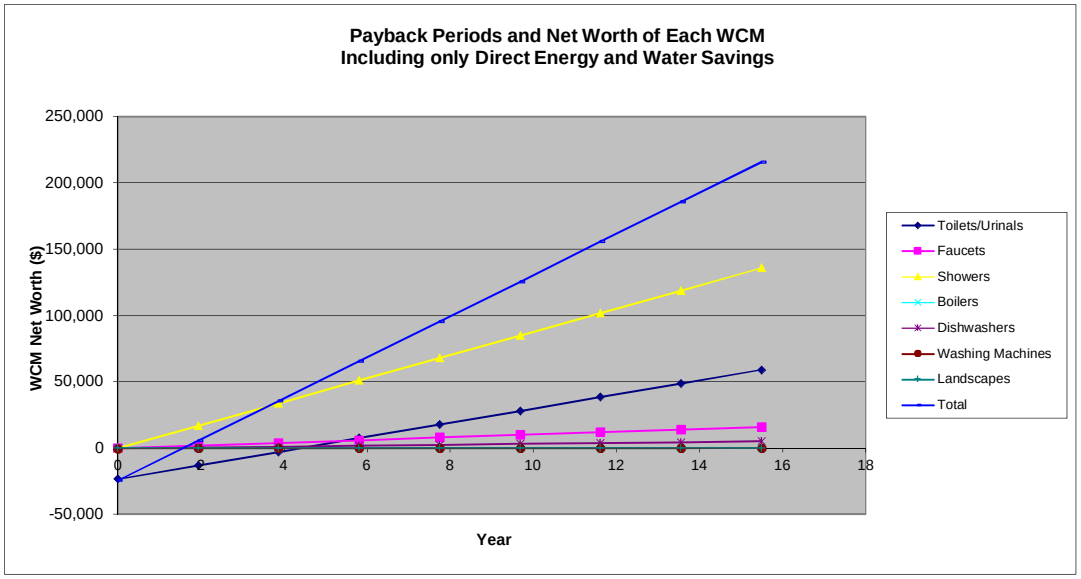
| | | |
|---|---|---|
| Hot Water Heating | **0.2** | kWh/gallon for Electrical hot water heaters |
| | **0.5** | cf gas/gallon for natural gas hot water heaters |
| Faucet | **50%** | of usage is hot water |
| Shower | **60%** | of usage is hot water |
| Dishwasher | **100%** | of usage is hot water |
| Wash Machine | **25%** | of usage is hot water |
| Leaks | **5%** | of usage is hot water |
| Water Treatment | **0.58** | kWh / 1,000 gallons treated - Indirect savings |
| UAF Gas | **2.1%** | of natural gas unaccounted for - Indirect savings |
| WW elec | **2.85** | kWh / 1,000 gallons treated - Indirect savings |
| Line Losses | **14%** | of Electricity lost in transmission - Indirect savings |
| IR Sensored Faucet | **0.17** | minutes per use |
| Heat in Boiler | **362** | Btu/lb - estimate |
| Heat of Propane gas | **1,040** | Btu/cf |
| Heat of Fuel oil | **145,000** | Btu/gal |
| Boiler Efficiency | **95%** | Default - 95% for electric, 80% for gas/oil 20 years or less, 70% for all others |
| Faucet Cleaning Use | **50%** | of non-restroom faucets' usage for cleaning (i.e. bucket filling) or other uses that will not be reduced by an aerator. |
| Landscape Savings | **50%** | of water reduced using ET watering techniques |
| Blowdown Reduction | **20%** | of Boiler blowdown reduced through process optimization |
| Heat of Electricity | **3412** | Btu=1 kWh |
| One Year | **260** | days (total work days assumed, not total calendar days) |

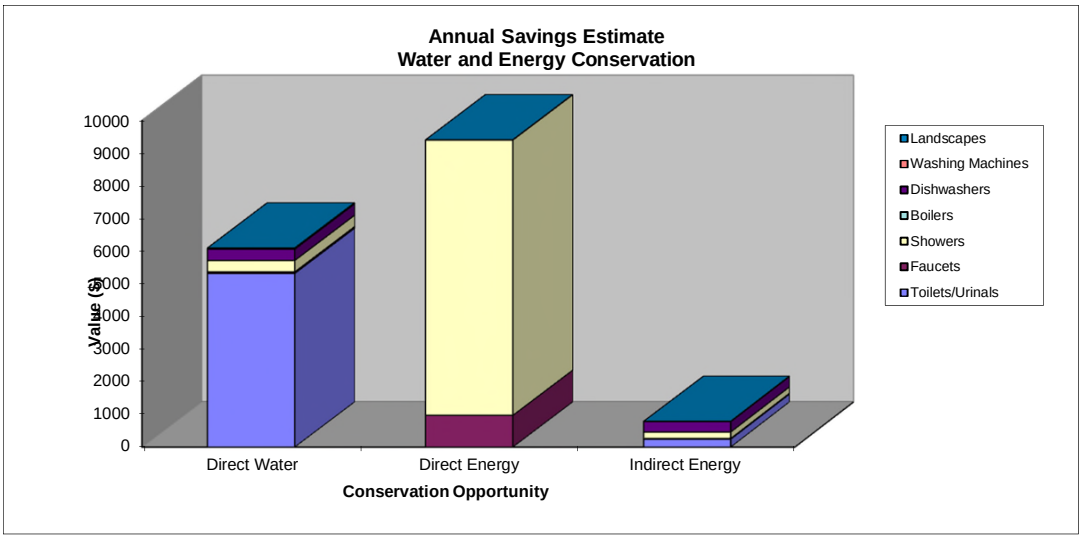
**Cost Information**

| | Equipment | Labor | Total | |
|---|---|---|---|---|
| ULF Toilet Replacement | **$220** | **$75** | **$295** | |
| ULF Urinal Replacement | **$350** | **$125** | **$475** | |
| Waterless Urinals | **$500** | **$125** | **$625** | |
| Aerators | **$8** | **$5** | **$13** | |
| Sensored Faucets | **$280** | **$50** | **$330** | |
| Showerheads | **$21** | **$10** | **$31** | |
| Leak Detection | | | **$0** | |
| Once Thru Conversion | | | **$0** | |
| Cooling Water Reduction | | | **$0** | |
| Blowdown Reduction | | | **$0** | |
| Lawn Sprinkling reduction | | | **50%** | of water savings value |
| Washing Machine | **$400** | **$25** | **$425** | |
| Dishwasher | **$250** | **$75** | **$325** | |

# Potential Conservation Opportunities

| Conservation Method | Number of Installations | Total Initial Cost ($) | Annual Savings ($) Direct Water | Direct Energy | Indirect Energy | Payback Period* (yrs) *Includes Direct Energy Only |
|---|---|---|---|---|---|---|
| Installation of ULF toilets and ULF urinals | 73 | $23,515 | $5,319 | $0 | $243 | 4.42 |
| Installation of automatic faucets | 0 | $0 | $0 | $0 | $0 | #N/A |
| Installation of faucet aerators | 5 | $65 | $68 | $2,509 | $32 | 0.03 |
| Low Flow showerhead | 3 | $93 | $347 | $8,424 | $197 | 0.01 |
| Boiler blowdown optimization | 1 | $0 | $0 | $2 | $0 | 0.00 |
| Efficient dishwashers | 1 | $325 | $347 | $0 | $317 | 0.94 |
| Efficient washing machines | 1 | $425 | $31 | $0 | $8 | 13.77 |
| Landscape irrigation optimization | #N/A | $0 | $0 | $0 | $0 | Annual |
| **Total (excluding Landscape)** | | **$24,423** | **$6,112** | **$10,935** | **$797** | **1.43** |



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# HVAC Schematic

# Basis of Design Narrative

# For The

# *BEAL ELEMENTARY SCHOOL*

# *in*

# *Shrewsbury, MA*

**August 1, 2018**

**Prepared by:**

**SEAMAN ENGINEERING CORPORATION**
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# HVAC NARRATIVE

## A. DESIGN INTENT

The heating medium is hot water generated by high efficiency condensing gas fired hot water boilers located in a ground level mechanical room. The boilers serve all areas of the building. The heating water is distributed to the fin-tube radiation, air handler units, cabinet and unit heaters and fan coil units located throughout the building.

High efficiency air cooled packaged rooftop heat pump systems provide full cooling control and supplemental heating to most all areas of the building. The heat pump cycles of these systems are used to temper air when winter outdoor air temperatures are above approximately 35°F resulting in higher heat pump efficiency/coefficients of performance (COP). Otherwise the boiler plant provides the heating required via glycol water coils in the units and/or radiation within the spaces.

The distribution systems consist of the following:

a. All classrooms and many areas with exterior exposures incorporate fin-tube radiation as the primary form of heat.

b. Variable air volume (VAV) terminals serving displacement diffusers in most all areas of the building with the exception of the office spaces.

c. VAV terminals with reheat in administration, media, and lobby areas.

d. Classroom ventilation is supported with central packaged VAV rooftop units complete with total energy recovery wheels, hot water coils and dehumidification cycles utilizing DX based system with hot gas reheat cycle. VAV terminals in these spaces control individual space temperature control.

e. Offices and Media spaces are supported by central packaged VAV rooftop units with total energy recovery wheels, hot water coils, cooling and dehumidification cycles utilizing DX based system with hot gas reheat cycle. VAV terminals in these spaces control individual space temperature control.

f. The Cafeteria & Gymnasium spaces are served by a central packaged rooftop unit with total energy recovery wheels, hot water coils, cooling and dehumidification cycles utilizing DX based system with hot gas reheat cycle. The systems have the ability to vary total air volume and outdoor air volume in a single zone VAV application.

g. Exhaust fans will vent specific areas such as bathrooms, storage areas and the kitchen. All exhaust fans shall have efficient ECM motors. Kitchen hood system shall have variable flow capabilities using smoke and/or heat sensors to vary exhaust airflow based on cooking demand.

The school is designed with a direct digital control (DDC) energy management system (EMS) that monitors and controls the HVAC equipment for efficient use. The system is designed on

PC based architecture and adjustments are made on a graphics based presentation of building systems. The system also supports maintenance and record keeping needs of the facility. Occupancy of the school shall be based on year-round use with occupied/unoccupied conditions based on current school day practice. This is an adjustable feature that can be made to reflect additional operating needs and use of the school building by staff or others.

The adjustable operating schedule, in general, is from 7:30 a.m. to 5:00 p.m., five days per week. It is expected that the building or certain areas within the building will also be used several evenings a week and occasionally on weekends.

The Designer of Record will certify that the HVAC systems have been installed in accordance with the approved construction documents, in conformance with Commonwealth of Massachusetts State Building Code 780 CMR Chapter 13, ninth edition.

## B. BASIS OF DESIGN

The HVAC systems and components are designed in accordance with the requirements of the Commonwealth of Massachusetts State Building Code - 9$^{th}$ Edition, 780 CMR, and conform to the energy conservation requirements of Chapter 13 of that code referencing IECC 2015 International Energy Conservation Code.

The Beal Elementary School is located in Shrewsbury, MA and the system design and loads complies with the criteria for Climate Zone 5A.

Interior design temperature set points are 72°F for heating and 75°F for cooling (for spaces with cooling cycles) during occupied conditions however setpoints in operation shall include a minimum 5 degree deadband between cooling and heating such as 70°F heating and 75°F cooling. Space conditions are allowed to drop to 62°F during the heating season and rise to 88°F during the cooling season when spaces are in the unoccupied condition. Morning warm-up or cool-down period is optimized to achieve design space conditions at the commencement of occupied periods.

Most all areas shall be designed to control maximum indoor humidity levels to no greater than 55% RH at design indoor space temperature.

Design occupant levels by space are contained within the architectural documents included as part of the schematic document submission.

## C. HVAC SYSTEM CONTROLS

Heating and cooling systems of the Beal Elementary School shall be monitored and controlled by an Energy Management System (EMS) using Direct Digital Control (DDC) technology. Each system is monitored for conformance to spatial design conditions and design point settings are adjustable through the DDC system. The DDC system is based on PC architecture with the central monitoring and control station located adjacent to the boiler

room. System shall be web based and accessible via password protection through internet browser software.

The HVAC systems are generally operated on a school day basis coinciding with the occupied/unoccupied schedule with the intent that the school shall be utilized year round. Adjustments can be made through the DDC system to allow for usage during periods other than the usual school operating periods.

Space temperature is monitored by individual space sensors that transmit data to the central monitoring and control station. Space conditions are adjustable through DDC system and can be modified to meet individual needs. Local control of space conditions is limited to predefined adjustments in space temperature and to facilitate a 3-hour occupied override feature.

Most systems serving densely occupied areas such as classrooms, media, cafeteria, gymnasium, etc… shall incorporate the use include carbon dioxide ($CO_2$) indoor air quality (IAQ) sensors which optimize the fresh outdoor air ventilation levels in response to variations in space occupancies.

The building shall be connected to an emergency power source for operation of heating boilers and pumps during emergency conditions.

## D. SYSTEMS AND EQUIPMENT CAPABILITIES

The buildings heating requirements will be satisfied via a high efficiency (93%+) LP gas-fired fire tube style condensing hot water boiler plant with a maximum design hot water supply temperature of 140°F. Pending final load calculations and system design, initially the boiler plant shall consist of two (2) gas-fired boilers each with a gross output capacity of 1,443,000 BTUH (total 2,886,000 BTUH plant) as manufactured by Cleaver Brooks Clearfire, Lochinvar Crest or approved equal series. Note: Boiler sized shall be adjusted based on finalization of building thermal envelope.

Provide 2-pipe hydronic hot water system complete with end-suction system pumps as manufactured by Taco, Armstrong or Grundfos rated for 280 GPM. Hydronic system shall connect to 2-pipe fan coil units, unit heaters, VAV coils and fin-tube radiation located throughout the building. All terminals connected to the new system shall be designed to operate with a maximum water temperature of 140°F. Pumps shall have premium efficient motors and be fitted with variable speed drives so that pump energy matches system flow demand.

One or more plate and frame heat exchangers shall be located in the boiler room and/or floor below the roof deck. These heat exchangers shall support a 30% propylene glycol water loop supporting rooftop unit heating coils. Each heat exchanger shall be fitted with a set of wet rotor in-line pumps with ECM motors. Each heat exchanger shall also include loop accessories such as air separator and expansion tank as well as a 6-gallon automatic glycol feed tank,

Air handlers serving classroom areas utilize total energy recovery energy exchange, hot water heating coils, DX coils and DX reheat coils to facilitate pretreating and dehumidification cycles.

The cooling system consists of multiple high efficiency packaged air cooled DX units with digital or inverter modulating scroll compressor technology and hot gas reheat dehumidification cycles. These units support all areas noted previously as being air conditioned as well as dehumidification for classroom spaces.

Systems and there capacities are as follows:

Abbreviations:
H&V – Heating & Ventilation; HVAC – Heating, ventilation and air conditioning; ERV – Energy Recovery Ventilation; VAV- Variable Air Volume; AHU – Air Handling Unit; RTU – Packaged Rooftop Unit with DX cooling and/or dehumidification

- MAU-1 Kitchen Make-up Air & Ventilation Unit: TBD CFM VAV, HVAC & Dehum. Control
- RTU-1 A Wing Main Floor Classrooms: 12,000 CFM VAV, HVAC with ERV and Dehum. Control
- RTU-2 A Wing Ground Floor Classrooms: 12,000 CFM VAV, HVAC with ERV and Dehum. Control
- RTU-3 B Wing Main Floor Classrooms: 9,800 CFM VAV, HVAC with ERV and Dehum. Control
- RTU-4 B Wing Ground Floor Classrooms: 9,000 CFM VAV, HVAC with ERV and Dehum. Control
- RTU-5 C Wing Main Floor Classrooms: 7,200 CFM VAV, HVAC with ERV and Dehum. Control
- RTU-6 C Wing Ground Floor Classrooms: 6,900 CFM VAV, HVAC with ERV and Dehum. Control
- RTU-7 D Wing Main Floor Classrooms: 7,600 CFM VAV, HVAC with ERV and Dehum. Control
- RTU-8 Art Classrooms: 2,400 CFM VAV, HVAC with ERV and Dehum. Control
- RTU-9 Gymnasium: 7,000 CFM Single Zone VAV, HVAC with ERV and Dehum. Control
- RTU-10 Gymnasium: 7,000 CFM Single Zone VAV, HVAC with ERV and Dehum. Control
- RTU-11 Offices: 3,800 CFM VAV, HVAC with ERV and Dehum. Control
- RTU-12 Cafeteria: 7,000 CFM Single Zone VAV, HVAC with ERV and Dehum. Control
- RTU-13 Cafeteria: 7,000 CFM Single Zone VAV, HVAC with ERV and Dehum. Control
- RTU-14 Main Lobby and Corridors: 9,000 CFM VAV, HVAC with ERV and Dehum. Control

- RTU-15 Music Classrooms: 2,500 CFM VAV, HVAC with ERV and Dehum. Control
- RTU-16 Media Center: 6,500 CFM VAV, HVAC with ERV and Dehum. Control

Supplemental cabinet and unit heaters are located at building entrances and other areas to mitigate drafts from entering internal building spaces.

E. TESTING

The HVAC equipment and systems are required to be tested and reports submitted for review and record as part of the construction document requirements. In addition, systems shall be properly commissioned by an independent 3rd party. Systems and equipment requiring testing and report submittal are:

a. Heating system includes all boilers, pumps, and heating coils of connected equipment.

b. Cooling system including DX split systems and packaged rooftop heat pump units.

c. All piped distribution systems are required to pass a hydrostatic test using water and the pressure medium at a test pressure of 150 percent of operation pressure. All hydronic heating and cooling systems will be tested and balanced. A testing, adjusting, and balancing (TAB) report will be prepared for each system and submitted for review and record to the architect and engineer. TAB shall be done by an independent testing and balancing contractor

d. All airside components of the HVAC systems shall operate as designed and conform to the specifications for airflow as defined in the contract documents. A testing, adjusting, and balancing (TAB) report will be prepared for each system and submitted for review and record to the architect and engineer. TAB shall be done by an independent testing and balancing contractor.

e. Ductwork shall be tested for leak integrity and performed in accordance with SMACNA standards.

f. Systems or equivalent components not meeting the design criteria of the contract documents shall be corrected and re-tested for conformance to contract documents at no additional cost to the owner.

g. Visual inspection of all equipment installations for conformance to contract documents with respect to sound, vibration and installation integrity. Manufacturers' recommendations for equipment installation will be followed. All HVAC systems will operate in accordance with the sequence of operation defined for that system.

## III. DESIGN PARAMETERS & LOADS

DESIGN CRITERIA

The HVAC systems and components are designed in accordance with the requirements of the Commonwealth of Massachusetts State Building Code - 9th Edition, 780 CMR, and conform to

the energy conservation requirements of Chapter 13 of that code referencing IECC 2015 International Energy Conservation Code with stretch code amendments as applicable.

The Beal Elementary School is located in Shrewsbury, MA and the systems design and loads comply with the criteria for Climate Zone 5A. Outdoor design conditions utilized were:

| | |
|---|---|
| Heating Degrees Winter: | 0ºF |
| Cooling Degrees (db) Summer: | 87ºF** |
| Cooling Degrees (wb) Summer: | 71ºF |

**87°F was used for cooling design as it is more reflective of the urban temperatures experienced in Shrewsbury as opposed to the 84°F 1% design temperature reported at the higher elevation Worcester Airport.

Interior design temperature set points are 72°F for heating and 75°F for cooling (for spaces with cooling cycles) during occupied conditions however setpoints in operation shall include a minimum 5 degree deadband between cooling and heating such as 70°F heating and 75°F cooling. Space conditions are allowed to drop to 60°F during the heating season and rise to 90°F during the cooling season when spaces are in the unoccupied condition. Morning warm-up or cool-down period is optimized to achieve design space conditions at the commencement of occupied periods.

Design occupant levels by space are contained within the architectural documents included as part of the approved schematic documents.

Outside air ventilation requirements were based on the ICC International Mechanical Code 2015 as referenced by the building code as well as cross references to ASHRAE Ventilation Standard 62.1- current edition. Ventilation requirements are based on space use, room occupancy, square footage and ventilation effectiveness.

## COOLING & HEATING LOADS

Cooling and heating load calculations were performed utilizing the design data referenced above. Climate data for Worcester, MA was selected for load and energy calculations in that it offers the most applicable environmental conditions to Shrewsbury, MA in addition to the fact that Worcester was the closest city in which pertinent hourly weather data was available for the computer simulation. Summary output data can be found in the Life Cycle Report. As noted previously. For peak cooling load calculations 87°F outdoor ambient was used as it is more reflective of the urban temperatures experienced in Shrewsbury as opposed to the 84°F 1% design temperature reported at the higher elevation Worcester Airport.

The building heating and cooling load requirements under peak design load conditions as indicated above are estimated as follows:

| | Heating Load | Cooling Load | Tons |
|---|---|---|---|
| Building Loads | 2,319,515 BTUH | 3,148,797 BTUH | 262 |

The estimates do not include localized cooling loads for tel/data and MDF rooms.

**End of Schematic Basis of Design HVAC Narrative**

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# HVAC SCHEMATIC

## Life Cycle Report

## For The

## *BEAL ELEMENTARY SCHOOL*

## *IN*

## *Shrewsbury, MA*

## August 28, 20184

**Prepared by:**

**SEAMAN ENGINEERING CORPORATION**
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# I. EXECUTIVE SUMMARY

This report defines the Heating, Ventilating and Air Conditioning (HVAC) systems being designed for the new Beal Elementary School in Shrewsbury, MA. which encompasses a gross building area of approximately 140,000 SF. In addition, it evaluates the current schematic basis of design which meets and exceeds the minimum state mandated energy performance requirements including the Stretch Code adopted by Shrewsbury against other proposed alternatives. The systems described as Schematic Basis of Design has currently been implemented into the schematic design submission.

The following briefly describes the major differences between the Schematic Basis of Design and the respective alternates.

Schematic Basis of Design – Condensing Boilers & Packaged Roof-top Units:
Incorporates a high efficiency 93%+ efficiency gas-fired boiler plant coupled to fin-tube radiation and air handler coils supporting the heating and ventilation needs of the building. Fin-tube radiation support classroom areas whereas air handling systems support the administration, gym, café and lobby areas. The ventilation and cooling needs of most all areas are supported by packaged rooftop total energy recovery units distributing reclaimed and tempered outdoor air to each space. All classroom systems and many other systems incorporate variable air volume (VAV) terminal boxes which control the amount of airflow to each room to support both space temperature and IAQ as monitored by space $CO_2$ sensors. Most units have refrigerant based dehumidification cycles to insure occupied space humidity levels do not rise above 55%. These dehumidification cycles recapture the hot gas hot gas process from the refrigeration cycle for reheating. All main air systems incorporate heat pump cycles to minimize use of fossil fuel heating during night heating and warm-up cycles.

Air distribution to most all classroom spaces is via displacement diffusers which introduce fresh ventilation air near the floor level thereby improving ventilation effectiveness and efficiency of the system.

*Advantages:*
- Good heating energy operating cost
- Low initial first cost

*Disadvantages:*
- Limited use of renewable energy

Schematic Design Alternate #1 – Biomass Wood Pellet Boiler:
Same as schematic basis of design above with the exception that in lieu of natural gas boilers as the primary heat source, the main plant would have one wood pellet boiler to support much of the building winter heating needs. A natural gas boiler or equivalent would still be required for periods of light load and for back-up.

*Advantages:*
- Use of renewable energy for heating
- Both wood and gas fuel use option

*Disadvantages:*
- Higher fuel cost when compared to nat. gas
- Higher maintenance cost of wood boiler
- Higher first cost.

Schematic Design Alternate #2 – Water Cooled Geothermal Chiller/Heater:
Same air distribution system as schematic basis of design. A geothermal based chiller/heater would be provided to supply either chilled water or hot water to rooftop air handling units. The geothermal chiller/heater would be coupled to a close loop vertical well field for heat extraction in the winter and heat rejection in the summer. The major draw backs to this system are the high cost of the ground coupled loop and the inability to provide both cooling and heating to the building simultaneously especially during transition months.

*Advantages:*
- Lower heating energy operating cost
- Reduces use of fossil fuels on-site

*Disadvantages:*
- High geothermal well field cost
- High pump energy impacts payback

Schematic Design Alternate #3 – Water Cooled Chiller:
Same as schematic basis of design above with the exception that in lieu of packaged air cooled equipment the rooftop units shall be air handlers with chilled water and hot water coils with bypass control for tempered reheat. A central water cooled chiller and tower would provide chilled water to the roof air handlers.

*Advantages:*
- Lower unitary maintenance cost
- Potential lower cooling energy operating cost
- Roof air handlers have longer life than packaged units

*Disadvantages:*
- High first cost and long payback
- Maintenance of cooling tower

The following table defines the economic differences between the respective options. We have designed around the Schematic Basis of Design case being that it incorporates readily employed and efficient technology using high efficiency gas-fired condensing boilers and packaged rooftop units with energy recovery. The measure also has the ability to incorporate air source heat pump technology within the main RTU units to further reduce the reliance on gas heating fuel. There are significant modeling limitations due to the hybrid nature of the systems and as such all energy cost values should be considered order of magnitude. For example, the model cannot account for the fact that the units are reheating the air during dehumidification cycles using waste unit heat and as such the model will show elevated heating use in the summer periods.

All life cycles were run on an average life cycle of 20 years however life of equipment will vary such as boilers at 30 years and RTU's at 15-20 years. Values below are in current dollars, simple payback method with no discount factor applied. An annual escalation rate for maintenance costs was set at 3% and fuel and power costs at 5%.

## ECONOMIC COMPARISON SUMMARY

| | Installed System Cost | Annual Energy Cost | Annual Maint. | 20 year Life Cycle Cost |
|---|---|---|---|---|
| **Schematic Basis of Design** | **$5,632,726** | **$114,741** | **$70,000** | **$11,553,802** |
| Alt. #1 – Biomass | $5,932,726 (note #1) | $129,811 | $70,000 | $12,377,021 |
| Alt #2 – Geothermal | $6,132,726 (note #2) | $133,429 | $70,000 | $12,702,635 |
| Alt #3 – Water Chiller | $5,832,726 | $136,318 | $70,000 | $12,502,939 |

**Cost Estimates from A.M Fogarty & Assoc., Inc. as well as R.S. Means and manufacturers' data.*
*Annual escalation rate of 3% for maintenance and 5% for power and fuel. Maintenance cost based on ASHRAE and published studies at approximately $0.50 per SF baseline.*
*Note #1: Biomass Boiler and pellet silo $300,000 add.*
*Note #2: Geothermal well field, chiller/heater $500,000 add.*
*Note #3: Water chiller, tower, etc.. $200,000 add.*

# II. DESIGN PARAMETERS & LOADS

## A. DESIGN CRITERIA

The HVAC systems and components are designed in accordance with the requirements of the Commonwealth of Massachusetts State Building Code - 9th Edition, 780 CMR, and conform to the energy conservation requirements of Chapter 13 of that code referencing IECC 2015 International Energy Conservation Code with stretch code amendments as applicable.

The Beal Elementary School is located in Shrewsbury, MA and the systems design and loads comply with the criteria for Climate Zone 5A. Outdoor design conditions utilized were:

| | |
|---|---|
| Heating Degrees Winter: | 0ºF |
| Cooling Degrees (db) Summer: | 87ºF** |
| Cooling Degrees (wb) Summer: | 71ºF |

**87°F was used for cooling design as it is more reflective of the urban temperatures experienced in Shrewsbury as opposed to the 84°F 1% design temperature reported at the higher elevation Worcester Airport.

Interior design temperature set points are 72°F for heating and 75°F for cooling (for spaces with cooling cycles) during occupied conditions however setpoints in operation shall include a minimum 5 degree deadband between cooling and heating such as 70°F heating and 75°F cooling. Space conditions are allowed to drop to 60°F during the heating season and rise to 90°F during the cooling season when spaces are in the unoccupied condition. Morning warm-up or cool-down period is optimized to achieve design space conditions at the commencement of occupied periods.

Design occupant levels by space are contained within the architectural documents included as part of the approved schematic documents.

Outside air ventilation requirements were based on the ICC International Mechanical Code 2015 as referenced by the building code as well as cross references to ASHRAE Ventilation Standard 62.1- current edition. Ventilation requirements are based on space use, room occupancy, square footage and ventilation effectiveness.

## B. COOLING & HEATING LOADS

Cooling and heating load calculations were performed utilizing the design data referenced above. Climate data for Worcester, MA was selected for load and energy calculations in that it offers the most applicable environmental conditions to Shrewsbury, MA in addition to the fact that Worcester was the closest city in which pertinent hourly weather data was available for the computer simulation. Summary output data can be found in the appendix section attached to this report. As noted previously. For peak cooling load calculations 87°F outdoor ambient was used as it is more reflective of the urban temperatures experienced in

Shrewsbury as opposed to the 84°F 1% design temperature reported at the higher elevation Worcester Airport.

The building heating and cooling load requirements under peak design load conditions as indicated above are estimated as follows:

| | Heating Load | Cooling Load | Tons |
|---|---|---|---|
| Building Loads | 2,319,515 BTUH | 3,729,164 BTUH | 311 |

The estimates do not include localized cooling loads for tel/data and MDF rooms.

# III. ENERGY SIMULATIONS

Energy simulations were run for the Schematic Basis of Design Case as well as the three alternates. The final results can be found in the Appendix section of this report.

There are various limitations to energy simulation programs especially in a building such as this where occupant loads can vary greatly day to day and space to space. We have listed some of our assumptions below, some of which may have been forced by program modeling limitations.

*Assumptions:*

- Occupancy times are from 7:00 AM to 5:00 PM Monday thru Friday with varying loading.
- Partial occupancy was assumed for most time periods in the gymnasium and café space.
- School occupied year-round.
- Indoor space temperature setpoints are 75°F/85°F occ./unocc. cooling and 72°/62° occ./unocc. heating.
- Indoor space humidity dehumidification setpoint 55% RH.
- Natural gas cost @ $1.50 per gallon
- Electric rate cost @ $0.17 per kW
- Wood pellet cost @ $250 per ton
- Energy escalation rate 5%, maintenance 3%

# IV. COST ESTIMATES

Cost estimates for the selected Schematic Basis of Design were assembled utilizing the estimates prepared from A.M Fogarty & Assoc., Inc. In addition, we projected estimates for the base case utilizing RS Means Cost Data amended as required based on known equipment prices from vendors.

A summary of the installed cost estimates are as follows:

- **Base Case – 93%+ eff. Boilers and High Eff. RTU's➔ $5,632,726**
- **Alt. #1 – Biomass Boiler ➔ $5,932,726**
- **Alt. #2 - Geothermal Chiller/Heater ➔ $6,132,726**
- **Alt. #3 - Water Chiller ➔ $5,832,726**

For Alt. #1 the Biomass Boiler and pellet silo premium was estimated to be $300,000. This should be considered a minimum premium value as significant variation can occur based on final boiler and pellet delivery system selection.

For Alt. #2 the Geothermal well field, chiller/heater premium was estimated to be $500,000. This should be considered a minimum premium value as significant variations can occur based on type of well (i.e. standing column, or closed loop).

For Alt. #3 water chiller, tower and accessory premium was estimated to be $200,000. This should be considered a minimum premium value as significant variations can occur based on final selected chiller.

# Appendix A

# COST ESTIMATES - Schematic

# (A.M Fogarty & Assoc., Inc.)

A.M. Fogarty
& Assoc., Inc.
175 Derby St., Suite 5, Hingham, MA 02043
TEL: (781) 749-7272 • FAX: (781) 740-2652
ptim@amfogarty.com
"Construction Cost Consultants"

# Schematic Cost Estimate
# Beal Elementary School
# Shrewsbury, MA

**23-Aug-18**

| | | | | |
|---|---|---|---|---|
| NEW BUILDING | | | | $43,402,421 |
| SITEWORK | | | | $9,531,904 |
| BUILDING DEMOLITION | 100,000 | GSF | $7.50 | $750,000 |
| HAZARDOUS WASTE REMOVAL | | | | $1,640,000 |
| | | | | --- |
| TOTAL DIRECT COST ( escalated to mid point of construction ) | | | | $55,324,325 |
| Chptr 149 a CM at Risk: | | | | |
| DESIGN CONTINGENCY | | 10% | | $5,532,432 |
| CM CONTINGENCY | | 3% | | $1,825,703 |
| ESCALATION ( winter 2019 ) | | 6% | | $3,760,948 |
| GENERAL CONDITIONS | 30 | MOS | $150,000 | $4,500,000 |
| GENERAL REQUIREMNTS | | 2.5% | | $1,773,585 |
| BUILDING PERMIT | | waived | | |
| P&P BOND | | 0.85% | | $618,094 |
| GENERAL LIABILITY INSURANCE | | 1.35% | | $990,024 |
| FEE | | 2.8% | | $2,043,941 |
| | | | | --- |
| TOTAL CONSTRUCTION COST | | | | $76,369,051 |
| COST PER S.F. | | | | $539.33 |

**ALTERNATES:**

| | |
|---|---|
| LAKE STREET ALIGNMENT | $0 |
| IRRIGATION WELL AND SYSTEM | $0 |
| FIRE SEPARATION WALL | $0 |

| | | | |
|---|---|---|---|
| PROJECT: | Beal Elementary School | NO. OF SQ. FT.: | 141,600 |
| LOCATION: | Shrewsbury, MA | COST PER SQ. FT.: | $373.83 |
| CLIENT: | Lamoureux-Pagano Architects | *GSF Noted on A1.1 | |
| DATE: | 23-Aug-18 | | |

No.: 18004

## SUMMARY

| | TOTAL | PERCENT OF PROJECT | COST PER SF |
|---|---|---|---|
| A. SUBSTRUCTURE | | | |
| A10 - FOUNDATIONS | | | |
| A1010 STANDARD FOUNDATIONS | 2,385,563 | 5% | 16.85 |
| A1020 SPECIAL FOUNDATIONS | 0 | 0% | 0.00 |
| A1030 SLAB ON GRADE | 951,902 | 2% | 6.72 |
| A20 - BASEMENT CONSTRUCTION | | | |
| A2010 BASEMENT EXCAVATION | 0 | 0% | 0.00 |
| A2020 BASEMENT WALLS | 0 | 0% | 0.00 |
| B. SHELL | | | |
| B10 - SUPERSTRUCTURE | | | |
| B1010 FLOOR CONSTRUCTION | 1,770,144 | 3% | 12.50 |
| B1020 ROOF CONSTRUCTION | 2,572,165 | 5% | 18.17 |
| B20 - EXTERIOR ENCLOSURE | | | |
| B2010 EXTERIOR WALLS | 5,566,817 | 11% | 39.31 |
| B2020 EXTERIOR WINDOWS | 1,400,740 | 3% | 9.89 |
| B2030 EXTERIOR DOORS | 117,068 | 0% | 0.83 |
| B30 - ROOFING | | | |
| B3010 ROOF COVERINGS | 2,053,905 | 4% | 14.50 |
| B3020 ROOF OPENINGS | 37,600 | 0% | 0.27 |
| C. INTERIORS | | | |
| C10 - INTERIOR CONSTRUCTION | | | |
| C1010 PARTITIONS | 2,725,546 | 5% | 19.25 |
| C1020 INTERIOR DOORS | 816,839 | 2% | 5.77 |
| C1030 FITTINGS | 725,362 | 1% | 5.12 |
| C20 - STAIRS | | | |
| C2010 STAIR CONSTRUCTION | 161,500 | 0% | 1.14 |
| C2020 STAIR FINISHES | 61,440 | 0% | 0.43 |
| C30 - INTERIOR FINISHES | | | |
| C3010 WALL FINISHES | 1,238,918 | 2% | 8.75 |
| C3020 FLOOR FINISHES | 1,289,721 | 2% | 9.11 |
| C3030 CEILING FINISHES | 1,047,147 | 2% | 7.40 |
| D. SERVICES | | | |
| D10 - CONVEYING | | | |
| D1010 ELEVATORS & LIFTS | 115,037 | 0% | 0.81 |
| D20 - PLUMBING | | | |
| D2010 PLUMBING | 2,448,142 | 5% | 17.29 |

Beal Elementary School

| | TOTAL | PERCENT OF PROJECT | COST PER SF |
|---|---|---|---|
| D30 - HVAC | | | |
| D3010 HVAC | 5,632,726 | 11% | 39.78 |
| D40 - FIRE PROTECTION | | | |
| D4010 SPRINKLERS | 623,040 | 1% | 4.40 |
| D4020 STANDPIPES | 0 | 0% | 0.00 |
| D4030 FIRE PROTECTION SPECIALTIES | 0 | 0% | 0.00 |
| D4090 OTHER FIRE PROTECTION SYSTEMS | 0 | 0% | 0.00 |
| D50 - ELECTRICAL | | | |
| D5010 ELECTRICAL SERVICE & DISTRIBUTION | 2,234,160 | 4% | 15.78 |
| D5020 LIGHTING & BRANCH WIRING | 1,649,640 | 3% | 11.65 |
| D5030 COMMUNICATION & SECURITY | 2,050,700 | 4% | 14.48 |
| D5090 OTHER ELECTRICAL SYSTEMS | 783,000 | 1% | 5.53 |
| E. EQUIPMENT & FURNISHINGS | | | |
| E10 - EQUIPMENT | | | |
| E1010 COMMERCIAL EQUIPMENT | 545,000 | 1% | 3.85 |
| E1020 INSTITUTIONAL EQUIPMENT | 0 | 0% | 0.00 |
| E1030 VEHICULAR EQUIPMENT | 0 | 0% | 0.00 |
| E1090 OTHER EQUIPMENT | 730,838 | 1% | 5.16 |
| E20 - FURNISHINGS | | | |
| E 2010 FIXED FURNISHINGS | 1,667,761 | 3% | 11.78 |
| E2020 MOVABLE FURNISHINGS | 0 | 0% | 0.00 |
| F. SPECIAL CONSTRUCTION & DEMOLITION | | | |
| F10 - SPECIAL CONSTRUCTION | | | |
| F1010 SPECIAL STRUCTURES | 0 | 0% | 0.00 |
| F20 - SELECTIVE BUILDING DEMOLITION | | | |
| F2010 BUILDING ELEMENTS DEMOLITION | 0 | 0% | 0.00 |
| F2020 HAZARDOUS COMPONENTS ABATEMENT | 0 | 0% | 0.00 |
| G. BUILDING SITEWORK | | | |
| G10 - SITE PREPARATION | | | |
| G1010 SITE CLEARING | 687,606 | 1% | 4.86 |
| G1020 SITE DEMOLITION & RELOCATIONS | 0 | 0% | 0.00 |
| G1030 SITE EARTHWORK | 1,671,407 | 3% | 11.80 |
| G1040 HAZARDOUS WASTE REMEDIATION | 0 | 0% | 0.00 |
| G20 - SITE IMPROVEMENTS | | | |
| G2010 ROADWAYS | 1,038,261 | 2% | 7.33 |
| G2020 PARKING LOTS | 0 | 0% | 0.00 |
| G2030 PEDESTRIAN PAVING | 533,205 | 1% | 3.77 |
| G2040 SITE DEVELOPMENT | 1,456,363 | 3% | 10.29 |
| G2050 LANDSCAPING | 1,842,420 | 3% | 13.01 |

Beal Elementary School

| | TOTAL | PERCENT OF PROJECT | COST PER SF |
|---|---|---|---|
| G30 - SITE MECHANICAL UTILITIES | | | |
| G3010 WATER SUPPLY | 464,163 | 1% | 3.28 |
| G3020 SANITARY SEWER | 104,503 | 0% | 0.74 |
| G3030 STORM SEWER | 1,071,381 | 2% | 7.57 |
| G3040 HEATING DISTRIBUTION | 0 | 0% | 0.00 |
| G3050 COOLING DISTRIBUTION | 0 | 0% | 0.00 |
| G3060 FUEL DISTRIBUTION | 62,360 | 0% | 0.44 |
| G3090 OTHER SITE MECHANICAL UTILITIES | 0 | 0% | 0.00 |
| G40 - SITE ELECTRICAL UTILITIES | | | |
| G4010 ELECTRICAL DISTRIBUTION | 286,338 | 1% | 2.02 |
| G4020 SITE LIGHTING | 313,899 | 1% | 2.22 |
| G4030 SITE COMMUNICATIONS & SECURITY | 0 | 0% | 0.00 |
| G4090 OTHER SITE ELECTRICAL UTILITIES | 0 | 0% | 0.00 |
| G90 - OTHER SITE CONSTRUCTION | | | |
| G9090 OTHER SITE SYSTEMS | 0 | 0% | 0.00 |
| | --- | --- | --- |
| TOTAL DIRECT COST | 52,934,325 | 100% | 373.83 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| BF Preventer @ Mech | 1 | LS | 5,000.00 | 5,000 |
| Underground Water Service: | | | | |
| 6" | 10 | LF | 150.00 | 1,500 |
| Meter Install | 1 | EA | 1,200.00 | 1,200 |
| 6" BFP | 1 | EA | 12,500.00 | 12,500 |
| Test , permit misc gc | 1 | LS | 50,000.00 | 50,000 |
| General Requirement Temp Gas and Water | 1 | LS | 50,000.00 | 50,000 |
| | | | | --- |
| | | | | 2,448,142 |
| TOTAL D20 - PLUMBING | $17.29 | /SF | | 2,448,142 |

D30 - HVAC

D3010 HVAC

230001 HVAC*

| | | | | |
|---|---|---|---|---|
| Rooftop Unit ( HW Coil w/ DX Cooling ): | | | | |
| RTU-1 | 12,000 | CFM | 12.25 | 147,000 |
| RTU-2 | 12,000 | CFM | 12.25 | 147,000 |
| RTU-3 | 9,800 | CFM | 12.25 | 120,050 |
| RTU-4 | 9,000 | CFM | 12.25 | 110,250 |
| RTU-5 | 7,200 | CFM | 12.25 | 88,200 |
| RTU-6 | 6,900 | CFM | 12.25 | 84,525 |
| RTU-7 | 7,600 | CFM | 12.25 | 93,100 |
| RTU-8 | 2,400 | CFM | 12.25 | 29,400 |
| RTU-9 | 7,000 | CFM | 12.25 | 85,750 |
| RTU-10 | 7,000 | CFM | 12.25 | 85,750 |
| RTU-11 | 3,800 | CFM | 12.25 | 46,550 |
| RTU-12 | 7,000 | CFM | 12.25 | 85,750 |
| RTU-13 | 7,000 | CFM | 12.25 | 85,750 |
| RTU-14 | 9,800 | CFM | 12.25 | 120,050 |
| RTU-15 | 2,500 | CFM | 12.25 | 30,625 |
| RTU-16 | 6,500 | CFM | 12.25 | 79,625 |
| Make-Up Air Unit: | | | | |
| MAU-1 | 7,000 | CFM | 5.50 | 38,500 |
| Hot Water Boiler (FBN-1250): | | | | |
| B-1 | 1 | EA | 36,500.00 | 36,500 |
| B-2 | 1 | EA | 36,500.00 | 36,500 |
| AS-1 | 1 | EA | 3,800.00 | 3,800 |
| ET- 1,2 | 2 | EA | 6,500.00 | 13,000 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Boiler Valve and trim | 1 | LS | 25,000.00 | 25,000 |
| AS | 2 | EA | 3,600.00 | 7,200 |
| 6" CPVC Boiler flue | | see plumbing | | |
| Boiler flue roof term | 2 | EA | 3,500.00 | 7,000 |
| Chemical treatment | 1 | LS | 4,500.00 | 4,500 |
| HW pump | 2 | EA | 7,500.00 | 15,000 |
| Boiler pump | 2 | EA | 1,500.00 | 3,000 |
| | | | | |
| Radiation Schedule: | | | | |
| BB-1 - no cover | 1,476 | LF | 68.50 | 101,106 |
| Modulating valve | 56 | EA | 275.00 | 15,400 |
| Balance/ISO valve | 112 | EA | 90.00 | 10,080 |
| | | | | |
| Hot Water Devices: | | | | |
| Unit heater | 4 | EA | 1,100.00 | 4,400 |
| Cabinet heater | 6 | EA | 3,500.00 | 21,000 |
| Modulating valve | 10 | EA | 275.00 | 2,750 |
| Balance/ISO valve | 20 | EA | 90.00 | 1,800 |
| | | | | |
| Hot Water Distribution piping | 141,600 | SF | 5.65 | 800,040 |
| | | | | |
| Displacement Diffuser: | | | | |
| DD-1 thru 4 | 180 | EA | 950.00 | 171,000 |
| | | | | |
| Fan Schedule: | | | | |
| EF-# | 1 | EA | 3,800.00 | 3,800 |
| EF-# | 1 | EA | 3,800.00 | 3,800 |
| EF-# | 1 | EA | 3,800.00 | 3,800 |
| EF-# | 1 | EA | 3,800.00 | 3,800 |
| KEF-# | 1 | EA | 5,500.00 | 5,500 |
| DEF-# | 1 | EA | 4,800.00 | 4,800 |
| ILF-# | 1 | EA | 3,500.00 | 3,500 |
| | | | | |
| Water to Water Heat Exchanger: | | | | |
| HX-1 | 1 | EA | 15,000.00 | 15,000 |
| | | | | |
| Fan Coils: | | | | |
| FC-1 | 1 | EA | 2,100.00 | 2,100 |
| FC-2,3,4 | 3 | EA | 2,550.00 | 7,650 |
| FC-5,6 | 2 | EA | 1,850.00 | 3,700 |
| ACCU-1 | 1 | EA | 3,300.00 | 3,300 |
| ACCU-2,3,4 | 3 | EA | 4,500.00 | 13,500 |
| ACCU-5,6 | 2 | EA | 3,500.00 | 7,000 |
| Refrigerant piping | 850 | LF | 34.00 | 28,900 |
| | | | | |
| VAV Box (Single Duct w/Reheat): | | | | |
| 6" to 14" | 47 | EA | 985.00 | 46,295 |
| 6" to 14" w/ reheat | 47 | EA | 1,320.00 | 62,040 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Mod. valve | 47 | EA | 275.00 | 12,925 |
| Drain valve | 47 | EA | 90.00 | 4,230 |
| Balance/shut off | 94 | EA | 95.00 | 8,930 |
| | | | | |
| Equipment: | | | | |
| CP-1 | 1 | LS | 5,000.00 | 5,000 |
| ASF-1 | 1 | LS | 7,500.00 | 7,500 |
| EPH-1 | 1 | LS | 3,500.00 | 3,500 |
| EPH-2 | 1 | LS | 3,500.00 | 3,500 |
| Elec Room Exhaust fan and Louver | 1 | LS | 3,500.00 | 3,500 |
| Elec Room Exhaust and Intake louver damper | 1 | EA | 3,500.00 | 3,500 |
| | | | | |
| Ductless Split Air-Conditioning Unit: | | | | |
| Split AC system | 4 | EA | 12,500.00 | 50,000 |
| | | | | |
| Air Distribution: | | | | |
| Grills dampers and diffusers | 141,600 | SF | 0.65 | 92,040 |
| Galvanized ductwork | 115,000 | LBS | 9.50 | 1,092,500 |
| 2" Duct insul | 80,000 | SF | 4.85 | 388,000 |
| Sound Attenuation ( supply only ) | 117,500 | CFM | 0.65 | 76,375 |
| Kitchen hood exhaust duct - welded | 2,000 | LBS | 17.50 | 35,000 |
| Alum. dishwasher ductwork | 1,200 | LBS | 12.00 | 14,400 |
| Fire wrap at duct | 650 | SF | 9.00 | 5,850 |
| | | | | |
| Temperature Control: | | | | |
| AHU/ERV | 15 | EA | 22,500.00 | 337,500 |
| Boiler and Pumps | 1 | LS | 40,000.00 | 40,000 |
| VAV | 98 | EA | 1,250.00 | 122,500 |
| HW Devices | 10 | EA | 1,600.00 | 16,000 |
| Exhaust Fan | 7 | EA | 2,500.00 | 17,500 |
| Fan Coil and Split System | 10 | EA | 2,500.00 | 25,000 |
| Misc. temp control | 1 | LS | 100,000.00 | 100,000 |
| | | | | |
| Seismic control | 1 | LS | 50,000.00 | 50,000 |
| Test and balance | 141,600 | GSF | 0.65 | 92,040 |
| GC & misc. | 1 | LS | 50,000.00 | 50,000 |
| *Fire safing carried w/ fittings | | | | |
| *excludes temporary heat and ventilation | | | | ---------- |
| | | | | 5,632,726 |

| | | | |
|---|---|---|---|
| TOTAL D30 - HVAC | $39.78 | /sf | 5,632,726 |

# Appendix B

# Major Equipment Data

HIGH EFFICIENCY BOILERS

# CREST®

## CONDENSING BOILER

SMART TOUCH™

**WITH BACnet MSTP PROTOCOL, CASCADING SEQUENCER WITH CASCADE REDUNDANCY**

6 INPUTS FROM 750,000 TO 2.0 MILLION BTU/HR

DIRECT-VENTING UP TO 100 FEET USING PVC, CPVC, POLYPROPYLENE OR STAINLESS STEEL

FLOW RATES FROM 18 TO 350 GPM

**96.2%** AHRI CERTIFIED™ www.ahridirectory.org

**THERMAL EFFICIENCY**

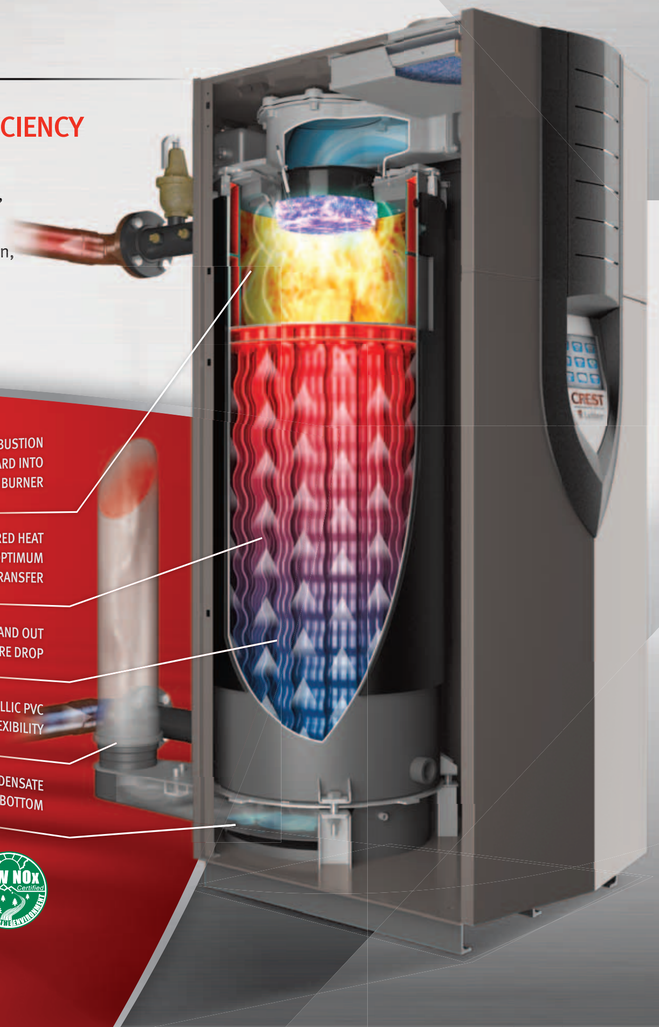
Lochinvar®

HIGH EFFICIENCY BOILERS & WATER HEATERS

# CREST®
CONDENSING BOILER

## RIDE THE LOCHINVAR WAVE™ TO 96.2% EFFICIENCY

With the exclusive **Wave** fire-tube design, advancements in Lochinvar combustion technology and the SMART TOUCH™ control, CREST changed how the industry thinks about fire-tube boilers. Now, six new CREST boilers, with 750,000, 1.0 million, 1.25 million, 1.5 million, 1.75 million and 2.0 million Btu/hr inputs, deliver **96.2% thermal efficiency**.




## THE CREST COMBUSTION SYSTEM

CREST boilers are equipped with a top-mounted micro-metal fiber burner, engineered specifically for fire-tube technology. The system is designed to ensure smooth, quiet modulating combustion from as low as 4% of maximum firing rate up to 100% as heating load increases. And in multi-boiler applications, modulation is an essential element in cascade sequencing, which helps ensure maximum efficiency and long-term reliability.

## REDUCE INSTALLATION COST WITH VARIABLE FLOW TECHNOLOGY

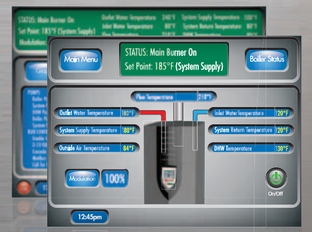
CREST can operate over a wide range of flow rates with very low pressure drop. This permits installation of a *full flow* (variable primary) system. Installation is streamlined, without the time and materials cost of primary/secondary piping, and pumps needed to maintain flow in a water-tube boiler. Variable flow also makes CREST more flexible at handling frequent fluctuations in the system flow rate.

LOW NOx Certified

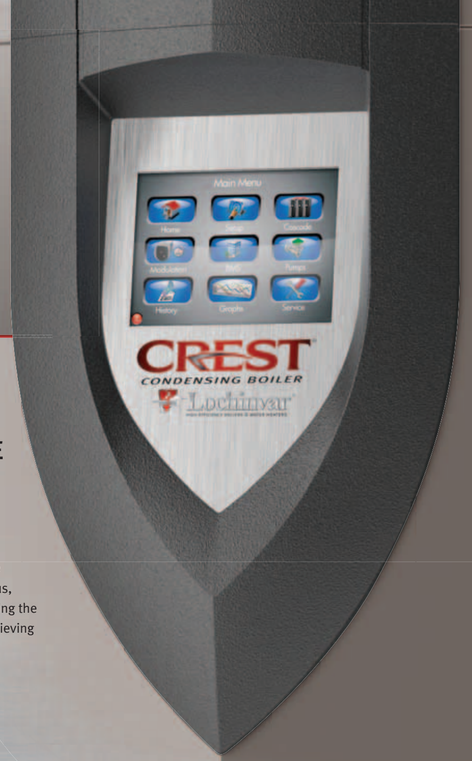
## UNEQUALED CONTROL AND MONITORING FUNCTIONS THAT ARE EASY TO USE

CREST features the all-in-one SMART TOUCH operating control. With an 8-inch touchscreen and multi-color interface, SMART TOUCH offers the best info-graphics and visual control content in the boiler industry today. It provides the operator with outstanding functionality, ease of operation and customized data retrieval. The SMART TOUCH control can be integrated directly into a Building Automation System via BACnet MSTP, ModBus and other communication protocols using a gateway device.

*See back page for a complete listing of SMART TOUCH features and functions.*




SMART TOUCH™



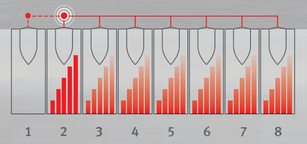

## SMOOTH-RUNNING, MODULATING COMBUSTION

With up to 25:1 **Modulation Turndown**, CREST automatically changes the firing rate as building heat loads vary. An FBN-2001 fires at its maximum 2,000,000 Btu/hr rate when heat load is highest, and then gradually turns down to as low as 4% (80,000 Btu/hr) as load decreases. A modulating system runs smoothly and efficiently, without frequent on/off cycling. When the system is zoned, CREST's high turndown works to match the actual system demand. In return, CREST reduces the customer's fuel bill and provides better comfort by load-matching the heat loss of the system.

## HIGH EFFICIENCY WITH MINIMUM SUPPLY PRESSURE

CREST operates reliably with supply gas pressure as low as 4 inches water column. ***Neg***ative ***Reg***ulation technology draws gas into a pre-mix combustion system, instead of relying on utility pressure through the gas valve. Operation is steady in low gas pressure systems or when peak gas supply demand occurs. Plus, Neg/Reg fan control fine-tunes the fuel/air ratio entering the burner, providing an even, cleaner-burning flame, achieving high combustion efficiency.

## PEACE OF MIND, WHEN IT MATTERS MOST



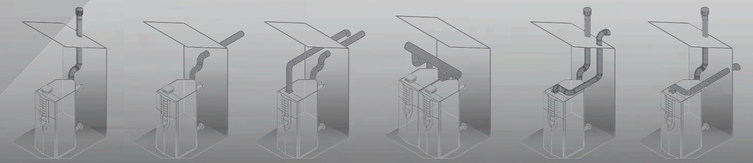

**Cascade Redundancy** provides peace of mind because it helps ensure that a CREST boiler system will always deliver reliable performance with no downtime. If the lead boiler is turned off for maintenance, Cascade Redundancy automatically shifts the lead role to the second sequenced boiler. Up to eight CREST boilers can be sequenced using a 2-wire daisy-chain connection. Cascade sequencing can be programmed for **Lead-Lag** or **Efficiency Optimized** operation.

With Lead-Lag operation, one lead boiler modulates to capacity on demand. As load increases, the system then cascades to additional lag boilers in sequence. The first-on role shifts daily, distributing equal runtimes to each unit.

In an Efficiency Optimized system, all boilers fire and modulate simultaneously at the same Btu/hr input rates, maximizing thermal efficiency.

## FLEXIBLE VENTING OPTIONS

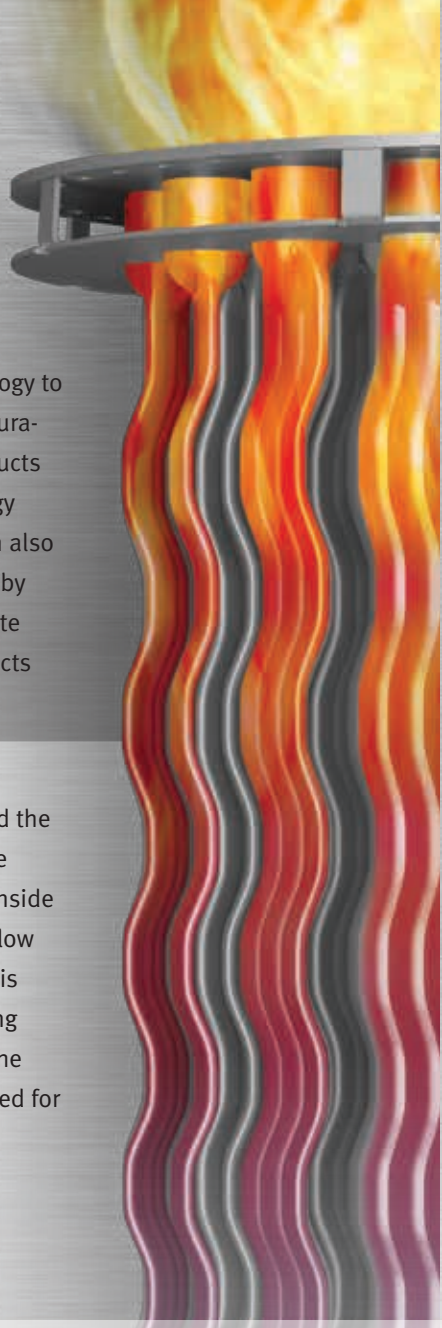
CREST offers 6 venting options, and permits direct-vent air intake and exhaust runs up to 100 equivalent feet, using PVC, CPVC, polypropylene or stainless steel pipe. Plus, multiple units can be common-vented to reduce time and materials cost.



Room Air Vertical | Room Air Sidewall | Direct-Vent | Common-Vent* | Direct-Vent Vertical | Vertical w/Sidewall Air

**Contact Lochinvar for information on common venting of CREST boilers.*

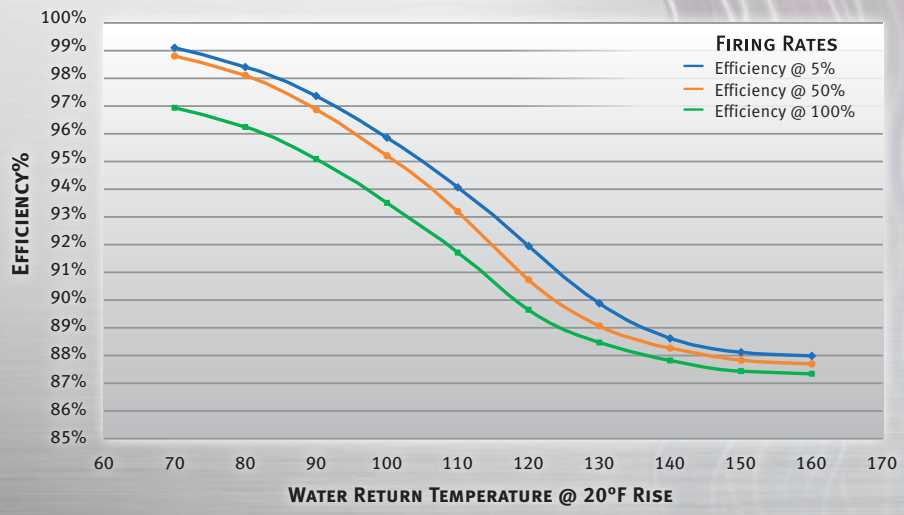
# SUPERIOR FIRE-TUBE HEAT EXCHANGER DESIGN BOOSTS THERMAL EFFICIENCY

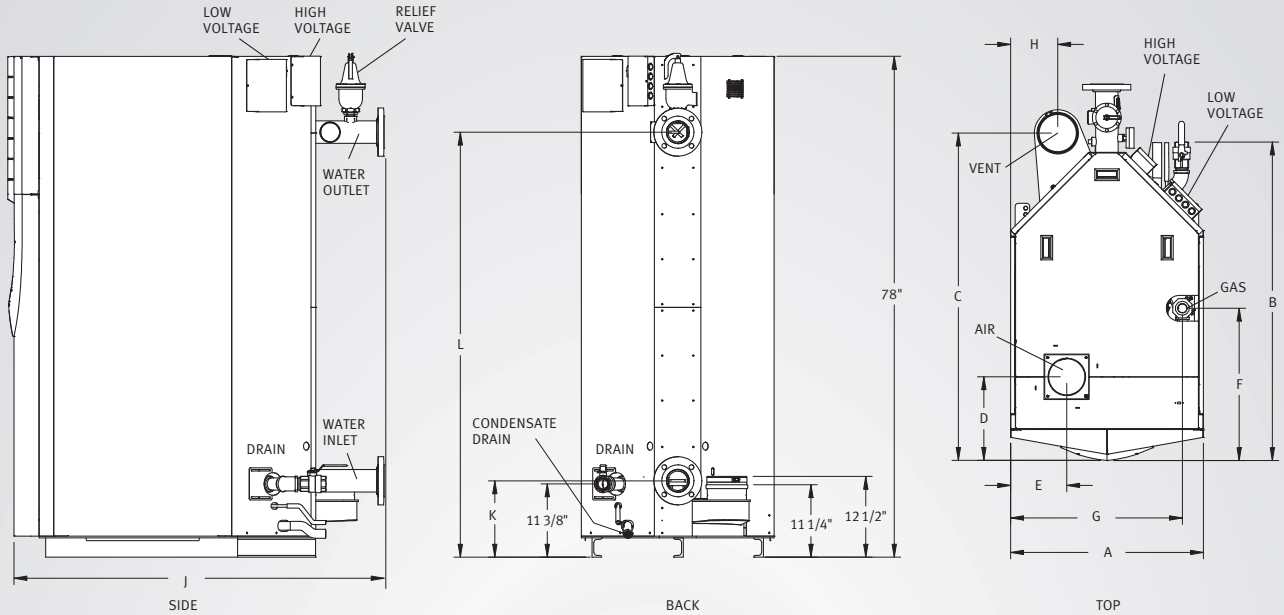


The CREST boiler takes fire-tube technology to a new level. The patented Wave™ configuration creates turbulence as flue gas products flow down the tube, scrubbing the energy from the flue products. The Wave design also enhances the life of the heat exchanger by allowing the tubes to flex, so they operate stress free with none of the adverse effects suffered by traditional fire-tube boilers.

Each fire tube is welded into the heat exchanger and surrounded by water, and the heat transfer process is enhanced by the water's counterflow. As water flows up inside the vessel, super-heated flue products flow down the fire tube. With one pass, heat is effectively captured, reaching condensing temperatures. At the top of the vessel, the combustion chamber is also water-backed for additional heat transfer.

# CREST BOILER EFFICIENCY






| Model Number | Input MBH Min | Input MBH Max | AHRI Thermal % | Output MBH | Net AHRI Rating MBH | Turndown | A | B | C | D | E | F | G | H | J | K | L | Gas Conn. | Water Inlet/ Outlet | Air Intake | Vent Size | Oper. Weight | Ship. Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FBN0751 | 50 | 750 | 96.2% | 722 | 627 | 15:1 | 30" | 49-1/2" | 51" | 13" | 8-3/4" | 23-3/4" | 26-3/4" | 7-3/8" | 57-5/8" | 11-7/8" | 66-1/8" | 1-1/4" | 3" | 6" | 6" | 1,768 | 1,560 |
| FBN1001 | 50 | 1,000 | 96.2% | 962 | 837 | 20:1 | 30" | 49-3/8" | 51" | 13" | 8-3/4" | 23-1/8" | 26- 3/4" | 6-1/2" | 57-5/8" | 11-7/8" | 66-1/8" | 1-1/4" | 3" | 6" | 6" | 1,838 | 1,596 |
| FBN1251 | 63 | 1,250 | 96.2% | 1,203 | 1,046 | 20:1 | 30" | 49-1/4" | 51-3/8" | 13" | 8-3/4" | 21-5/8" | 26-3/4" | 6-1/2" | 57-3/4" | 11-7/8" | 66-1/8" | 1-1/4" | 3" | 6" | 8" | 1,975 | 1,648 |
| FBN1501 | 60 | 1,500 | 96.2% | 1,443 | 1,255 | 25:1 | 30" | 40-5/8" | 62-3/8" | 15 7/8" | 9" | 27-7/8" | 26-7/8" | 5-1/8" | 68" | 12-3/8" | 65-3/8" | 1-1/2" | 4" | 8" | 8" | 2,307 | 1,961 |
| FBN1751 | 70 | 1,750 | 96.2% | 1,684 | 1,464 | 25:1 | 30" | 38-7/8" | 61-1/2" | 15 7/8" | 9" | 27-1/8" | 27" | 5-1/8" | 68" | 12-3/8" | 65-3/8" | 1-1/2" | 4" | 8" | 8" | 2,458 | 2,017 |
| FBN2001 | 80 | 2,000 | 96.2% | 1,924 | 1,673 | 25:1 | 30" | 38-7/8" | 61-1/2" | 15 7/8" | 9" | 26-3/4" | 27" | 5-1/8" | 68" | 12-3/8" | 65-3/8" | 1-1/2" | 4" | 8" | 8" | 2,570 | 2,087 |

*NOTES: Change "N" to "L" for LP gas models. Indoor installation only. *Information subject to change without notice*

## Smart Touch™ Features

**SMART TOUCH Touchscreen Operating Control**
**Full-Color 8" Touchscreen LCD Display**
**Built-in Cascading Sequencer for up to 8 Boilers with Built-in Redundancy**
› Cascade Multiple Sized Boilers
› Lead/Lag Cascade
› Efficiency Optimized Cascade
**Front-End Loading Capability with Copper-Fin II® and Power-Fin® Boilers**
**Building Management System Integration with 0-10 VDC Input**
**BACnet MSTP Communications**
**Outdoor Reset Control with Outdoor Air Sensor**
**Password Security**
**Domestic Hot Water Prioritization**
› DHW tank piped with priority in the boiler loop
› DHW tank piped as a zone in the system with the pumps controlled by the Smart System
› DHW Modulation Limiting
› Separately Adjustable SH/DHW Switching Times
**Low Water Flow Safety Control & Indication**
**Inlet & Outlet Temperature Readout**
**Freeze Protection**
**Service Reminder**
**Time Clock**
**Data Logging**
› Hours Running, Space Heating
› Hours Running, Domestic Hot Water
› Hours Running, Modulation Rate
› Ignition Attempts
› Last 10 Lockouts
**Programmable System Efficiency Optimizers**
› Night Setback
› Anti-Cycling
› Outdoor Air Reset Curve
› Ramp Delay
› Boost Temperature & Time
› Modulation Factor Control
**Three Pump Control**
› System Pump
› Boiler Pump
› Domestic Hot Water Pump
**High-Voltage Terminal Strip**
› 120 VAC / 60 Hertz / 1 Phase Power Supply
› System Pump, Boiler Pump and DHW Pump Power
**Low-Voltage Terminal Strip**
› 24 VAC Auxiliary Device Relay
› Auxiliary Proving Switch Contacts
› Alarm on Any Failure Contacts
› Runtime Contacts
› DHW Thermostat Contacts
› Unit Enable/Disable Contacts
› System Sensor Contacts
› DHW Tank Sensor Contacts
› Outdoor Air Sensor Contacts
› Cascade Contacts
› 0-10 VDC BMS External Control Contact
› 0-10 VDC Variable Speed Boiler Pump Control Contact

## Optional Equipment

Wireless Outdoor Temperature Sensor
Alarm Bell
BMS Gateway - BACnet IP or LonWorks
Condensate Neutralization Kit
SMART TOUCH PC Software
Common Vent Kits
Electrical Options (Shipped Loose):
› 208V/3Ø/60Hz
› 480V/3Ø/60Hz
› 600V/3Ø/60Hz
Motorized Isolation Valve
Variable Speed Boiler Pump

## Codes & Registrations

ANSI Z21.13/CSA Certified
ASME Certified, "H" Stamp / National Board
California Code Compliant
CSD1 / Factory Mutual / GE Gap Compliant
AHRI Certified

## Standard Features

96.2% Thermal Efficiency (AHRI)
Up to 99% Thermal Efficiency in Low-Temp. Applications
Modulating Burner with up to 25:1 Turndown
Direct-Spark Ignition
Low-NOx Operation
Sealed Combustion
Air Inlet Filter w/Replacement Reminder
Low Gas Pressure Operation
Vertical and Horizontal Direct Venting
› Direct Vent up to 100 Feet
› PVC, CPVC, Polypropylene or AL29-4C
ASME "H" Stamped Heat Exchanger
316L Stainless Steel Fire Tubes
160 psi Working Pressure
On/Off Switch
Adjustable High Limit with Manual Reset
Low Water Cutoff with Manual Reset & Test
High & Low Gas Pressure Switches w/Manual Reset
Low Air Pressure Switches
Condensate Trap w/Blocked Drain Switch
Drain Valve
System Sensor
Outdoor Air Sensor
Inlet & Outlet Temperature Sensors
High-Voltage Terminal Strip
Low-Voltage Terminal Strip
Downstream Gas Test Cocks
50 psi ASME Relief Valve
Temperature & Pressure Gauge
Zero Clearances to Combustible Materials
10-Year Limited Warranty (See Warranty for Details)
1-Year Warranty on Parts (See Warranty for Details)

Lochinvar®
HIGH EFFICIENCY BOILERS & WATER HEATERS

Lochinvar, LLC
300 Maddox Simpson Parkway
Lebanon, Tennessee 37090
P: 615.889.8900 | F: 615.547.1000
Lochinvar.com



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# INTELLI-HOOD®

Melink®

*The Industry Standard in Kitchen Ventilation Controls*

# *INTELLI-HOOD® Controls: The Industry Standard*

The Melink Intelli-Hood controls are the industry standard for commercial kitchen ventilation systems. Mechanical engineers, foodservice consultants, energy service companies, and chain operators are specifying them on thousands of hoods for both new and existing facilities around the world.

## *Savings & Benefits*

The Intelli-Hood controls reduce your exhaust and make-up fan speeds during idle, non-cooking conditions. **This yields fan energy savings of up to 97% and conditioned air savings of up to 70%. The result is a typical payback of 1- 3 years.**

## *More than 10,000 Installations Worldwide*

Realizing the huge potential for fan energy and conditioned air savings, Melink pioneered the demand ventilation system for use in various food service facilities more than 23 years ago. Since then, we have completed more than 10,000 installations in:

- Restaurants
- Supermarkets
- Hotels
- K-12 Schools
- Colleges & Universities
- Hospitals
- Government Buildings
- Military Facilities
- Corporate Dining
- Clubs

Melink®

# *Melink's patented technology is the difference - providing superior performance and energy savings*

**Note: The red line represents an infrared beam that detects smoke and vapors inside the hood, increasing the fan speed to 100% only when necessary.**

## *Intelli-Hood® Advantages*

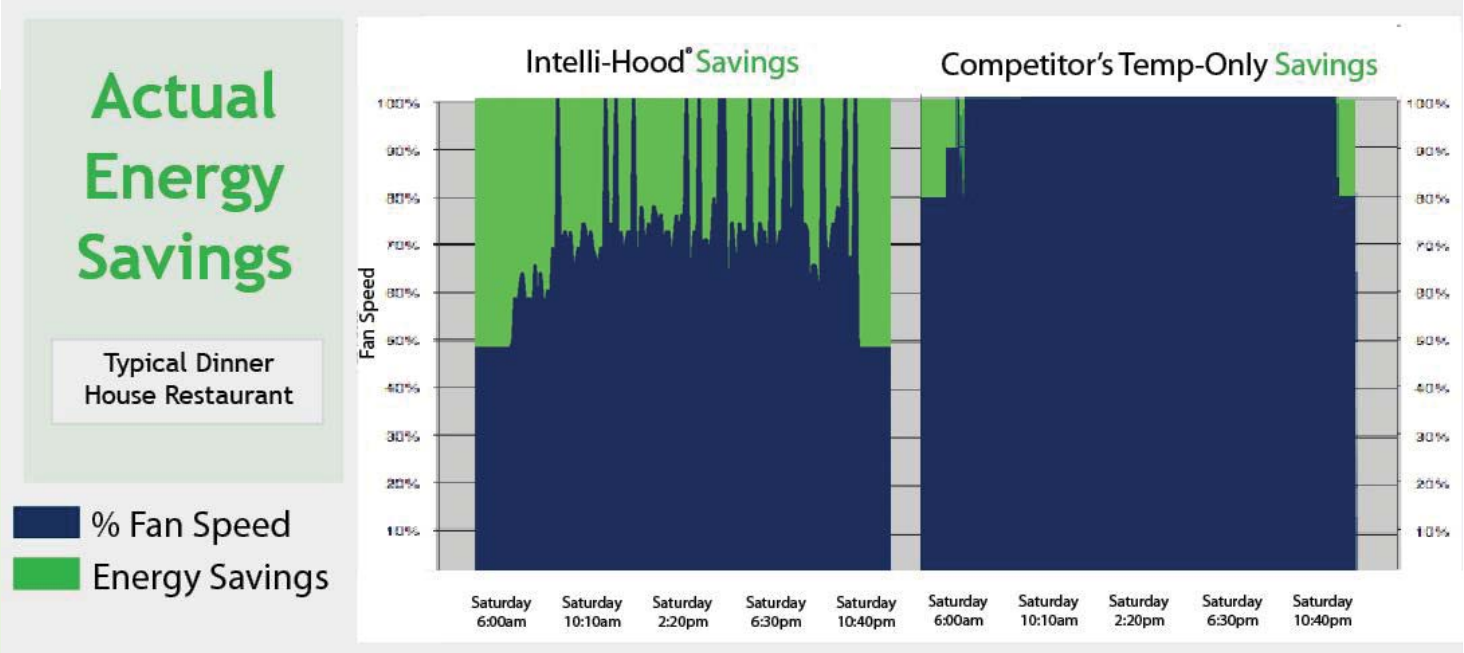
Melink pioneered demand ventilation controls for commercial kitchen hoods over 23 years ago. The advantages of this extensive experience & expertise are:

- Optic Sensors allow a lower minimum speed for greater energy savings
- Optic Sensors ensure robust capture and containment of all smoke
- Intelligent algorithms provide automatic daily calibration
- Plug and play cables eliminate installation problems
- Remote monitoring allows energy savings to be verified
- Melink national network of trained technicians is best in industry

Melink®

# *INTELLI-HOOD® Saves up to 97% in Fan Energy and 70% in Conditioned Air*

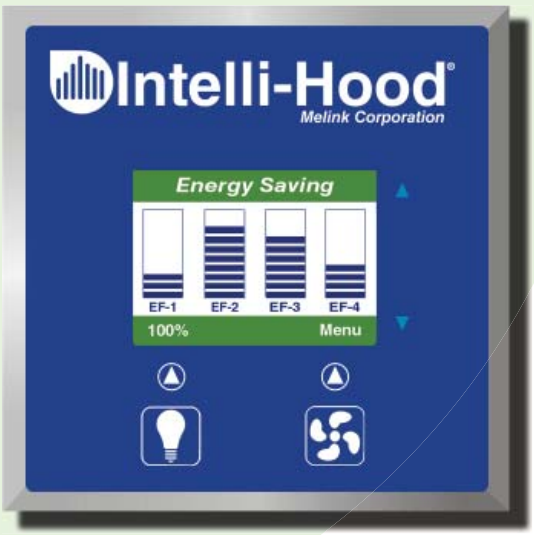
Most commercial kitchen hoods operate at 100% capacity all day long, even during idle, non-cooking conditions. Melink was the first to solve this industry problem through variable-speed control.




## *Simple to Install & Operate*

The Intelli-Hood controls are easily installed on new hoods and retrofitted on existing hoods. The Temperature and Optic Sensors get mounted inside the hood/duct, and the Touchpad, System Controller, and Variable-Speed Drives typically get mounted in an end-cabinet or on a kitchen wall. The System Controller can control up to 30+ hoods with a Hood Controller on each hood.

To operate, the cook/chef simply presses the light and fan switch on the Keypad, and the system begins operating. When the cooking appliances are turned on, the fan speeds increase based on the exhaust air temperature. During actual cooking, the speeds increase to 100% until the smoke/vapor is removed.




*Touchpad*

Melink®

# RN Series

- A-, B- & C-cabinet: 6-30 tons

# RN Series

- D-cabinet: 26-70 tons

# Standard Features

- Stainless steel condensate pan
- Copeland scroll compressors
- Elevated compressor deck
- Thermal expansion valves (TXV)
- Distributor tube sleeves
- Sloped condenser coils
- 5-year compressor warranty

# Standard Features

- Hinged access doors
- Stainless steel piano hinges
- Quarter-turn lockable door handles
- Color-coded wiring diagrams
- Component labels
- Direct-drive supply fan(s)
- Top-lifting/Rigging

# Standard Features

- 2” double-wall foam construction
  - 2-part urethane foam
  - 24 ga. inner and outer skin
- Composite panels result in 25% less weight
- Offered at the same price as standard single-wall fiberglass construction
- No exposed insulation (IAQ air tunnel)
- Thermal break

# Digital Scroll Technology

- Initial Roots In Asian multi-evaporator single condenser systems
- Available Today In 4 To 15 HP
  - Singles And Tandems
  - 10-100% Capacity Modulation

# Supply Fan(s)

- Non-housed, direct-drive backward inclined (BI) fan
- Rubber and Shear isolated
- Slide out serviceability
- 1-fan RQ & RN A-, B- & C-cabinet
- 1 or 2 fans RN D-cabinet

# Specifiable Options

- Air-to-Air Energy Recovery
  - Total & sensible wheels
  - Polymer matrix w/impregnated silica gel dessicant
  - Slide-out for maintenance
  - Bypass available
  - Defrost available

# Appendix C

# Heating & Cooling Load Calculations

# Air System Sizing Summary for RTU-1 A Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

| | | | | | |
|---|---|---|---|---|---|
| Air System Name | **RTU-1 A Wing Main Floor** | | Number of zones | **13** | |
| Equipment Class | **PKG ROOF** | | Floor Area | **12854.5** | ft² |
| Air System Type | **VAV** | | Location | **Worcester, Massachusetts** | |

## Sizing Calculation Information

| | | | | |
|---|---|---|---|---|
| Calculation Months | **Jan to Dec** | | Zone CFM Sizing | **Peak zone sensible load** |
| Sizing Data | **Calculated** | | Space CFM Sizing | **Individual peak space loads** |

## Central Cooling Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Total coil load | **27.3** | Tons | Load occurs at | **Aug 1400** | |
| Total coil load | **328.1** | MBH | OA DB / WB | **86.5 / 70.9** | °F |
| Sensible coil load | **263.7** | MBH | Entering DB / WB | **78.4 / 63.2** | °F |
| Coil CFM at Aug 1400 | **9707** | CFM | Leaving DB / WB | **52.3 / 51.0** | °F |
| Max block CFM at Jul 1700 | **9707** | CFM | Coil ADP | **49.4** | °F |
| Sum of peak zone CFM | **11332** | CFM | Bypass Factor | **0.100** | |
| Sensible heat ratio | **0.804** | | Resulting RH | **42** | % |
| CFM/Ton | **355.0** | | Design supply temp. | **55.0** | °F |
| ft²/Ton | **470.2** | | Zone T-stat Check | **0 of 13** | OK |
| BTU/(hr·ft²) | **25.5** | | Max zone temperature deviation | **5.0** | °F |
| Water flow @ 10.0 °F rise | **N/A** | | | | |

## Central Heating Coil Sizing Data

**No central heating coil loads occurred during this calculation.**

## Preheat Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Max coil load | **0.8** | MBH | Load occurs at | **Des Htg** | |
| Coil CFM at Des Htg | **5584** | CFM | Ent. DB / Lvg DB | **49.9 / 50.0** | °F |
| Max coil CFM | **9707** | CFM | | | |
| Water flow @ 20.0 °F drop | **0.08** | gpm | | | |

## Supply Fan Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Actual max CFM at Jul 1700 | **9707** | CFM | Fan motor BHP | **10.02** | BHP |
| Standard CFM | **9358** | CFM | Fan motor kW | **7.95** | kW |
| Actual max CFM/ft² | **0.76** | CFM/ft² | Fan static | **3.00** | in wg |

## Outdoor Ventilation Air Data

| | | | | | |
|---|---|---|---|---|---|
| Design airflow CFM | **5584** | CFM | CFM/person | **21.64** | CFM/person |
| CFM/ft² | **0.43** | CFM/ft² | | | |

# Zone Sizing Summary for RTU-1 A Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

Air System Name ..... **RTU-1 A Wing Main Floor**
Equipment Class ..... **PKG ROOF**
Air System Type ..... **VAV**

Number of zones ..... **13**
Floor Area ..... **12854.5** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

## Zone Terminal Sizing Data

| Zone Name | Design Supply Airflow (CFM) | Minimum Supply Airflow (CFM) | Zone CFM/ft² | Reheat Coil Load (MBH) | Reheat Coil Water gpm @ 20.0 °F | Zone Htg Unit Coil Load (MBH) | Zone Htg Unit Water gpm @ 20.0 °F | Mixing Box Fan Airflow (CFM) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 1119 | 567 | 1.06 | 23.6 | 2.36 | 0.0 | - | 0 |
| Zone 2 | 1082 | 559 | 1.07 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 3 | 392 | 159 | 0.77 | 6.6 | 0.66 | 0.0 | - | 0 |
| Zone 4 | 1091 | 562 | 1.06 | 23.4 | 2.34 | 0.0 | - | 0 |
| Zone 5 | 2011 | 603 | 0.74 | 25.1 | 2.51 | 0.0 | - | 0 |
| Zone 6 | 972 | 554 | 0.99 | 23.1 | 2.31 | 0.0 | - | 0 |
| Zone 7 | 977 | 559 | 0.97 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 8 | 390 | 158 | 0.77 | 6.6 | 0.66 | 0.0 | - | 0 |
| Zone 9 | 128 | 119 | 0.47 | 4.9 | 0.49 | 0.0 | - | 0 |
| Zone 10 | 1081 | 559 | 1.07 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 11 | 977 | 559 | 0.97 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 12 | 986 | 567 | 0.94 | 23.6 | 2.36 | 0.0 | - | 0 |
| Zone 13 | 126 | 59 | 0.18 | 2.4 | 0.24 | 0.0 | - | 0 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 23.3 | Jul 1600 | 7.4 | 1060.0 |
| Zone 2 | 22.5 | Jul 1600 | 5.8 | 1010.0 |
| Zone 3 | 8.2 | Jul 1700 | 2.5 | 511.5 |
| Zone 4 | 22.7 | Jul 1600 | 6.4 | 1030.0 |
| Zone 5 | 41.9 | Oct 1200 | 12.2 | 2710.0 |
| Zone 6 | 20.2 | Jul 0800 | 5.8 | 983.0 |
| Zone 7 | 20.3 | Jul 0800 | 5.8 | 1010.0 |
| Zone 8 | 8.1 | Jul 1700 | 2.5 | 505.0 |
| Zone 9 | 2.7 | Jul 1500 | 0.4 | 275.0 |
| Zone 10 | 22.5 | Jul 1600 | 5.7 | 1010.0 |
| Zone 11 | 20.3 | Jul 0800 | 5.8 | 1010.0 |
| Zone 12 | 20.5 | Jul 0800 | 5.9 | 1055.0 |
| Zone 13 | 2.6 | Jul 1500 | 1.1 | 685.0 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| MA01 classroom | 1 | 23.3 | Jul 1600 | 1119 | 7.4 | 1060.0 | 1.06 |
| *Zone 2* | | | | | | | |
| MA02 classroom | 1 | 22.5 | Jul 1600 | 1082 | 5.8 | 1010.0 | 1.07 |
| *Zone 3* | | | | | | | |

# Zone Sizing Summary for RTU-1 A Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| MA03 inclusion | 1 | 8.2 | Jul 1700 | 392 | 2.5 | 511.5 | 0.77 |
| ***Zone 4*** | | | | | | | |
| MA04 classroom | 1 | 22.7 | Jul 1600 | 1091 | 6.4 | 1030.0 | 1.06 |
| ***Zone 5*** | | | | | | | |
| MA05 corridor | 1 | 41.9 | Oct 1200 | 2011 | 12.2 | 2710.0 | 0.74 |
| ***Zone 6*** | | | | | | | |
| MA06 classroom | 1 | 20.2 | Jul 0800 | 972 | 5.8 | 983.0 | 0.99 |
| ***Zone 7*** | | | | | | | |
| MA07 classroom | 1 | 20.3 | Jul 0800 | 977 | 5.8 | 1010.0 | 0.97 |
| ***Zone 8*** | | | | | | | |
| MA08 inclusion | 1 | 8.1 | Jul 1700 | 390 | 2.5 | 505.0 | 0.77 |
| ***Zone 9*** | | | | | | | |
| MA09 reading/speech | 1 | 2.7 | Jul 1500 | 128 | 0.4 | 275.0 | 0.47 |
| ***Zone 10*** | | | | | | | |
| MA10 sub. seperate | 1 | 22.5 | Jul 1600 | 1081 | 5.7 | 1010.0 | 1.07 |
| ***Zone 11*** | | | | | | | |
| MA11 classroom | 1 | 20.3 | Jul 0800 | 977 | 5.8 | 1010.0 | 0.97 |
| ***Zone 12*** | | | | | | | |
| MA12 classroom | 1 | 20.5 | Jul 0800 | 986 | 5.9 | 1055.0 | 0.94 |
| ***Zone 13*** | | | | | | | |
| MA13 restroom | 1 | 1.2 | Jul 1500 | 57 | 0.5 | 310.0 | 0.18 |
| MA14 restroom | 1 | 1.1 | Jul 1500 | 51 | 0.4 | 275.0 | 0.18 |
| MA15 restroom | 1 | 0.4 | Jul 1500 | 18 | 0.2 | 100.0 | 0.18 |

# Air System Design Load Summary for RTU-1 A Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Aug 1400<br>COOLING OA DB / WB 86.5 °F / 70.9 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 1273 ft² | 61720 | - | 1273 ft² | - | - |
| Wall Transmission | 4240 ft² | 2061 | - | 4240 ft² | 9061 | - |
| Roof Transmission | 12880 ft² | 17182 | - | 12880 ft² | 20250 | - |
| Window Transmission | 1273 ft² | 4483 | - | 1273 ft² | 38023 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 8998 W | 30701 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 6085 W | 20761 | - | 0 | 0 | - |
| People | 258 | 59339 | 30960 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **196247** | **30960** | **-** | **67334** | **0** |
| Zone Conditioning | - | 257618 | 30960 | - | 65307 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Return Fan Load | 9707 CFM | 0 | - | 5584 CFM | 0 | - |
| Ventilation Load | 5265 CFM | 15900 | 33418 | 5584 CFM | 124213 | 0 |
| Supply Fan Load | 9707 CFM | 27110 | - | 5584 CFM | -7529 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **300627** | **64378** | **-** | **181992** | **0** |
| Central Cooling Coil | - | 263674 | 64404 | - | 0 | 0 |
| Central Heating Coil | - | 0 | - | - | 0 | - |
| Preheat Coil | - | 0 | - | - | 845 | - |
| Terminal Reheat Coils | - | 0 | - | - | 181147 | - |
| **>> Total Conditioning** | **-** | **263674** | **64404** | **-** | **181992** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Air System Sizing Summary for RTU 2 A Wing Ground Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

| | | | | | |
|---|---|---|---|---|---|
| Air System Name | **RTU 2 A Wing Ground Floor** | | Number of zones | **14** | |
| Equipment Class | **PKG ROOF** | | Floor Area | **13391.5** | ft² |
| Air System Type | **VAV** | | Location | **Worcester, Massachusetts** | |

## Sizing Calculation Information

| | | | | |
|---|---|---|---|---|
| Calculation Months | **Jan to Dec** | | Zone CFM Sizing | **Peak zone sensible load** |
| Sizing Data | **Calculated** | | Space CFM Sizing | **Individual peak space loads** |

## Central Cooling Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Total coil load | **26.6** | Tons | Load occurs at | **Aug 1500** | |
| Total coil load | **318.7** | MBH | OA DB / WB | **87.0 / 71.0** | °F |
| Sensible coil load | **252.9** | MBH | Entering DB / WB | **78.5 / 63.4** | °F |
| Coil CFM at Aug 1500 | **9291** | CFM | Leaving DB / WB | **52.3 / 51.0** | °F |
| Max block CFM at Jul 1700 | **9291** | CFM | Coil ADP | **49.4** | °F |
| Sum of peak zone CFM | **11643** | CFM | Bypass Factor | **0.100** | |
| Sensible heat ratio | **0.794** | | Resulting RH | **43** | % |
| CFM/Ton | **349.9** | | Design supply temp. | **55.0** | °F |
| ft²/Ton | **504.3** | | Zone T-stat Check | **5 of 14** | OK |
| BTU/(hr·ft²) | **23.8** | | Max zone temperature deviation | **5.1** | °F |
| Water flow @ 10.0 °F rise | **N/A** | | | | |

## Central Heating Coil Sizing Data

**No central heating coil loads occurred during this calculation.**

## Preheat Coil Sizing Data

**No heating coil loads occurred during this calculation.**

## Supply Fan Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Actual max CFM at Jul 1700 | **9291** | CFM | Fan motor BHP | **9.59** | BHP |
| Standard CFM | **8957** | CFM | Fan motor kW | **7.61** | kW |
| Actual max CFM/ft² | **0.69** | CFM/ft² | Fan static | **3.00** | in wg |

## Outdoor Ventilation Air Data

| | | | | | |
|---|---|---|---|---|---|
| Design airflow CFM | **5809** | CFM | CFM/person | **22.52** | CFM/person |
| CFM/ft² | **0.43** | CFM/ft² | | | |

# Zone Sizing Summary for RTU 2 A Wing Ground Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

Air System Name ..... **RTU 2 A Wing Ground Floor**
Equipment Class ..... **PKG ROOF**
Air System Type ..... **VAV**

Number of zones ..... **14**
Floor Area ..... **13391.5** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

## Zone Terminal Sizing Data

| Zone Name | Design Supply Airflow (CFM) | Minimum Supply Airflow (CFM) | Zone CFM/ft² | Reheat Coil Load (MBH) | Reheat Coil Water gpm @ 20.0 °F | Zone Htg Unit Coil Load (MBH) | Zone Htg Unit Water gpm @ 20.0 °F | Mixing Box Fan Airflow (CFM) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 1046 | 567 | 0.99 | 23.6 | 2.36 | 0.0 | - | 0 |
| Zone 2 | 1014 | 559 | 1.00 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 3 | 358 | 158 | 0.71 | 6.6 | 0.66 | 0.0 | - | 0 |
| Zone 4 | 1022 | 562 | 0.99 | 23.4 | 2.34 | 0.0 | - | 0 |
| Zone 5 | 1970 | 591 | 0.73 | 24.6 | 2.46 | 0.0 | - | 0 |
| Zone 6 | 970 | 560 | 0.96 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 7 | 969 | 559 | 0.96 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 8 | 358 | 158 | 0.71 | 6.6 | 0.66 | 0.0 | - | 0 |
| Zone 9 | 119 | 119 | 0.43 | 4.9 | 0.49 | 0.0 | - | 0 |
| Zone 10 | 1014 | 559 | 1.00 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 11 | 969 | 559 | 0.96 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 12 | 978 | 567 | 0.93 | 23.6 | 2.36 | 0.0 | - | 0 |
| Zone 13 | 79 | 59 | 0.11 | 2.4 | 0.24 | 0.0 | - | 0 |
| Zone 14 | 778 | 399 | 1.52 | 16.6 | 1.66 | 0.0 | - | 0 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 21.8 | Jul 1600 | 7.4 | 1060.0 |
| Zone 2 | 21.1 | Jul 1600 | 5.2 | 1010.0 |
| Zone 3 | 7.4 | Jul 1700 | 2.2 | 505.0 |
| Zone 4 | 21.3 | Jul 1600 | 6.0 | 1030.0 |
| Zone 5 | 41.0 | Nov 1100 | 9.3 | 2710.0 |
| Zone 6 | 20.2 | Jul 0700 | 5.3 | 1015.0 |
| Zone 7 | 20.2 | Jul 0700 | 5.2 | 1010.0 |
| Zone 8 | 7.4 | Jul 1700 | 2.2 | 505.0 |
| Zone 9 | 2.3 | Jan 2300 | 0.0 | 275.0 |
| Zone 10 | 21.1 | Jul 1600 | 5.1 | 1010.0 |
| Zone 11 | 20.2 | Jul 0700 | 5.2 | 1010.0 |
| Zone 12 | 20.4 | Jul 0700 | 5.3 | 1055.0 |
| Zone 13 | 1.6 | Jan 2300 | 0.0 | 685.0 |
| Zone 14 | 16.2 | Jul 0700 | 9.5 | 511.5 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| GA01 classroom | 1 | 21.8 | Jul 1600 | 1046 | 7.4 | 1060.0 | 0.99 |
| *Zone 2* | | | | | | | |

# Zone Sizing Summary for RTU 2 A Wing Ground Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| GA02 classroom | 1 | 21.1 | Jul 1600 | 1014 | 5.2 | 1010.0 | 1.00 |
| ***Zone 3*** | | | | | | | |
| GA03 inclusion | 1 | 7.4 | Jul 1700 | 358 | 2.2 | 505.0 | 0.71 |
| ***Zone 4*** | | | | | | | |
| GA04 classroom | 1 | 21.3 | Jul 1600 | 1022 | 6.0 | 1030.0 | 0.99 |
| ***Zone 5*** | | | | | | | |
| GA05 corridor | 1 | 41.0 | Nov 1100 | 1970 | 9.3 | 2710.0 | 0.73 |
| ***Zone 6*** | | | | | | | |
| GA06 classroom | 1 | 20.2 | Jul 0700 | 970 | 5.3 | 1015.0 | 0.96 |
| ***Zone 7*** | | | | | | | |
| GA07 classroom | 1 | 20.2 | Jul 0700 | 969 | 5.2 | 1010.0 | 0.96 |
| ***Zone 8*** | | | | | | | |
| GA08 inclusion | 1 | 7.4 | Jul 1700 | 358 | 2.2 | 505.0 | 0.71 |
| ***Zone 9*** | | | | | | | |
| GA09 reading/speech | 1 | 2.3 | Jan 2300 | 119 | 0.0 | 275.0 | 0.43 |
| ***Zone 10*** | | | | | | | |
| GA10 sub. seperate | 1 | 21.1 | Jul 1600 | 1014 | 5.1 | 1010.0 | 1.00 |
| ***Zone 11*** | | | | | | | |
| GA11 classroom | 1 | 20.2 | Jul 0700 | 969 | 5.2 | 1010.0 | 0.96 |
| ***Zone 12*** | | | | | | | |
| GA12 classroom | 1 | 20.4 | Jul 0700 | 978 | 5.3 | 1055.0 | 0.93 |
| ***Zone 13*** | | | | | | | |
| GA13 restroom | 1 | 0.7 | Jan 2300 | 36 | 0.0 | 310.0 | 0.11 |
| GA14 restroom | 1 | 0.7 | Jan 2300 | 32 | 0.0 | 275.0 | 0.11 |
| GA15 restroom | 1 | 0.2 | Jan 2300 | 11 | 0.0 | 100.0 | 0.11 |
| ***Zone 14*** | | | | | | | |
| GA16 stairwell | 1 | 16.2 | Jul 0700 | 778 | 9.5 | 511.5 | 1.52 |

# Air System Design Load Summary for RTU 2 A Wing Ground Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Aug 1500<br>COOLING OA DB / WB 87.0 °F / 71.0 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 1448 ft² | 66914 | - | 1448 ft² | - | - |
| Wall Transmission | 5111 ft² | 2990 | - | 5111 ft² | 10922 | - |
| Roof Transmission | 512 ft² | 678 | - | 512 ft² | 804 | - |
| Window Transmission | 1448 ft² | 5422 | - | 1448 ft² | 43250 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 13320 ft² | 0 | - | 13320 ft² | 13087 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 9374 W | 31984 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 6098 W | 20805 | - | 0 | 0 | - |
| People | 258 | 59339 | 30960 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **188131** | **30960** | **-** | **68063** | **0** |
| Zone Conditioning | - | 249089 | 30960 | - | 65982 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Return Fan Load | 9291 CFM | 0 | - | 5975 CFM | 0 | - |
| Ventilation Load | 5534 CFM | 17981 | 34835 | 5809 CFM | 129173 | 0 |
| Supply Fan Load | 9291 CFM | 25950 | - | 5975 CFM | -9124 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **293020** | **65795** | **-** | **186031** | **0** |
| Central Cooling Coil | - | 252870 | 65802 | - | 0 | 0 |
| Central Heating Coil | - | 0 | - | - | 0 | - |
| Preheat Coil | - | 0 | - | - | 0 | - |
| Terminal Reheat Coils | - | 0 | - | - | 186018 | - |
| **>> Total Conditioning** | **-** | **252870** | **65802** | **-** | **186018** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Air System Sizing Summary for RTU-3 B Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

| | | | | | |
|---|---|---|---|---|---|
| Air System Name | **RTU-3 B Wing Main Floor** | | Number of zones | **16** | |
| Equipment Class | **PKG ROOF** | | Floor Area | **14125.0** | ft² |
| Air System Type | **VAV** | | Location | **Worcester, Massachusetts** | |

## Sizing Calculation Information

| | | | | |
|---|---|---|---|---|
| Calculation Months | **Jan to Dec** | | Zone CFM Sizing | **Peak zone sensible load** |
| Sizing Data | **Calculated** | | Space CFM Sizing | **Individual peak space loads** |

## Central Cooling Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Total coil load | **26.1** | Tons | Load occurs at | **Aug 1400** | |
| Total coil load | **313.2** | MBH | OA DB / WB | **86.5 / 70.9** | °F |
| Sensible coil load | **253.4** | MBH | Entering DB / WB | **79.1 / 63.4** | °F |
| Coil CFM at Aug 1400 | **9081** | CFM | Leaving DB / WB | **52.3 / 50.9** | °F |
| Max block CFM at Jul 1700 | **9081** | CFM | Coil ADP | **49.3** | °F |
| Sum of peak zone CFM | **9996** | CFM | Bypass Factor | **0.100** | |
| Sensible heat ratio | **0.809** | | Resulting RH | **41** | % |
| CFM/Ton | **347.9** | | Design supply temp. | **55.0** | °F |
| ft²/Ton | **541.1** | | Zone T-stat Check | **0 of 16** | OK |
| BTU/(hr·ft²) | **22.2** | | Max zone temperature deviation | **5.0** | °F |
| Water flow @ 10.0 °F rise | **N/A** | | | | |

## Central Heating Coil Sizing Data

**No central heating coil loads occurred during this calculation.**

## Preheat Coil Sizing Data

**No heating coil loads occurred during this calculation.**

## Supply Fan Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Actual max CFM at Jul 1700 | **9081** | CFM | Fan motor BHP | **9.37** | BHP |
| Standard CFM | **8754** | CFM | Fan motor kW | **7.43** | kW |
| Actual max CFM/ft² | **0.64** | CFM/ft² | Fan static | **3.00** | in wg |

## Outdoor Ventilation Air Data

| | | | | | |
|---|---|---|---|---|---|
| Design airflow CFM | **5452** | CFM | CFM/person | **22.62** | CFM/person |
| CFM/ft² | **0.39** | CFM/ft² | | | |

# Zone Sizing Summary for RTU-3 B Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

Air System Name ..... **RTU-3 B Wing Main Floor**
Equipment Class ..... **PKG ROOF**
Air System Type ..... **VAV**

Number of zones ..... **16**
Floor Area ..... **14125.0** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

## Zone Terminal Sizing Data

| Zone Name | Design Supply Airflow (CFM) | Minimum Supply Airflow (CFM) | Zone CFM/ft² | Reheat Coil Load (MBH) | Reheat Coil Water gpm @ 20.0 °F | Zone Htg Unit Coil Load (MBH) | Zone Htg Unit Water gpm @ 20.0 °F | Mixing Box Fan Airflow (CFM) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 781 | 567 | 0.74 | 23.6 | 2.36 | 0.0 | - | 0 |
| Zone 2 | 740 | 559 | 0.73 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 3 | 267 | 161 | 0.51 | 6.7 | 0.67 | 0.0 | - | 0 |
| Zone 4 | 754 | 562 | 0.73 | 23.4 | 2.34 | 0.0 | - | 0 |
| Zone 5 | 2312 | 694 | 0.71 | 28.9 | 2.89 | 0.0 | - | 0 |
| Zone 6 | 1022 | 554 | 1.04 | 23.1 | 2.31 | 0.0 | - | 0 |
| Zone 7 | 1027 | 559 | 1.02 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 8 | 224 | 158 | 0.44 | 6.6 | 0.66 | 0.0 | - | 0 |
| Zone 9 | 128 | 119 | 0.47 | 4.9 | 0.49 | 0.0 | - | 0 |
| Zone 10 | 739 | 559 | 0.73 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 11 | 1027 | 559 | 1.02 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 12 | 271 | 162 | 0.51 | 6.8 | 0.68 | 0.0 | - | 0 |
| Zone 13 | 212 | 113 | 0.39 | 4.7 | 0.47 | 0.0 | - | 0 |
| Zone 14 | 144 | 64 | 0.22 | 2.7 | 0.27 | 0.0 | - | 0 |
| Zone 15 | 210 | 140 | 0.54 | 5.8 | 0.58 | 0.0 | - | 0 |
| Zone 16 | 137 | 47 | 0.40 | 1.9 | 0.19 | 0.0 | - | 0 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 16.3 | Jul 1700 | 7.4 | 1060.0 |
| Zone 2 | 15.4 | Jul 1700 | 5.8 | 1010.0 |
| Zone 3 | 5.6 | Jul 1700 | 2.5 | 522.0 |
| Zone 4 | 15.7 | Jul 1700 | 6.4 | 1030.0 |
| Zone 5 | 48.1 | Jul 1700 | 13.0 | 3235.0 |
| Zone 6 | 21.3 | Oct 1200 | 5.8 | 983.0 |
| Zone 7 | 21.4 | Oct 1200 | 5.8 | 1010.0 |
| Zone 8 | 4.7 | Jul 1700 | 1.3 | 505.0 |
| Zone 9 | 2.7 | Jul 1500 | 0.4 | 275.0 |
| Zone 10 | 15.4 | Jul 1700 | 5.8 | 1010.0 |
| Zone 11 | 21.4 | Oct 1200 | 5.8 | 1010.0 |
| Zone 12 | 5.6 | Jul 1700 | 2.6 | 530.0 |
| Zone 13 | 4.4 | Jul 1700 | 2.7 | 550.0 |
| Zone 14 | 3.0 | Jul 1500 | 1.0 | 660.0 |
| Zone 15 | 4.4 | Jun 1700 | 3.4 | 390.0 |
| Zone 16 | 2.9 | Jul 1700 | 1.1 | 345.0 |

# Zone Sizing Summary for RTU-3 B Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| MB01 classroom | 1 | 16.3 | Jul 1700 | 781 | 7.4 | 1060.0 | 0.74 |
| *Zone 2* | | | | | | | |
| MB02 classroom | 1 | 15.4 | Jul 1700 | 740 | 5.8 | 1010.0 | 0.73 |
| *Zone 3* | | | | | | | |
| MB03 inclusion | 1 | 5.6 | Jul 1700 | 267 | 2.5 | 522.0 | 0.51 |
| *Zone 4* | | | | | | | |
| MB04 classroom | 1 | 15.7 | Jul 1700 | 754 | 6.4 | 1030.0 | 0.73 |
| *Zone 5* | | | | | | | |
| MB05 corridor | 1 | 48.1 | Jul 1700 | 2312 | 13.0 | 3235.0 | 0.71 |
| *Zone 6* | | | | | | | |
| MB06 classroom | 1 | 21.3 | Oct 1200 | 1022 | 5.8 | 983.0 | 1.04 |
| *Zone 7* | | | | | | | |
| MB07 classroom | 1 | 21.4 | Oct 1200 | 1027 | 5.8 | 1010.0 | 1.02 |
| *Zone 8* | | | | | | | |
| MB08 inclusion | 1 | 4.7 | Jul 1700 | 224 | 1.3 | 505.0 | 0.44 |
| *Zone 9* | | | | | | | |
| MB09 reading/speech | 1 | 2.7 | Jul 1500 | 128 | 0.4 | 275.0 | 0.47 |
| *Zone 10* | | | | | | | |
| MB10 classroom | 1 | 15.4 | Jul 1700 | 739 | 5.8 | 1010.0 | 0.73 |
| *Zone 11* | | | | | | | |
| MB11 classroom | 1 | 21.4 | Oct 1200 | 1027 | 5.8 | 1010.0 | 1.02 |
| *Zone 12* | | | | | | | |
| MB12 E.L.E. | 1 | 5.6 | Jul 1700 | 271 | 2.6 | 530.0 | 0.51 |
| *Zone 13* | | | | | | | |
| MB13 teacher planning | 1 | 3.9 | Jul 1700 | 186 | 2.5 | 400.0 | 0.46 |
| MB17 toilet | 1 | 0.6 | Jul 1500 | 28 | 0.2 | 150.0 | 0.18 |
| *Zone 14* | | | | | | | |
| MB18 storage | 1 | 2.0 | Jul 1500 | 97 | 0.8 | 525.0 | 0.18 |
| MB19 reading office | 1 | 1.0 | Jul 1500 | 47 | 0.2 | 135.0 | 0.35 |
| *Zone 15* | | | | | | | |
| MB14 inst. coaches con. | 1 | 4.4 | Jun 1700 | 210 | 3.4 | 390.0 | 0.54 |
| *Zone 16* | | | | | | | |
| MB15 instructional coach | 1 | 1.4 | Jul 1700 | 69 | 0.5 | 175.0 | 0.40 |
| MB16 instructional coach | 1 | 1.4 | Jul 1700 | 68 | 0.6 | 170.0 | 0.40 |

# Air System Design Load Summary for RTU-3 B Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Aug 1400<br>COOLING OA DB / WB 86.5 °F / 70.9 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 1272 ft² | 43894 | - | 1272 ft² | - | - |
| Wall Transmission | 4932 ft² | 1790 | - | 4932 ft² | 10539 | - |
| Roof Transmission | 14140 ft² | 18863 | - | 14140 ft² | 22231 | - |
| Window Transmission | 1272 ft² | 4480 | - | 1272 ft² | 37993 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 9888 W | 33735 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 6725 W | 22946 | - | 0 | 0 | - |
| People | 241 | 55429 | 28920 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **181137** | **28920** | **-** | **70763** | **0** |
| Zone Conditioning | - | 236473 | 28920 | - | 68266 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Return Fan Load | 9081 CFM | 0 | - | 5576 CFM | 0 | - |
| Ventilation Load | 4834 CFM | 13257 | 30848 | 5452 CFM | 121226 | 0 |
| Supply Fan Load | 9081 CFM | 25361 | - | 5576 CFM | -8037 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **275091** | **59768** | **-** | **181455** | **0** |
| Central Cooling Coil | - | 253449 | 59774 | - | 0 | 0 |
| Central Heating Coil | - | 0 | - | - | 0 | - |
| Preheat Coil | - | 0 | - | - | 0 | - |
| Terminal Reheat Coils | - | 0 | - | - | 181448 | - |
| **>> Total Conditioning** | **-** | **253449** | **59774** | **-** | **181448** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Air System Sizing Summary for RTU-4 B Wing Ground Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

| | | | | | |
|---|---|---|---|---|---|
| Air System Name | **RTU-4 B Wing Ground Floor** | | Number of zones | **14** | |
| Equipment Class | **PKG ROOF** | | Floor Area | **14349.5** | ft² |
| Air System Type | **VAV** | | Location | **Worcester, Massachusetts** | |

## Sizing Calculation Information

| | | | | |
|---|---|---|---|---|
| Calculation Months | **Jan to Dec** | | Zone CFM Sizing | **Peak zone sensible load** |
| Sizing Data | **Calculated** | | Space CFM Sizing | **Individual peak space loads** |

## Central Cooling Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Total coil load | **26.5** | Tons | Load occurs at | **Aug 1400** | |
| Total coil load | **317.4** | MBH | OA DB / WB | **86.5 / 70.9** | °F |
| Sensible coil load | **251.7** | MBH | Entering DB / WB | **79.3 / 63.7** | °F |
| Coil CFM at Aug 1400 | **8962** | CFM | Leaving DB / WB | **52.3 / 51.0** | °F |
| Max block CFM at Sep 1300 | **8962** | CFM | Coil ADP | **49.3** | °F |
| Sum of peak zone CFM | **10539** | CFM | Bypass Factor | **0.100** | |
| Sensible heat ratio | **0.793** | | Resulting RH | **41** | % |
| CFM/Ton | **338.8** | | Design supply temp. | **55.0** | °F |
| ft²/Ton | **542.5** | | Zone T-stat Check | **1 of 14** | OK |
| BTU/(hr·ft²) | **22.1** | | Max zone temperature deviation | **5.0** | °F |
| Water flow @ 10.0 °F rise | **N/A** | | | | |

## Central Heating Coil Sizing Data

**No central heating coil loads occurred during this calculation.**

## Preheat Coil Sizing Data

**No heating coil loads occurred during this calculation.**

## Supply Fan Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Actual max CFM at Sep 1300 | **8962** | CFM | Fan motor BHP | **9.25** | BHP |
| Standard CFM | **8640** | CFM | Fan motor kW | **7.34** | kW |
| Actual max CFM/ft² | **0.62** | CFM/ft² | Fan static | **3.00** | in wg |

## Outdoor Ventilation Air Data

| | | | | | |
|---|---|---|---|---|---|
| Design airflow CFM | **6030** | CFM | CFM/person | **22.84** | CFM/person |
| CFM/ft² | **0.42** | CFM/ft² | | | |

# Zone Sizing Summary for RTU-4 B Wing Ground Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

Air System Name ..... **RTU-4 B Wing Ground Floor**
Equipment Class ..... **PKG ROOF**
Air System Type ..... **VAV**

Number of zones ..... **14**
Floor Area ..... **14349.5** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

## Zone Terminal Sizing Data

| Zone Name | Design Supply Airflow (CFM) | Minimum Supply Airflow (CFM) | Zone CFM/ft² | Reheat Coil Load (MBH) | Reheat Coil Water gpm @ 20.0 °F | Zone Htg Unit Coil Load (MBH) | Zone Htg Unit Water gpm @ 20.0 °F | Mixing Box Fan Airflow (CFM) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 1423 | 1135 | 0.67 | 47.3 | 4.73 | 0.0 | - | 0 |
| Zone 2 | 675 | 559 | 0.67 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 3 | 230 | 158 | 0.46 | 6.6 | 0.66 | 0.0 | - | 0 |
| Zone 4 | 688 | 562 | 0.67 | 23.4 | 2.34 | 0.0 | - | 0 |
| Zone 5 | 2107 | 632 | 0.65 | 26.3 | 2.63 | 0.0 | - | 0 |
| Zone 6 | 1011 | 560 | 1.00 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 7 | 1010 | 559 | 1.00 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 8 | 349 | 158 | 0.69 | 6.6 | 0.66 | 0.0 | - | 0 |
| Zone 9 | 119 | 119 | 0.43 | 4.9 | 0.49 | 0.0 | - | 0 |
| Zone 10 | 675 | 559 | 0.67 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 11 | 1010 | 559 | 1.00 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 12 | 237 | 162 | 0.45 | 6.8 | 0.68 | 0.0 | - | 0 |
| Zone 13 | 177 | 97 | 0.32 | 4.0 | 0.40 | 0.0 | - | 0 |
| Zone 14 | 826 | 404 | 1.52 | 16.8 | 1.68 | 0.0 | - | 0 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 29.6 | Jul 1700 | 14.8 | 2120.0 |
| Zone 2 | 14.1 | Jul 1700 | 5.2 | 1010.0 |
| Zone 3 | 4.8 | Jul 1700 | 2.2 | 505.0 |
| Zone 4 | 14.3 | Jul 1700 | 6.0 | 1030.0 |
| Zone 5 | 43.9 | Jul 1700 | 9.3 | 3235.0 |
| Zone 6 | 21.1 | Oct 1100 | 5.2 | 1015.0 |
| Zone 7 | 21.0 | Oct 1100 | 5.2 | 1010.0 |
| Zone 8 | 7.3 | Oct 1100 | 2.2 | 505.0 |
| Zone 9 | 2.3 | Jan 2300 | 0.0 | 275.0 |
| Zone 10 | 14.1 | Jul 1700 | 5.2 | 1010.0 |
| Zone 11 | 21.0 | Oct 1100 | 5.2 | 1010.0 |
| Zone 12 | 4.9 | Jul 1700 | 2.3 | 530.0 |
| Zone 13 | 3.7 | Jul 1700 | 2.3 | 550.0 |
| Zone 14 | 17.2 | Oct 1200 | 9.7 | 544.5 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| GB01 classroom | 2 | 14.8 | Jul 1700 | 712 | 7.4 | 1060.0 | 0.67 |
| *Zone 2* | | | | | | | |

# Zone Sizing Summary for RTU-4 B Wing Ground Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| GB02 classroom | 1 | 14.1 | Jul 1700 | 675 | 5.2 | 1010.0 | 0.67 |
| ***Zone 3*** | | | | | | | |
| GB03 inclusion | 1 | 4.8 | Jul 1700 | 230 | 2.2 | 505.0 | 0.46 |
| ***Zone 4*** | | | | | | | |
| GB04 classroom | 1 | 14.3 | Jul 1700 | 688 | 6.0 | 1030.0 | 0.67 |
| ***Zone 5*** | | | | | | | |
| GB05 corridor | 1 | 43.9 | Jul 1700 | 2107 | 9.3 | 3235.0 | 0.65 |
| ***Zone 6*** | | | | | | | |
| GB06 classroom | 1 | 21.1 | Oct 1100 | 1011 | 5.2 | 1015.0 | 1.00 |
| ***Zone 7*** | | | | | | | |
| GB07 classroom | 1 | 21.0 | Oct 1100 | 1010 | 5.2 | 1010.0 | 1.00 |
| ***Zone 8*** | | | | | | | |
| GB08 inclusion | 1 | 7.3 | Oct 1100 | 349 | 2.2 | 505.0 | 0.69 |
| ***Zone 9*** | | | | | | | |
| GB09 reading/speech | 1 | 2.3 | Jan 2300 | 119 | 0.0 | 275.0 | 0.43 |
| ***Zone 10*** | | | | | | | |
| GB10 classroom | 1 | 14.1 | Jul 1700 | 675 | 5.2 | 1010.0 | 0.67 |
| ***Zone 11*** | | | | | | | |
| GB11 classroom | 1 | 21.0 | Oct 1100 | 1010 | 5.2 | 1010.0 | 1.00 |
| ***Zone 12*** | | | | | | | |
| GB12 E.L.E. | 1 | 4.9 | Jul 1700 | 237 | 2.3 | 530.0 | 0.45 |
| ***Zone 13*** | | | | | | | |
| GB13 teacher planning | 1 | 3.3 | Jul 1700 | 160 | 2.3 | 400.0 | 0.40 |
| GB14 toilet | 1 | 0.4 | Jan 2300 | 17 | 0.0 | 150.0 | 0.11 |
| ***Zone 14*** | | | | | | | |
| GB15 stairwell | 1 | 17.2 | Oct 1200 | 826 | 9.7 | 544.5 | 1.52 |

# Air System Design Load Summary for RTU-4 B Wing Ground Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Aug 1400<br>COOLING OA DB / WB 86.5 °F / 70.9 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 1536 ft² | 54721 | - | 1536 ft² | - | - |
| Wall Transmission | 6207 ft² | 2312 | - | 6207 ft² | 13263 | - |
| Roof Transmission | 545 ft² | 726 | - | 545 ft² | 856 | - |
| Window Transmission | 1536 ft² | 5409 | - | 1536 ft² | 45878 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 14245 ft² | 0 | - | 14245 ft² | 14933 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 10045 W | 34272 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 6828 W | 23295 | - | 0 | 0 | - |
| People | 264 | 60719 | 31680 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **181455** | **31680** | **-** | **74930** | **0** |
| Zone Conditioning | - | 243816 | 31680 | - | 72551 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Return Fan Load | 8962 CFM | 0 | - | 6222 CFM | 0 | - |
| Ventilation Load | 5439 CFM | 14978 | 34039 | 6030 CFM | 134080 | 0 |
| Supply Fan Load | 8962 CFM | 25029 | - | 6222 CFM | -10339 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **283823** | **65719** | **-** | **196292** | **0** |
| Central Cooling Coil | - | 251682 | 65725 | - | 0 | 0 |
| Central Heating Coil | - | 0 | - | - | 0 | - |
| Preheat Coil | - | 0 | - | - | 0 | - |
| Terminal Reheat Coils | - | 0 | - | - | 196279 | - |
| **>> Total Conditioning** | **-** | **251682** | **65725** | **-** | **196279** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Air System Sizing Summary for RTU-5 C Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

| | | | | | |
|---|---|---|---|---|---|
| Air System Name | **RTU-5 C Wing Main Floor** | | Number of zones | **11** | |
| Equipment Class | **PKG ROOF** | | Floor Area | **9759.0** | ft² |
| Air System Type | **VAV** | | Location | **Worcester, Massachusetts** | |

## Sizing Calculation Information

| | | | | |
|---|---|---|---|---|
| Calculation Months | **Jan to Dec** | | Zone CFM Sizing | **Peak zone sensible load** |
| Sizing Data | **Calculated** | | Space CFM Sizing | **Individual peak space loads** |

## Central Cooling Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Total coil load | **18.3** | Tons | Load occurs at | **Aug 1400** | |
| Total coil load | **220.1** | MBH | OA DB / WB | **86.5 / 70.9** | °F |
| Sensible coil load | **178.2** | MBH | Entering DB / WB | **78.9 / 63.3** | °F |
| Coil CFM at Aug 1400 | **6439** | CFM | Leaving DB / WB | **52.3 / 50.9** | °F |
| Max block CFM at Jul 1700 | **6439** | CFM | Coil ADP | **49.4** | °F |
| Sum of peak zone CFM | **7185** | CFM | Bypass Factor | **0.100** | |
| Sensible heat ratio | **0.810** | | Resulting RH | **41** | % |
| CFM/Ton | **351.1** | | Design supply temp. | **55.0** | °F |
| ft²/Ton | **532.2** | | Zone T-stat Check | **1 of 11** | OK |
| BTU/(hr·ft²) | **22.5** | | Max zone temperature deviation | **6.0** | °F |
| Water flow @ 10.0 °F rise | **N/A** | | | | |

## Central Heating Coil Sizing Data

**No central heating coil loads occurred during this calculation.**

## Preheat Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Max coil load | **0.4** | MBH | Load occurs at | **Des Htg** | |
| Coil CFM at Des Htg | **3830** | CFM | Ent. DB / Lvg DB | **49.9 / 50.0** | °F |
| Max coil CFM | **6439** | CFM | | | |
| Water flow @ 20.0 °F drop | **0.04** | gpm | | | |

## Supply Fan Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Actual max CFM at Jul 1700 | **6439** | CFM | Fan motor BHP | **6.64** | BHP |
| Standard CFM | **6207** | CFM | Fan motor kW | **5.27** | kW |
| Actual max CFM/ft² | **0.66** | CFM/ft² | Fan static | **3.00** | in wg |

## Outdoor Ventilation Air Data

| | | | | | |
|---|---|---|---|---|---|
| Design airflow CFM | **3820** | CFM | CFM/person | **22.74** | CFM/person |
| CFM/ft² | **0.39** | CFM/ft² | | | |

# Zone Sizing Summary for RTU-5 C Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

Air System Name ..... **RTU-5 C Wing Main Floor**
Equipment Class ..... **PKG ROOF**
Air System Type ..... **VAV**

Number of zones ..... **11**
Floor Area ..... **9759.0** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

## Zone Terminal Sizing Data

| Zone Name | Design Supply Airflow (CFM) | Minimum Supply Airflow (CFM) | Zone CFM/ft² | Reheat Coil Load (MBH) | Reheat Coil Water gpm @ 20.0 °F | Zone Htg Unit Coil Load (MBH) | Zone Htg Unit Water gpm @ 20.0 °F | Mixing Box Fan Airflow (CFM) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 794 | 574 | 0.72 | 23.9 | 2.39 | 0.0 | - | 0 |
| Zone 2 | 84 | 46 | 0.23 | 1.9 | 0.19 | 0.0 | - | 0 |
| Zone 3 | 765 | 568 | 0.72 | 23.7 | 2.37 | 0.0 | - | 0 |
| Zone 4 | 2009 | 603 | 0.91 | 25.1 | 2.51 | 0.0 | - | 0 |
| Zone 5 | 1044 | 572 | 0.96 | 23.8 | 2.39 | 0.0 | - | 0 |
| Zone 6 | 244 | 92 | 0.66 | 3.8 | 0.38 | 0.0 | - | 0 |
| Zone 7 | 1031 | 561 | 1.01 | 23.4 | 2.34 | 0.0 | - | 0 |
| Zone 8 | 739 | 559 | 0.73 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 9 | 136 | 51 | 0.27 | 2.1 | 0.21 | 0.0 | - | 0 |
| Zone 10 | 233 | 162 | 0.44 | 6.8 | 0.68 | 0.0 | - | 0 |
| Zone 11 | 106 | 42 | 0.22 | 1.8 | 0.18 | 0.0 | - | 0 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 16.5 | Jul 1700 | 7.5 | 1100.0 |
| Zone 2 | 1.7 | Jul 1700 | 1.0 | 371.0 |
| Zone 3 | 15.9 | Jul 1700 | 6.4 | 1065.0 |
| Zone 4 | 41.8 | Jul 1600 | 11.4 | 2210.0 |
| Zone 5 | 21.7 | Oct 1200 | 5.9 | 1089.0 |
| Zone 6 | 5.1 | Oct 1200 | 2.2 | 371.0 |
| Zone 7 | 21.5 | Oct 1200 | 5.9 | 1023.0 |
| Zone 8 | 15.4 | Jul 1700 | 5.7 | 1010.0 |
| Zone 9 | 2.8 | Jul 1500 | 0.8 | 510.0 |
| Zone 10 | 4.8 | Jul 1700 | 1.3 | 530.0 |
| Zone 11 | 2.2 | Jul 1700 | 1.0 | 480.0 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| MC01 kindergarten | 1 | 16.5 | Jul 1700 | 794 | 7.5 | 1100.0 | 0.72 |
| *Zone 2* | | | | | | | |
| MC02 storage | 1 | 0.7 | Jul 1500 | 32 | 0.6 | 161.0 | 0.20 |
| MC03 toilet | 1 | 1.1 | Jul 1700 | 53 | 0.4 | 210.0 | 0.25 |
| *Zone 3* | | | | | | | |
| MC04 kindergarten | 1 | 15.9 | Jul 1700 | 765 | 6.4 | 1065.0 | 0.72 |
| *Zone 4* | | | | | | | |
| MC05 corridor | 1 | 41.8 | Jul 1600 | 2009 | 11.4 | 2210.0 | 0.91 |

# Zone Sizing Summary for RTU-5 C Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 5* | | | | | | | |
| MC06 kindergarten | 1 | 21.7 | Oct 1200 | 1044 | 5.9 | 1089.0 | 0.96 |
| *Zone 6* | | | | | | | |
| MC07 toilet | 1 | 1.1 | Jul 1700 | 53 | 0.4 | 210.0 | 0.25 |
| MC08 storage | 1 | 4.5 | Oct 1200 | 215 | 1.8 | 161.0 | 1.34 |
| *Zone 7* | | | | | | | |
| MC09 kindergarten | 1 | 21.5 | Oct 1200 | 1031 | 5.9 | 1023.0 | 1.01 |
| *Zone 8* | | | | | | | |
| MC10 sub. seperate | 1 | 15.4 | Jul 1700 | 739 | 5.7 | 1010.0 | 0.73 |
| *Zone 9* | | | | | | | |
| MC11 teacher planning | 1 | 2.3 | Jul 1500 | 112 | 0.6 | 380.0 | 0.30 |
| MC15 toilet | 1 | 0.5 | Jul 1500 | 24 | 0.2 | 130.0 | 0.18 |
| *Zone 10* | | | | | | | |
| MC12 inclusion | 1 | 4.8 | Jul 1700 | 233 | 1.3 | 530.0 | 0.44 |
| *Zone 11* | | | | | | | |
| MC13 toilet | 1 | 1.5 | Jul 1700 | 73 | 0.7 | 290.0 | 0.25 |
| MC14 toilet | 1 | 0.7 | Jul 1500 | 35 | 0.3 | 190.0 | 0.18 |

# Air System Design Load Summary for RTU-5 C Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Aug 1400<br>COOLING OA DB / WB 86.5 °F / 70.9 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 881 ft² | 36225 | - | 881 ft² | - | - |
| Wall Transmission | 3477 ft² | 1478 | - | 3477 ft² | 7430 | - |
| Roof Transmission | 9865 ft² | 13160 | - | 9865 ft² | 15510 | - |
| Window Transmission | 881 ft² | 3103 | - | 881 ft² | 26314 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 6831 W | 23308 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 4204 W | 14342 | - | 0 | 0 | - |
| People | 168 | 38639 | 20160 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **130255** | **20160** | **-** | **49255** | **0** |
| Zone Conditioning | - | 167602 | 20160 | - | 47544 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Return Fan Load | 6439 CFM | 0 | - | 3830 CFM | 0 | - |
| Ventilation Load | 3402 CFM | 9606 | 21734 | 3820 CFM | 84944 | 0 |
| Supply Fan Load | 6439 CFM | 17982 | - | 3830 CFM | -5312 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **195190** | **41894** | **-** | **127177** | **0** |
| Central Cooling Coil | - | 178156 | 41905 | - | 0 | 0 |
| Central Heating Coil | - | 0 | - | - | 0 | - |
| Preheat Coil | - | 0 | - | - | 448 | - |
| Terminal Reheat Coils | - | 0 | - | - | 126729 | - |
| **>> Total Conditioning** | **-** | **178156** | **41905** | **-** | **127177** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Air System Sizing Summary for RTU-6 C Wing Ground Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

| | | | | | |
|---|---|---|---|---|---|
| Air System Name | **RTU-6 C Wing Ground Floor** | | Number of zones | **12** | |
| Equipment Class | **PKG ROOF** | | Floor Area | **10504.5** | ft² |
| Air System Type | **VAV** | | Location | **Worcester, Massachusetts** | |

## Sizing Calculation Information

| | | | | |
|---|---|---|---|---|
| Calculation Months | **Jan to Dec** | | Zone CFM Sizing | **Peak zone sensible load** |
| Sizing Data | **Calculated** | | Space CFM Sizing | **Individual peak space loads** |

## Central Cooling Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Total coil load | **19.2** | Tons | Load occurs at | **Aug 1400** | |
| Total coil load | **230.1** | MBH | OA DB / WB | **86.5 / 70.9** | °F |
| Sensible coil load | **184.6** | MBH | Entering DB / WB | **79.2 / 63.6** | °F |
| Coil CFM at Aug 1400 | **6586** | CFM | Leaving DB / WB | **52.3 / 50.9** | °F |
| Max block CFM at Sep 1300 | **6586** | CFM | Coil ADP | **49.3** | °F |
| Sum of peak zone CFM | **7710** | CFM | Bypass Factor | **0.100** | |
| Sensible heat ratio | **0.802** | | Resulting RH | **41** | % |
| CFM/Ton | **343.4** | | Design supply temp. | **55.0** | °F |
| ft²/Ton | **547.8** | | Zone T-stat Check | **1 of 12** | OK |
| BTU/(hr·ft²) | **21.9** | | Max zone temperature deviation | **7.1** | °F |
| Water flow @ 10.0 °F rise | **N/A** | | | | |

## Central Heating Coil Sizing Data

**No central heating coil loads occurred during this calculation.**

## Preheat Coil Sizing Data

**No heating coil loads occurred during this calculation.**

## Supply Fan Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Actual max CFM at Sep 1300 | **6586** | CFM | Fan motor BHP | **6.79** | BHP |
| Standard CFM | **6349** | CFM | Fan motor kW | **5.39** | kW |
| Actual max CFM/ft² | **0.63** | CFM/ft² | Fan static | **3.00** | in wg |

## Outdoor Ventilation Air Data

| | | | | | |
|---|---|---|---|---|---|
| Design airflow CFM | **4167** | CFM | CFM/person | **23.41** | CFM/person |
| CFM/ft² | **0.40** | CFM/ft² | | | |

# Zone Sizing Summary for RTU-6 C Wing Ground Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

Air System Name ..... **RTU-6 C Wing Ground Floor**
Equipment Class ..... **PKG ROOF**
Air System Type ..... **VAV**

Number of zones ..... **12**
Floor Area ..... **10504.5** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

## Zone Terminal Sizing Data

| Zone Name | Design Supply Airflow (CFM) | Minimum Supply Airflow (CFM) | Zone CFM/ft² | Reheat Coil Load (MBH) | Reheat Coil Water gpm @ 20.0 °F | Zone Htg Unit Coil Load (MBH) | Zone Htg Unit Water gpm @ 20.0 °F | Mixing Box Fan Airflow (CFM) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 712 | 567 | 0.67 | 23.6 | 2.36 | 0.0 | - | 0 |
| Zone 2 | 231 | 158 | 0.46 | 6.6 | 0.66 | 0.0 | - | 0 |
| Zone 3 | 688 | 562 | 0.67 | 23.4 | 2.34 | 0.0 | - | 0 |
| Zone 4 | 1933 | 580 | 0.75 | 24.1 | 2.42 | 0.0 | - | 0 |
| Zone 5 | 1011 | 560 | 1.00 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 6 | 349 | 158 | 0.69 | 6.6 | 0.66 | 0.0 | - | 0 |
| Zone 7 | 1010 | 559 | 1.00 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 8 | 675 | 559 | 0.67 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 9 | 101 | 51 | 0.20 | 2.1 | 0.21 | 0.0 | - | 0 |
| Zone 10 | 125 | 125 | 0.40 | 5.2 | 0.52 | 0.0 | - | 0 |
| Zone 11 | 50 | 38 | 0.11 | 1.6 | 0.16 | 0.0 | - | 0 |
| Zone 12 | 826 | 401 | 1.52 | 16.7 | 1.67 | 0.0 | - | 0 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 14.8 | Jul 1700 | 7.4 | 1060.0 |
| Zone 2 | 4.8 | Jul 1700 | 2.2 | 505.0 |
| Zone 3 | 14.3 | Jul 1700 | 6.0 | 1030.0 |
| Zone 4 | 40.2 | Jul 1600 | 9.2 | 2565.0 |
| Zone 5 | 21.1 | Oct 1100 | 5.2 | 1015.0 |
| Zone 6 | 7.3 | Oct 1100 | 2.2 | 505.0 |
| Zone 7 | 21.0 | Oct 1100 | 4.9 | 1010.0 |
| Zone 8 | 14.1 | Jul 1700 | 5.1 | 1010.0 |
| Zone 9 | 2.1 | Jan 2300 | 0.0 | 510.0 |
| Zone 10 | 2.4 | Jan 2300 | 0.0 | 310.0 |
| Zone 11 | 1.1 | Jan 2300 | 0.0 | 440.0 |
| Zone 12 | 17.2 | Oct 1200 | 9.6 | 544.5 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| GC01 classroom | 1 | 14.8 | Jul 1700 | 712 | 7.4 | 1060.0 | 0.67 |
| *Zone 2* | | | | | | | |
| GC02 inclusion | 1 | 4.8 | Jul 1700 | 231 | 2.2 | 505.0 | 0.46 |
| *Zone 3* | | | | | | | |
| GC03 classroom | 1 | 14.3 | Jul 1700 | 688 | 6.0 | 1030.0 | 0.67 |
| *Zone 4* | | | | | | | |

# Zone Sizing Summary for RTU-6 C Wing Ground Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| GC04 corridor | 1 | 39.8 | Jul 1600 | 1910 | 9.2 | 2450.0 | 0.78 |
| GC11 storage | 1 | 0.5 | Jan 2300 | 23 | 0.0 | 115.0 | 0.20 |
| ***Zone 5*** | | | | | | | |
| GC05 classroom | 1 | 21.1 | Oct 1100 | 1011 | 5.2 | 1015.0 | 1.00 |
| ***Zone 6*** | | | | | | | |
| GC06 inclusion | 1 | 7.3 | Oct 1100 | 349 | 2.2 | 505.0 | 0.69 |
| ***Zone 7*** | | | | | | | |
| GC07 classroom | 1 | 21.0 | Oct 1100 | 1010 | 4.9 | 1010.0 | 1.00 |
| ***Zone 8*** | | | | | | | |
| GC08 classroom | 1 | 14.1 | Jul 1700 | 675 | 5.1 | 1010.0 | 0.67 |
| ***Zone 9*** | | | | | | | |
| GC09 teacher planning | 1 | 1.8 | Jan 2300 | 86 | 0.0 | 380.0 | 0.23 |
| GC10 toilets | 1 | 0.3 | Jan 2300 | 15 | 0.0 | 130.0 | 0.11 |
| ***Zone 10*** | | | | | | | |
| GC12 reading/speech | 1 | 2.4 | Jan 2300 | 125 | 0.0 | 310.0 | 0.40 |
| ***Zone 11*** | | | | | | | |
| GC13 toilets | 1 | 0.5 | Jan 2300 | 25 | 0.0 | 220.0 | 0.11 |
| GC14 toilets | 1 | 0.5 | Jan 2300 | 25 | 0.0 | 220.0 | 0.11 |
| ***Zone 12*** | | | | | | | |
| GC15 stairwell | 1 | 17.2 | Oct 1200 | 826 | 9.6 | 544.5 | 1.52 |

# Air System Design Load Summary for RTU-6 C Wing Ground Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Aug 1400<br>COOLING OA DB / WB 86.5 °F / 70.9 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 1100 ft² | 44985 | - | 1100 ft² | - | - |
| Wall Transmission | 4059 ft² | 1575 | - | 4059 ft² | 8674 | - |
| Roof Transmission | 545 ft² | 726 | - | 545 ft² | 856 | - |
| Window Transmission | 1100 ft² | 3874 | - | 1100 ft² | 32855 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 10420 ft² | 0 | - | 10420 ft² | 9609 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 7353 W | 25088 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 4695 W | 16019 | - | 0 | 0 | - |
| People | 178 | 40939 | 21360 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **133207** | **21360** | **-** | **51995** | **0** |
| Zone Conditioning | - | 177190 | 21360 | - | 50304 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Return Fan Load | 6586 CFM | 0 | - | 4317 CFM | 0 | - |
| Ventilation Load | 3805 CFM | 10446 | 24188 | 4167 CFM | 92630 | 0 |
| Supply Fan Load | 6586 CFM | 18393 | - | 4317 CFM | -6744 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **206029** | **45548** | **-** | **136190** | **0** |
| Central Cooling Coil | - | 184570 | 45558 | - | 0 | 0 |
| Central Heating Coil | - | 0 | - | - | 0 | - |
| Preheat Coil | - | 0 | - | - | 0 | - |
| Terminal Reheat Coils | - | 0 | - | - | 136178 | - |
| **>> Total Conditioning** | **-** | **184570** | **45558** | **-** | **136178** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Air System Sizing Summary for RTU-7 D Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

| | | | | | |
|---|---|---|---|---|---|
| Air System Name | **RTU-7 D Wing Main Floor** | | Number of zones | **11** | |
| Equipment Class | **PKG ROOF** | | Floor Area | **9410.0** | ft² |
| Air System Type | **VAV** | | Location | **Worcester, Massachusetts** | |

## Sizing Calculation Information

| | | | | |
|---|---|---|---|---|
| Calculation Months | **Jan to Dec** | | Zone CFM Sizing | **Peak zone sensible load** |
| Sizing Data | **Calculated** | | Space CFM Sizing | **Individual peak space loads** |

## Central Cooling Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Total coil load | **17.7** | Tons | Load occurs at | **Jul 1400** | |
| Total coil load | **212.9** | MBH | OA DB / WB | **86.5 / 70.9** | °F |
| Sensible coil load | **172.3** | MBH | Entering DB / WB | **78.6 / 63.2** | °F |
| Coil CFM at Jul 1400 | **6296** | CFM | Leaving DB / WB | **52.3 / 51.0** | °F |
| Max block CFM at Jul 1700 | **6296** | CFM | Coil ADP | **49.4** | °F |
| Sum of peak zone CFM | **7484** | CFM | Bypass Factor | **0.100** | |
| Sensible heat ratio | **0.809** | | Resulting RH | **42** | % |
| CFM/Ton | **354.9** | | Design supply temp. | **55.0** | °F |
| ft²/Ton | **530.4** | | Zone T-stat Check | **1 of 11** | OK |
| BTU/(hr·ft²) | **22.6** | | Max zone temperature deviation | **5.1** | °F |
| Water flow @ 10.0 °F rise | **N/A** | | | | |

## Central Heating Coil Sizing Data

**No central heating coil loads occurred during this calculation.**

## Preheat Coil Sizing Data

**No heating coil loads occurred during this calculation.**

## Supply Fan Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Actual max CFM at Jul 1700 | **6296** | CFM | Fan motor BHP | **6.50** | BHP |
| Standard CFM | **6070** | CFM | Fan motor kW | **5.15** | kW |
| Actual max CFM/ft² | **0.67** | CFM/ft² | Fan static | **3.00** | in wg |

## Outdoor Ventilation Air Data

| | | | | | |
|---|---|---|---|---|---|
| Design airflow CFM | **3542** | CFM | CFM/person | **22.13** | CFM/person |
| CFM/ft² | **0.38** | CFM/ft² | | | |

# Zone Sizing Summary for RTU-7 D Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

Air System Name ..... **RTU-7 D Wing Main Floor**
Equipment Class ..... **PKG ROOF**
Air System Type ..... **VAV**

Number of zones ..... **11**
Floor Area ..... **9410.0** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

## Zone Terminal Sizing Data

| Zone Name | Design Supply Airflow (CFM) | Minimum Supply Airflow (CFM) | Zone CFM/ft² | Reheat Coil Load (MBH) | Reheat Coil Water gpm @ 20.0 °F | Zone Htg Unit Coil Load (MBH) | Zone Htg Unit Water gpm @ 20.0 °F | Mixing Box Fan Airflow (CFM) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 982 | 560 | 0.97 | 23.3 | 2.33 | 0.0 | - | 0 |
| Zone 2 | 225 | 92 | 0.61 | 3.8 | 0.38 | 0.0 | - | 0 |
| Zone 3 | 982 | 561 | 0.96 | 23.4 | 2.34 | 0.0 | - | 0 |
| Zone 4 | 1223 | 445 | 0.56 | 18.5 | 1.86 | 0.0 | - | 0 |
| Zone 5 | 1106 | 567 | 1.04 | 23.6 | 2.36 | 0.0 | - | 0 |
| Zone 6 | 267 | 92 | 0.71 | 3.8 | 0.38 | 0.0 | - | 0 |
| Zone 7 | 1032 | 562 | 1.00 | 23.4 | 2.34 | 0.0 | - | 0 |
| Zone 8 | 393 | 158 | 0.78 | 6.6 | 0.66 | 0.0 | - | 0 |
| Zone 9 | 128 | 119 | 0.47 | 4.9 | 0.49 | 0.0 | - | 0 |
| Zone 10 | 347 | 161 | 0.66 | 6.7 | 0.67 | 0.0 | - | 0 |
| Zone 11 | 798 | 323 | 0.76 | 13.4 | 1.35 | 0.0 | - | 0 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 20.5 | Jul 0800 | 7.1 | 1016.0 |
| Zone 2 | 4.7 | Jul 0800 | 2.2 | 371.0 |
| Zone 3 | 20.5 | Jul 0800 | 6.5 | 1023.0 |
| Zone 4 | 25.5 | Jul 1700 | 10.7 | 2180.0 |
| Zone 5 | 23.0 | Jul 1600 | 7.1 | 1060.0 |
| Zone 6 | 5.6 | Jul 1600 | 2.2 | 375.0 |
| Zone 7 | 21.5 | Oct 1200 | 5.9 | 1030.0 |
| Zone 8 | 8.2 | Jul 1700 | 2.5 | 505.0 |
| Zone 9 | 2.7 | Jul 1500 | 0.4 | 275.0 |
| Zone 10 | 7.2 | Jul 0800 | 2.6 | 525.0 |
| Zone 11 | 16.6 | Jul 0800 | 5.9 | 1050.0 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| MD01 kindergarten | 1 | 20.5 | Jul 0800 | 982 | 7.1 | 1016.0 | 0.97 |
| *Zone 2* | | | | | | | |
| MD02 storage | 1 | 4.1 | Jul 0700 | 198 | 1.8 | 161.0 | 1.23 |
| MD03 toilet | 1 | 1.1 | Jul 1700 | 53 | 0.4 | 210.0 | 0.25 |
| *Zone 3* | | | | | | | |
| MD04 kindergarten | 1 | 20.5 | Jul 0800 | 982 | 6.5 | 1023.0 | 0.96 |
| *Zone 4* | | | | | | | |
| MD05 corridor | 1 | 25.5 | Jul 1700 | 1223 | 10.7 | 2180.0 | 0.56 |

# Zone Sizing Summary for RTU-7 D Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 5* | | | | | | | |
| MD06 kindergarten | 1 | 23.0 | Jul 1600 | 1106 | 7.1 | 1060.0 | 1.04 |
| *Zone 6* | | | | | | | |
| MD07 toilet | 1 | 1.1 | Jul 1700 | 53 | 0.4 | 210.0 | 0.25 |
| MD08 storage | 1 | 4.7 | Jul 1600 | 226 | 1.8 | 165.0 | 1.37 |
| *Zone 7* | | | | | | | |
| MD09 kindergarten | 1 | 21.5 | Oct 1200 | 1032 | 5.9 | 1030.0 | 1.00 |
| *Zone 8* | | | | | | | |
| MD10 inclusion | 1 | 8.2 | Jul 1700 | 393 | 2.5 | 505.0 | 0.78 |
| *Zone 9* | | | | | | | |
| MD11 reading/speech | 1 | 2.7 | Jul 1500 | 128 | 0.4 | 275.0 | 0.47 |
| *Zone 10* | | | | | | | |
| MD12 E.L.E. | 1 | 7.2 | Jul 0800 | 347 | 2.6 | 525.0 | 0.66 |
| *Zone 11* | | | | | | | |
| MD13 OT/PT | 1 | 16.6 | Jul 0800 | 798 | 5.9 | 1050.0 | 0.76 |

# Air System Design Load Summary for RTU-7 D Wing Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Jul 1400<br>COOLING OA DB / WB 86.5 °F / 70.9 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 990 ft² | 32133 | - | 990 ft² | - | - |
| Wall Transmission | 3826 ft² | 1840 | - | 3826 ft² | 8176 | - |
| Roof Transmission | 9690 ft² | 14038 | - | 9690 ft² | 15235 | - |
| Window Transmission | 990 ft² | 3486 | - | 990 ft² | 29570 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 6587 W | 22474 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 4332 W | 14781 | - | 0 | 0 | - |
| People | 160 | 36799 | 19200 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **125552** | **19200** | **-** | **52981** | **0** |
| Zone Conditioning | - | 172123 | 19200 | - | 50723 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Return Fan Load | 6296 CFM | 0 | - | 3640 CFM | 0 | - |
| Ventilation Load | 3337 CFM | 9789 | 21369 | 3542 CFM | 78633 | 0 |
| Supply Fan Load | 6296 CFM | 17584 | - | 3640 CFM | -4929 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **199496** | **40569** | **-** | **124427** | **0** |
| Central Cooling Coil | - | 172307 | 40576 | - | 0 | 0 |
| Central Heating Coil | - | 0 | - | - | 0 | - |
| Preheat Coil | - | 0 | - | - | 0 | - |
| Terminal Reheat Coils | - | 0 | - | - | 124419 | - |
| **>> Total Conditioning** | **-** | **172307** | **40576** | **-** | **124419** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Air System Sizing Summary for RTU-8 Art Wing

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

| | | | | | |
|---|---|---|---|---|---|
| Air System Name | **RTU-8 Art Wing** | | Number of zones | **2** | |
| Equipment Class | **PKG ROOF** | | Floor Area | **2330.0** | ft² |
| Air System Type | **VAV** | | Location | **Worcester, Massachusetts** | |

## Sizing Calculation Information

| | | | | |
|---|---|---|---|---|
| Calculation Months | **Jan to Dec** | | Zone CFM Sizing | **Peak zone sensible load** |
| Sizing Data | **Calculated** | | Space CFM Sizing | **Individual peak space loads** |

## Central Cooling Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Total coil load | **6.3** | Tons | Load occurs at | **Jul 1500** | |
| Total coil load | **75.9** | MBH | OA DB / WB | **87.0 / 71.0** | °F |
| Sensible coil load | **62.5** | MBH | Entering DB / WB | **78.8 / 63.2** | °F |
| Coil CFM at Jul 1500 | **2295** | CFM | Leaving DB / WB | **52.7 / 51.3** | °F |
| Max block CFM at Jul 1700 | **2295** | CFM | Coil ADP | **49.8** | °F |
| Sum of peak zone CFM | **2295** | CFM | Bypass Factor | **0.100** | |
| Sensible heat ratio | **0.824** | | Resulting RH | **41** | % |
| CFM/Ton | **362.9** | | Design supply temp. | **55.0** | °F |
| ft²/Ton | **368.4** | | Zone T-stat Check | **0 of 2** | OK |
| BTU/(hr·ft²) | **32.6** | | Max zone temperature deviation | **2.1** | °F |
| Water flow @ 10.0 °F rise | **N/A** | | | | |

## Central Heating Coil Sizing Data

**No central heating coil loads occurred during this calculation.**

## Preheat Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Max coil load | **0.2** | MBH | Load occurs at | **Des Htg** | |
| Coil CFM at Des Htg | **1199** | CFM | Ent. DB / Lvg DB | **49.9 / 50.0** | °F |
| Max coil CFM | **2295** | CFM | | | |
| Water flow @ 20.0 °F drop | **0.02** | gpm | | | |

## Supply Fan Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Actual max CFM at Jul 1700 | **2295** | CFM | Fan motor BHP | **2.04** | BHP |
| Standard CFM | **2212** | CFM | Fan motor kW | **1.62** | kW |
| Actual max CFM/ft² | **0.98** | CFM/ft² | Fan static | **3.00** | in wg |

## Outdoor Ventilation Air Data

| | | | | | |
|---|---|---|---|---|---|
| Design airflow CFM | **1199** | CFM | CFM/person | **22.21** | CFM/person |
| CFM/ft² | **0.51** | CFM/ft² | | | |

# Zone Sizing Summary for RTU-8 Art Wing

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

Air System Name ..... **RTU-8 Art Wing**
Equipment Class ..... **PKG ROOF**
Air System Type ..... **VAV**

Number of zones ..... **2**
Floor Area ..... **2330.0** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

## Zone Terminal Sizing Data

| Zone Name | Design Supply Airflow (CFM) | Minimum Supply Airflow (CFM) | Zone CFM/ft² | Reheat Coil Load (MBH) | Reheat Coil Water gpm @ 20.0 °F | Zone Htg Unit Coil Load (MBH) | Zone Htg Unit Water gpm @ 20.0 °F | Mixing Box Fan Airflow (CFM) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 1111 | 570 | 1.08 | 23.7 | 2.37 | 0.0 | - | 0 |
| Zone 2 | 1184 | 630 | 0.91 | 26.2 | 2.62 | 0.0 | - | 0 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 23.1 | Jul 1700 | 7.0 | 1032.0 |
| Zone 2 | 24.7 | Jul 1700 | 7.7 | 1298.0 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| GAR1 art room | 1 | 23.1 | Jul 1700 | 1111 | 7.0 | 1032.0 | 1.08 |
| *Zone 2* | | | | | | | |
| GAR2 art room | 1 | 23.2 | Jul 1700 | 1115 | 7.3 | 1037.0 | 1.08 |
| GAR3 art storage | 1 | 1.5 | Jul 1500 | 70 | 0.4 | 261.0 | 0.27 |

# Air System Design Load Summary for RTU-8 Art Wing

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Jul 1500<br>COOLING OA DB / WB 87.0 °F / 71.0 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 232 ft² | 19577 | - | 232 ft² | - | - |
| Wall Transmission | 776 ft² | 330 | - | 776 ft² | 1658 | - |
| Roof Transmission | 2330 ft² | 3547 | - | 2330 ft² | 3663 | - |
| Window Transmission | 232 ft² | 869 | - | 232 ft² | 6930 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 2330 ft² | 0 | - | 2330 ft² | 2400 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 1631 W | 5565 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 1165 W | 3975 | - | 0 | 0 | - |
| People | 54 | 12420 | 6480 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **46283** | **6480** | **-** | **14651** | **0** |
| Zone Conditioning | - | 53752 | 6480 | - | 14239 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Return Fan Load | 2295 CFM | 0 | - | 1199 CFM | 0 | - |
| Ventilation Load | 1090 CFM | 3236 | 6906 | 1199 CFM | 26688 | 0 |
| Supply Fan Load | 2295 CFM | 5512 | - | 1199 CFM | -3137 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **62500** | **13386** | **-** | **37790** | **0** |
| Central Cooling Coil | - | 62500 | 13387 | - | 0 | 0 |
| Central Heating Coil | - | 0 | - | - | 0 | - |
| Preheat Coil | - | 0 | - | - | 159 | - |
| Terminal Reheat Coils | - | 0 | - | - | 37631 | - |
| **>> Total Conditioning** | **-** | **62500** | **13387** | **-** | **37790** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Air System Sizing Summary for Gym RTU 9 & 10

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:13PM

## Air System Information

| | | | | | |
|---|---|---|---|---|---|
| Air System Name | **Gym RTU 9 & 10** | | Number of zones | **1** | |
| Equipment Class | **PKG ROOF** | | Floor Area | **9622.3** | ft² |
| Air System Type | **VAV** | | Location | **Worcester, Massachusetts** | |

## Sizing Calculation Information

| | | | |
|---|---|---|---|
| Calculation Months | **Jan to Dec** | Zone CFM Sizing | **Peak zone sensible load** |
| Sizing Data | **Calculated** | Space CFM Sizing | **Individual peak space loads** |

## Central Cooling Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Total coil load | **53.2** | Tons | Load occurs at | **Jul 1400** | |
| Total coil load | **638.0** | MBH | OA DB / WB | **86.5 / 70.9** | °F |
| Sensible coil load | **430.6** | MBH | Entering DB / WB | **78.9 / 65.7** | °F |
| Coil CFM at Jul 1400 | **15558** | CFM | Leaving DB / WB | **52.3 / 51.3** | °F |
| Max block CFM at Jul 1700 | **15558** | CFM | Coil ADP | **49.4** | °F |
| Sum of peak zone CFM | **15558** | CFM | Bypass Factor | **0.100** | |
| Sensible heat ratio | **0.675** | | Resulting RH | **51** | % |
| CFM/Ton | **292.6** | | Design supply temp. | **55.0** | °F |
| ft²/Ton | **181.0** | | Zone T-stat Check | **0 of 1** | OK |
| BTU/(hr·ft²) | **66.3** | | Max zone temperature deviation | **1.3** | °F |
| Water flow @ 10.0 °F rise | **N/A** | | | | |

## Central Heating Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Max coil load | **7.8** | MBH | Load occurs at | **Mar 1600** | |
| Coil CFM at Mar 1600 | **15470** | CFM | BTU/(hr·ft²) | **0.8** | |
| Max coil CFM | **15558** | CFM | Ent. DB / Lvg DB | **51.9 / 52.3** | °F |
| Water flow @ 20.0 °F drop | **0.78** | gpm | | | |

## Preheat Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Max coil load | **0.4** | MBH | Load occurs at | **Des Htg** | |
| Coil CFM at Des Htg | **9040** | CFM | Ent. DB / Lvg DB | **50.0 / 50.0** | °F |
| Max coil CFM | **15558** | CFM | | | |
| Water flow @ 20.0 °F drop | **0.04** | gpm | | | |

## Supply Fan Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Actual max CFM at Jul 1700 | **15558** | CFM | Fan motor BHP | **16.05** | BHP |
| Standard CFM | **14999** | CFM | Fan motor kW | **12.73** | kW |
| Actual max CFM/ft² | **1.62** | CFM/ft² | Fan static | **3.00** | in wg |

## Outdoor Ventilation Air Data

| | | | | | |
|---|---|---|---|---|---|
| Design airflow CFM | **9040** | CFM | CFM/person | **9.42** | CFM/person |
| CFM/ft² | **0.94** | CFM/ft² | | | |

# Zone Sizing Summary for Gym RTU 9 & 10

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:13PM

## Air System Information

Air System Name ..... **Gym RTU 9 & 10**
Equipment Class ..... **PKG ROOF**
Air System Type ..... **VAV**

Number of zones ..... **1**
Floor Area ..... **9622.3** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

## Zone Terminal Sizing Data

| Zone Name | Design Supply Airflow (CFM) | Minimum Supply Airflow (CFM) | Zone CFM/ft² | Reheat Coil Load (MBH) | Reheat Coil Water gpm @ 20.0 °F | Zone Htg Unit Coil Load (MBH) | Zone Htg Unit Water gpm @ 20.0 °F | Mixing Box Fan Airflow (CFM) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 15558 | 9040 | 1.62 | 376.5 | 37.67 | 0.0 | - | 0 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 324.0 | Jul 1700 | 53.8 | 9622.3 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| Gym - Bleachers | 1 | 230.4 | Jul 1700 | 11062 | 22.9 | 2485.0 | 4.45 |
| Gym - Regular | 1 | 93.6 | Jul 1700 | 4496 | 30.9 | 7137.3 | 0.63 |

# Air System Design Load Summary for Gym RTU 9 & 10

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:13PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Jul 1400<br>COOLING OA DB / WB 86.5 °F / 70.9 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 640 ft² | 9945 | - | 640 ft² | - | - |
| Wall Transmission | 7141 ft² | 3160 | - | 7141 ft² | 15260 | - |
| Roof Transmission | 9622 ft² | 13940 | - | 9622 ft² | 15128 | - |
| Window Transmission | 640 ft² | 2254 | - | 640 ft² | 19116 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 9622 ft² | 0 | - | 9622 ft² | 4302 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 6736 W | 22981 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 0 W | 0 | - | 0 | 0 | - |
| People | 960 | 249596 | 173400 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **301877** | **173400** | **-** | **53807** | **0** |
| Zone Conditioning | - | 361208 | 173400 | - | 51906 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Return Fan Load | 15558 CFM | 0 | - | 9040 CFM | 0 | - |
| Ventilation Load | 9040 CFM | 25987 | 33919 | 9040 CFM | 201503 | 0 |
| Supply Fan Load | 15558 CFM | 43452 | - | 9040 CFM | -12295 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **430648** | **207319** | **-** | **241113** | **0** |
| Central Cooling Coil | - | 430648 | 207343 | - | 0 | 0 |
| Central Heating Coil | - | 0 | - | - | 0 | - |
| Preheat Coil | - | 0 | - | - | 447 | - |
| Terminal Reheat Coils | - | 0 | - | - | 240666 | - |
| **>> Total Conditioning** | **-** | **430648** | **207343** | **-** | **241113** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Air System Sizing Summary for Cafe RTU-12 & 13

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:13PM

## Air System Information

| | | | | | |
|---|---|---|---|---|---|
| Air System Name | **Cafe RTU-12 & 13** | | Number of zones | **1** | |
| Equipment Class | **PKG ROOF** | | Floor Area | **8576.0** | ft² |
| Air System Type | **VAV** | | Location | **Worcester, Massachusetts** | |

## Sizing Calculation Information

| | | | |
|---|---|---|---|
| Calculation Months | **Jan to Dec** | Zone CFM Sizing | **Peak zone sensible load** |
| Sizing Data | **Calculated** | Space CFM Sizing | **Individual peak space loads** |

## Central Cooling Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Total coil load | **37.9** | Tons | Load occurs at | **Aug 1400** | |
| Total coil load | **454.8** | MBH | OA DB / WB | **86.5 / 70.9** | °F |
| Sensible coil load | **331.7** | MBH | Entering DB / WB | **79.7 / 65.0** | °F |
| Coil CFM at Aug 1400 | **11614** | CFM | Leaving DB / WB | **52.3 / 51.1** | °F |
| Max block CFM at Sep 1200 | **11614** | CFM | Coil ADP | **49.3** | °F |
| Sum of peak zone CFM | **11614** | CFM | Bypass Factor | **0.100** | |
| Sensible heat ratio | **0.729** | | Resulting RH | **45** | % |
| CFM/Ton | **306.5** | | Design supply temp. | **55.0** | °F |
| ft²/Ton | **226.3** | | Zone T-stat Check | **0 of 1** | OK |
| BTU/(hr·ft²) | **53.0** | | Max zone temperature deviation | **2.2** | °F |
| Water flow @ 10.0 °F rise | **N/A** | | | | |

## Central Heating Coil Sizing Data

**No central heating coil loads occurred during this calculation.**

## Preheat Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Max coil load | **0.3** | MBH | Load occurs at | **Des Htg** | |
| Coil CFM at Des Htg | **7365** | CFM | Ent. DB / Lvg DB | **50.0 / 50.0** | °F |
| Max coil CFM | **11614** | CFM | | | |
| Water flow @ 20.0 °F drop | **0.03** | gpm | | | |

## Supply Fan Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Actual max CFM at Sep 1200 | **11614** | CFM | Fan motor BHP | **11.98** | BHP |
| Standard CFM | **11196** | CFM | Fan motor kW | **9.51** | kW |
| Actual max CFM/ft² | **1.35** | CFM/ft² | Fan static | **3.00** | in wg |

## Outdoor Ventilation Air Data

| | | | | | |
|---|---|---|---|---|---|
| Design airflow CFM | **7401** | CFM | CFM/person | **10.32** | CFM/person |
| CFM/ft² | **0.86** | CFM/ft² | | | |

# Zone Sizing Summary for Cafe RTU-12 & 13

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:13PM

## Air System Information

Air System Name ..... **Cafe RTU-12 & 13**
Equipment Class ..... **PKG ROOF**
Air System Type ..... **VAV**

Number of zones ..... **1**
Floor Area ..... **8576.0** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

## Zone Terminal Sizing Data

| Zone Name | Design Supply Airflow (CFM) | Minimum Supply Airflow (CFM) | Zone CFM/ft² | Reheat Coil Load (MBH) | Reheat Coil Water gpm @ 20.0 °F | Zone Htg Unit Coil Load (MBH) | Zone Htg Unit Water gpm @ 20.0 °F | Mixing Box Fan Airflow (CFM) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 11614 | 7365 | 1.35 | 306.7 | 30.69 | 0.0 | - | 0 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 241.8 | Sep 1200 | 40.6 | 8576.0 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| Main Floor Cafe | 1 | 220.4 | Oct 1200 | 10583 | 21.0 | 6911.0 | 1.53 |
| Main Floor Servery | 1 | 28.8 | Jun 1700 | 1381 | 19.7 | 1665.0 | 0.83 |

# Air System Design Load Summary for Cafe RTU-12 & 13

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:13PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Aug 1400<br>COOLING OA DB / WB 86.5 °F / 70.9 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 989 ft² | 32327 | - | 989 ft² | - | - |
| Wall Transmission | 1657 ft² | 965 | - | 1657 ft² | 3542 | - |
| Roof Transmission | 3330 ft² | 4442 | - | 3330 ft² | 5236 | - |
| Window Transmission | 989 ft² | 3483 | - | 989 ft² | 29540 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 3330 ft² | 0 | - | 3330 ft² | 2326 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 6003 W | 20483 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 1665 W | 5681 | - | 0 | 0 | - |
| People | 717 | 164908 | 86040 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **232288** | **86040** | **-** | **40644** | **0** |
| Zone Conditioning | - | 279937 | 86040 | - | 39412 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Return Fan Load | 11614 CFM | 0 | - | 7365 CFM | 0 | - |
| Ventilation Load | 7401 CFM | 19308 | 37037 | 7365 CFM | 164193 | 0 |
| Supply Fan Load | 11614 CFM | 32437 | - | 7365 CFM | -11060 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **331681** | **123077** | **-** | **192544** | **0** |
| Central Cooling Coil | - | 331681 | 123081 | - | 0 | 0 |
| Central Heating Coil | - | 0 | - | - | 0 | - |
| Preheat Coil | - | 0 | - | - | 295 | - |
| Terminal Reheat Coils | - | 0 | - | - | 192106 | - |
| **>> Total Conditioning** | **-** | **331681** | **123081** | **-** | **192400** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Dedicated Outdoor Air System (DOAS) Sizing Summary for Ground lvl heating only

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:13PM

## Air System Information

Air System Name ..... **Ground lvl heating only**
Equipment Class ..... **TERM**
Air System Type ..... **2P-FC**

Number of zones ..... **3**
Floor Area ..... **2974.0** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Sum of space airflow rates**
Space CFM Sizing ..... **Individual peak space loads**

**NOTE: No other data is applicable for a Terminal Units air system without a Dedicated Outdoor Air System (DOAS).**

# Zone Sizing Summary for Ground lvl heating only

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:13PM

## Air System Information

Air System Name ..... **Ground lvl heating only**
Equipment Class ..... **TERM**
Air System Type ..... **2P-FC**

Number of zones ..... **3**
Floor Area ..... **2974.0** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Sum of space airflow rates**
Space CFM Sizing ..... **Individual peak space loads**

## Terminal Unit Sizing Data - Cooling

| Zone Name | Total Coil Load (MBH) | Sens Coil Load (MBH) | Coil Entering DB / WB (°F) | Coil Leaving DB / WB (°F) | Water Flow @ 10.0 °F (gpm) | Time of Peak Coil Load | Zone CFM/ft² |
|---|---|---|---|---|---|---|---|
| Zone 1 | 0.0 | 0.0 | -1.0 / -1.0 | -1.0 / -1.0 | 0.00 | Des 0000 | 0.22 |
| Zone 2 | 0.0 | 0.0 | -1.0 / -1.0 | -1.0 / -1.0 | 0.00 | Des 0000 | 0.12 |
| Zone 3 | 0.0 | 0.0 | -1.0 / -1.0 | -1.0 / -1.0 | 0.00 | Des 0000 | 0.12 |

## Terminal Unit Sizing Data - Heating, Fan, Ventilation

| Zone Name | Heating Coil Load (MBH) | Heating Coil Ent/Lvg DB (°F) | Htg Coil Water Flow @20.0 °F (gpm) | Fan Design Airflow (CFM) | Fan Motor (BHP) | Fan Motor (kW) | OA Vent Design Airflow (CFM) |
|---|---|---|---|---|---|---|---|
| Zone 1 | 21.6 | 32.3 / 93.8 | 2.16 | 338 | 0.000 | 0.000 | 184 |
| Zone 2 | 7.6 | 0.0 / 93.2 | 0.76 | 78 | 0.000 | 0.000 | 78 |
| Zone 3 | 7.1 | 0.0 / 72.0 | 0.71 | 95 | 0.000 | 0.000 | 95 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 9.4 | Jul 1700 | 8.1 | 1535.0 |
| Zone 2 | 4.6 | Jul 1700 | 1.8 | 650.0 |
| Zone 3 | 3.7 | Jul 1700 | 0.0 | 789.0 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| GD01 Storage | 1 | 9.4 | Jul 1700 | 338 | 8.1 | 1535.0 | 0.22 |
| *Zone 2* | | | | | | | |
| GD02 Outdoor Storage | 1 | 4.6 | Jul 1700 | 78 | 1.8 | 650.0 | 0.12 |
| *Zone 3* | | | | | | | |
| GD03 Custodian's Storage | 1 | 3.7 | Jul 1700 | 95 | 0.0 | 789.0 | 0.12 |

# Air System Design Load Summary for Ground lvl heating only

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:13PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | NO COOLING DATA<br>NO COOLING OA DB / WB | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 74 ft² | - | - | 74 ft² | - | - |
| Wall Transmission | 1984 ft² | - | - | 1984 ft² | 4240 | - |
| Roof Transmission | 0 ft² | - | - | 0 ft² | 0 | - |
| Window Transmission | 74 ft² | - | - | 74 ft² | 2210 | - |
| Skylight Transmission | 0 ft² | - | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | - | - | 0 ft² | 0 | - |
| Floor Transmission | 2974 ft² | - | - | 2974 ft² | 3386 | - |
| Partitions | 0 ft² | - | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | - | - | 0 ft² | 0 | - |
| Overhead Lighting | - | - | - | 0 | 0 | - |
| Task Lighting | - | - | - | 0 | 0 | - |
| Electric Equipment | - | - | - | 0 | 0 | - |
| People | - | - | - | 0 | 0 | 0 |
| Infiltration | - | - | - | - | 0 | 0 |
| Miscellaneous | - | - | - | - | 0 | 0 |
| Safety Factor | 0% / 0% | - | - | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **-** | **-** | **-** | **9836** | **0** |
| Zone Conditioning | - | - | - | - | 9651 | 0 |
| Plenum Wall Load | 0% | - | - | 0 | 0 | - |
| Plenum Roof Load | 0% | - | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | - | - | 0 | 0 | - |
| Exhaust Fan Load | - | - | - | 0 CFM | 0 | - |
| Ventilation Load | - | - | - | 357 CFM | 26511 | 0 |
| Ventilation Fan Load | - | - | - | 0 CFM | 0 | - |
| Space Fan Coil Fans | - | - | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | - | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **-** | **-** | **-** | **36162** | **0** |
| Terminal Unit Cooling | - | - | - | - | 0 | 0 |
| Terminal Unit Heating | - | - | - | - | 36272 | - |
| **>> Total Conditioning** | **-** | **-** | **-** | **-** | **36272** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Air System Sizing Summary for RTU 14 - Entry/coridor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:13PM

## Air System Information

| | | | | | |
|---|---|---|---|---|---|
| Air System Name | **RTU 14 - Entry/coridor** | | Number of zones | **6** | |
| Equipment Class | **PKG ROOF** | | Floor Area | **12230.0** | ft² |
| Air System Type | **VAV** | | Location | **Worcester, Massachusetts** | |

## Sizing Calculation Information

| | | | | |
|---|---|---|---|---|
| Calculation Months | **Jan to Dec** | | Zone CFM Sizing | **Peak zone sensible load** |
| Sizing Data | **Calculated** | | Space CFM Sizing | **Individual peak space loads** |

## Central Cooling Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Total coil load | **17.9** | Tons | Load occurs at | **Jul 0700** | |
| Total coil load | **214.7** | MBH | OA DB / WB | **71.6 / 66.4** | °F |
| Sensible coil load | **198.9** | MBH | Entering DB / WB | **78.7 / 61.7** | °F |
| Coil CFM at Jul 0700 | **7231** | CFM | Leaving DB / WB | **52.3 / 50.8** | °F |
| Max block CFM at Aug 0900 | **7231** | CFM | Coil ADP | **49.4** | °F |
| Sum of peak zone CFM | **8825** | CFM | Bypass Factor | **0.100** | |
| Sensible heat ratio | **0.926** | | Resulting RH | **36** | % |
| CFM/Ton | **404.1** | | Design supply temp. | **55.0** | °F |
| ft²/Ton | **683.5** | | Zone T-stat Check | **0 of 6** | OK |
| BTU/(hr·ft²) | **17.6** | | Max zone temperature deviation | **6.2** | °F |
| Water flow @ 10.0 °F rise | **N/A** | | | | |

## Central Heating Coil Sizing Data

**No central heating coil loads occurred during this calculation.**

## Preheat Coil Sizing Data

**No heating coil loads occurred during this calculation.**

## Supply Fan Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Actual max CFM at Aug 0900 | **7231** | CFM | Fan motor BHP | **7.46** | BHP |
| Standard CFM | **6971** | CFM | Fan motor kW | **5.92** | kW |
| Actual max CFM/ft² | **0.59** | CFM/ft² | Fan static | **3.00** | in wg |

## Outdoor Ventilation Air Data

| | | | | | |
|---|---|---|---|---|---|
| Design airflow CFM | **2848** | CFM | CFM/person | **142.38** | CFM/person |
| CFM/ft² | **0.23** | CFM/ft² | | | |

# Zone Sizing Summary for RTU 14 - Entry/coridor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:13PM

## Air System Information

Air System Name ..... **RTU 14 - Entry/coridor**
Equipment Class ..... **PKG ROOF**
Air System Type ..... **VAV**

Number of zones ..... **6**
Floor Area ..... **12230.0** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

## Zone Terminal Sizing Data

| Zone Name | Design Supply Airflow (CFM) | Minimum Supply Airflow (CFM) | Zone CFM/ft² | Reheat Coil Load (MBH) | Reheat Coil Water gpm @ 20.0 °F | Zone Htg Unit Coil Load (MBH) | Zone Htg Unit Water gpm @ 20.0 °F | Mixing Box Fan Airflow (CFM) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 4226 | 1498 | 1.05 | 62.4 | 6.24 | 0.0 | - | 0 |
| Zone 2 | 1765 | 530 | 0.89 | 22.1 | 2.21 | 0.0 | - | 0 |
| Zone 3 | 669 | 201 | 0.43 | 8.4 | 0.84 | 0.0 | - | 0 |
| Zone 4 | 808 | 242 | 0.33 | 10.1 | 1.01 | 0.0 | - | 0 |
| Zone 5 | 715 | 214 | 0.57 | 8.9 | 0.89 | 0.0 | - | 0 |
| Zone 6 | 641 | 393 | 0.67 | 16.3 | 1.64 | 0.0 | - | 0 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 88.0 | Jul 0700 | 35.9 | 4025.0 |
| Zone 2 | 36.8 | Oct 1200 | 12.3 | 1975.0 |
| Zone 3 | 13.9 | Jul 1700 | 4.8 | 1570.0 |
| Zone 4 | 16.8 | Oct 1100 | 4.5 | 2450.0 |
| Zone 5 | 14.9 | Jul 1700 | 1.1 | 1260.0 |
| Zone 6 | 13.4 | Jan 2300 | 0.0 | 950.0 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| MLC1 entry lobby | 1 | 88.0 | Jul 0700 | 4226 | 35.9 | 4025.0 | 1.05 |
| *Zone 2* | | | | | | | |
| MLC2 corridor | 1 | 36.8 | Oct 1200 | 1765 | 12.3 | 1975.0 | 0.89 |
| *Zone 3* | | | | | | | |
| MLC3 corridor | 1 | 13.9 | Jul 1700 | 669 | 4.8 | 1570.0 | 0.43 |
| *Zone 4* | | | | | | | |
| GLC 1 main corridor | 1 | 16.8 | Oct 1100 | 808 | 4.5 | 2450.0 | 0.33 |
| *Zone 5* | | | | | | | |
| GLC 2 corridor | 1 | 14.9 | Jul 1700 | 715 | 1.1 | 1260.0 | 0.57 |
| *Zone 6* | | | | | | | |
| GLC 3 OT/PT | 1 | 13.4 | Jan 2300 | 641 | 0.0 | 950.0 | 0.67 |

# Air System Design Load Summary for RTU 14 - Entry/coridor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Jul 0700<br>COOLING OA DB / WB 71.6 °F / 66.4 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 1393 ft² | 70487 | - | 1393 ft² | - | - |
| Wall Transmission | 1806 ft² | 353 | - | 1806 ft² | 3859 | - |
| Roof Transmission | 7570 ft² | 694 | - | 7570 ft² | 11902 | - |
| Window Transmission | 1393 ft² | -1159 | - | 1393 ft² | 41607 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 4660 ft² | 0 | - | 4660 ft² | 1225 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 8561 W | 29209 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 11990 W | 40910 | - | 0 | 0 | - |
| People | 20 | 4600 | 2400 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **145094** | **2400** | **-** | **58593** | **0** |
| Zone Conditioning | - | 223516 | 2400 | - | 55342 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Return Fan Load | 7231 CFM | 0 | - | 3077 CFM | 0 | - |
| Ventilation Load | 1835 CFM | -4451 | 13446 | 2848 CFM | 63005 | 0 |
| Supply Fan Load | 7231 CFM | 20194 | - | 3077 CFM | -3339 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **239260** | **15846** | **-** | **115007** | **0** |
| Central Cooling Coil | - | 198881 | 15846 | - | 0 | 0 |
| Central Heating Coil | - | 0 | - | - | 0 | - |
| Preheat Coil | - | 0 | - | - | 0 | - |
| Terminal Reheat Coils | - | 0 | - | - | 114965 | - |
| **>> Total Conditioning** | **-** | **198881** | **15846** | **-** | **114965** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Air System Sizing Summary for RTU-11 Office wing

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

| | | | | | |
|---|---|---|---|---|---|
| Air System Name | **RTU-11 Office wing** | | Number of zones | **15** | |
| Equipment Class | **PKG ROOF** | | Floor Area | **6345.0** | ft² |
| Air System Type | **VAV** | | Location | **Worcester, Massachusetts** | |

## Sizing Calculation Information

| | | | | |
|---|---|---|---|---|
| Calculation Months | **Jan to Dec** | | Zone CFM Sizing | **Peak zone sensible load** |
| Sizing Data | **Calculated** | | Space CFM Sizing | **Individual peak space loads** |

## Central Cooling Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Total coil load | **9.0** | Tons | Load occurs at | **Jul 0700** | |
| Total coil load | **108.0** | MBH | OA DB / WB | **71.6 / 66.4** | °F |
| Sensible coil load | **97.2** | MBH | Entering DB / WB | **78.6 / 62.0** | °F |
| Coil CFM at Jul 0700 | **3553** | CFM | Leaving DB / WB | **52.3 / 50.8** | °F |
| Max block CFM at Jul 0800 | **3553** | CFM | Coil ADP | **49.4** | °F |
| Sum of peak zone CFM | **4034** | CFM | Bypass Factor | **0.100** | |
| Sensible heat ratio | **0.900** | | Resulting RH | **36** | % |
| CFM/Ton | **394.8** | | Design supply temp. | **55.0** | °F |
| ft²/Ton | **705.1** | | Zone T-stat Check | **0 of 15** | OK |
| BTU/(hr·ft²) | **17.0** | | Max zone temperature deviation | **6.9** | °F |
| Water flow @ 10.0 °F rise | **N/A** | | | | |

## Central Heating Coil Sizing Data

**No central heating coil loads occurred during this calculation.**

## Preheat Coil Sizing Data

**No heating coil loads occurred during this calculation.**

## Supply Fan Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Actual max CFM at Jul 0800 | **3553** | CFM | Fan motor BHP | **3.67** | BHP |
| Standard CFM | **3425** | CFM | Fan motor kW | **2.91** | kW |
| Actual max CFM/ft² | **0.56** | CFM/ft² | Fan static | **3.00** | in wg |

## Outdoor Ventilation Air Data

| | | | | | |
|---|---|---|---|---|---|
| Design airflow CFM | **1261** | CFM | CFM/person | **90.08** | CFM/person |
| CFM/ft² | **0.20** | CFM/ft² | | | |

# Zone Sizing Summary for RTU-11 Office wing

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

Air System Name ..... **RTU-11 Office wing**
Equipment Class ..... **PKG ROOF**
Air System Type ..... **VAV**

Number of zones ..... **15**
Floor Area ..... **6345.0** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

## Zone Terminal Sizing Data

| Zone Name | Design Supply Airflow (CFM) | Minimum Supply Airflow (CFM) | Zone CFM/ft² | Reheat Coil Load (MBH) | Reheat Coil Water gpm @ 20.0 °F | Zone Htg Unit Coil Load (MBH) | Zone Htg Unit Water gpm @ 20.0 °F | Mixing Box Fan Airflow (CFM) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 158 | 106 | 0.99 | 4.4 | 0.44 | 0.0 | - | 0 |
| Zone 2 | 130 | 52 | 1.08 | 2.2 | 0.22 | 0.0 | - | 0 |
| Zone 3 | 898 | 293 | 1.66 | 12.2 | 1.22 | 0.0 | - | 0 |
| Zone 4 | 299 | 98 | 1.66 | 4.1 | 0.41 | 0.0 | - | 0 |
| Zone 5 | 305 | 101 | 1.49 | 4.2 | 0.42 | 0.0 | - | 0 |
| Zone 6 | 305 | 101 | 1.49 | 4.2 | 0.42 | 0.0 | - | 0 |
| Zone 7 | 313 | 170 | 0.38 | 7.1 | 0.71 | 0.0 | - | 0 |
| Zone 8 | 112 | 35 | 0.30 | 1.4 | 0.14 | 0.0 | - | 0 |
| Zone 9 | 123 | 38 | 0.29 | 1.6 | 0.16 | 0.0 | - | 0 |
| Zone 10 | 105 | 43 | 0.18 | 1.8 | 0.18 | 0.0 | - | 0 |
| Zone 11 | 123 | 50 | 0.18 | 2.1 | 0.21 | 0.0 | - | 0 |
| Zone 12 | 944 | 377 | 0.96 | 15.7 | 1.57 | 0.0 | - | 0 |
| Zone 13 | 75 | 30 | 0.18 | 1.3 | 0.13 | 0.0 | - | 0 |
| Zone 14 | 53 | 20 | 0.29 | 0.8 | 0.08 | 0.0 | - | 0 |
| Zone 15 | 91 | 37 | 0.18 | 1.5 | 0.15 | 0.0 | - | 0 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 3.3 | Jul 0800 | 2.5 | 160.0 |
| Zone 2 | 2.7 | Jul 0800 | 1.2 | 120.0 |
| Zone 3 | 18.7 | Jul 0700 | 7.0 | 540.0 |
| Zone 4 | 6.2 | Jul 0700 | 2.3 | 180.0 |
| Zone 5 | 6.3 | Jul 0700 | 2.4 | 205.0 |
| Zone 6 | 6.3 | Jul 0700 | 2.4 | 205.0 |
| Zone 7 | 6.5 | Jul 1700 | 4.1 | 825.0 |
| Zone 8 | 2.3 | Jul 1500 | 0.6 | 380.0 |
| Zone 9 | 2.6 | Jul 1500 | 0.7 | 420.0 |
| Zone 10 | 2.2 | Jul 1500 | 0.9 | 570.0 |
| Zone 11 | 2.6 | Jul 1500 | 1.1 | 670.0 |
| Zone 12 | 19.7 | Sep 0900 | 9.0 | 985.0 |
| Zone 13 | 1.6 | Jul 1500 | 0.6 | 405.0 |
| Zone 14 | 1.1 | Jul 1500 | 0.3 | 185.0 |
| Zone 15 | 1.9 | Jul 1500 | 0.8 | 495.0 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |

# Zone Sizing Summary for RTU-11 Office wing

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| MO01 exam | 1 | 3.3 | Jul 0800 | 158 | 2.5 | 160.0 | 0.99 |
| *Zone 2* | | | | | | | |
| MO02 exam | 1 | 2.7 | Jul 0800 | 130 | 1.2 | 120.0 | 1.08 |
| *Zone 3* | | | | | | | |
| MO03 guidance office | 1 | 6.2 | Jul 0700 | 299 | 2.3 | 180.0 | 1.66 |
| MO04 guidance office | 1 | 6.2 | Jul 0700 | 299 | 2.3 | 180.0 | 1.66 |
| MO05 guidance office | 1 | 6.2 | Jul 0700 | 299 | 2.3 | 180.0 | 1.66 |
| *Zone 4* | | | | | | | |
| MO06 special ed | 1 | 6.2 | Jul 0700 | 299 | 2.3 | 180.0 | 1.66 |
| *Zone 5* | | | | | | | |
| MO07 pricipals office | 1 | 6.3 | Jul 0700 | 305 | 2.4 | 205.0 | 1.49 |
| *Zone 6* | | | | | | | |
| MO08 assistant pricipal | 1 | 6.3 | Jul 0700 | 305 | 2.4 | 205.0 | 1.49 |
| *Zone 7* | | | | | | | |
| MO09 resting | 1 | 2.6 | Jul 1700 | 124 | 1.9 | 245.0 | 0.50 |
| MO10 toilet | 1 | 1.2 | Jun 1700 | 56 | 1.4 | 95.0 | 0.59 |
| MO11 nurse suite | 1 | 2.9 | Jul 1500 | 140 | 0.8 | 485.0 | 0.29 |
| *Zone 8* | | | | | | | |
| MO12 special ed conf. | 1 | 2.3 | Jul 1500 | 112 | 0.6 | 380.0 | 0.30 |
| *Zone 9* | | | | | | | |
| MO13 admin conference | 1 | 2.6 | Jul 1500 | 123 | 0.7 | 420.0 | 0.29 |
| *Zone 10* | | | | | | | |
| MO14 storage | 1 | 1.1 | Jul 1500 | 53 | 0.5 | 290.0 | 0.18 |
| MO15 mail | 1 | 1.1 | Jul 1500 | 52 | 0.4 | 280.0 | 0.18 |
| *Zone 11* | | | | | | | |
| MO16 toilet | 1 | 0.5 | Jul 1500 | 23 | 0.2 | 125.0 | 0.18 |
| MO18 corridor | 1 | 2.1 | Jul 1500 | 100 | 0.9 | 545.0 | 0.18 |
| *Zone 12* | | | | | | | |
| MO17 reception | 1 | 19.7 | Sep 0900 | 944 | 9.0 | 985.0 | 0.96 |
| *Zone 13* | | | | | | | |
| MO19 toilet | 1 | 0.8 | Jul 1500 | 39 | 0.3 | 210.0 | 0.18 |
| MO20 toilet | 1 | 0.7 | Jul 1500 | 36 | 0.3 | 195.0 | 0.18 |
| *Zone 14* | | | | | | | |
| MO21 toilet | 1 | 0.3 | Jul 1500 | 17 | 0.1 | 90.0 | 0.18 |
| MO22 P.E.office | 1 | 0.8 | Jul 1500 | 36 | 0.1 | 95.0 | 0.38 |
| *Zone 15* | | | | | | | |
| MO23 P.E. storage | 1 | 1.9 | Jul 1500 | 91 | 0.8 | 495.0 | 0.18 |

# Air System Design Load Summary for RTU-11 Office wing

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Jul 0700 | | | HEATING DATA AT DES HTG | | |
| | COOLING OA DB / WB 71.6 °F / 66.4 °F | | | HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 748 ft² | 46609 | - | 748 ft² | - | - |
| Wall Transmission | 1730 ft² | 262 | - | 1730 ft² | 3697 | - |
| Roof Transmission | 6345 ft² | 727 | - | 6345 ft² | 9976 | - |
| Window Transmission | 748 ft² | -622 | - | 748 ft² | 22342 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 4442 W | 15154 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 2010 W | 6858 | - | 0 | 0 | - |
| People | 14 | 3220 | 1680 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **72208** | **1680** | **-** | **36014** | **0** |
| Zone Conditioning | - | 102558 | 1680 | - | 35101 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Return Fan Load | 3553 CFM | 0 | - | 1552 CFM | 0 | - |
| Ventilation Load | 1261 CFM | -3095 | 9143 | 1261 CFM | 27988 | 0 |
| Supply Fan Load | 3553 CFM | 9923 | - | 1552 CFM | -1707 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **109386** | **10823** | **-** | **61382** | **0** |
| Central Cooling Coil | - | 97160 | 10823 | - | 0 | 0 |
| Central Heating Coil | - | 0 | - | - | 0 | - |
| Preheat Coil | - | 0 | - | - | 0 | - |
| Terminal Reheat Coils | - | 0 | - | - | 61377 | - |
| **>> Total Conditioning** | **-** | **97160** | **10823** | **-** | **61377** | **0** |
| **Key:** | **Positive values are clg loads** | | | **Positive values are htg loads** | | |
| | **Negative values are htg loads** | | | **Negative values are clg loads** | | |

# Air System Sizing Summary for RTU-15 Music

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

| | | | | | |
|---|---|---|---|---|---|
| Air System Name | **RTU-15 Music** | | Number of zones | **2** | |
| Equipment Class | **PKG ROOF** | | Floor Area | **2995.0** | ft² |
| Air System Type | **VAV** | | Location | **Worcester, Massachusetts** | |

## Sizing Calculation Information

| | | | |
|---|---|---|---|
| Calculation Months | **Jan to Dec** | Zone CFM Sizing | **Peak zone sensible load** |
| Sizing Data | **Calculated** | Space CFM Sizing | **Individual peak space loads** |

## Central Cooling Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Total coil load | **5.8** | Tons | Load occurs at | **Aug 1300** | |
| Total coil load | **69.2** | MBH | OA DB / WB | **85.2 / 70.5** | °F |
| Sensible coil load | **56.1** | MBH | Entering DB / WB | **80.0 / 63.9** | °F |
| Coil CFM at Aug 1300 | **1974** | CFM | Leaving DB / WB | **52.7 / 51.3** | °F |
| Max block CFM at Sep 1200 | **1974** | CFM | Coil ADP | **49.7** | °F |
| Sum of peak zone CFM | **2014** | CFM | Bypass Factor | **0.100** | |
| Sensible heat ratio | **0.810** | | Resulting RH | **40** | % |
| CFM/Ton | **342.2** | | Design supply temp. | **55.0** | °F |
| ft²/Ton | **519.3** | | Zone T-stat Check | **0 of 2** | OK |
| BTU/(hr·ft²) | **23.1** | | Max zone temperature deviation | **4.9** | °F |
| Water flow @ 10.0 °F rise | **N/A** | | | | |

## Central Heating Coil Sizing Data

**No central heating coil loads occurred during this calculation.**

## Preheat Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Max coil load | **0.1** | MBH | Load occurs at | **Des Htg** | |
| Coil CFM at Des Htg | **1124** | CFM | Ent. DB / Lvg DB | **49.9 / 50.0** | °F |
| Max coil CFM | **1974** | CFM | | | |
| Water flow @ 20.0 °F drop | **0.01** | gpm | | | |

## Supply Fan Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Actual max CFM at Sep 1200 | **1974** | CFM | Fan motor BHP | **1.75** | BHP |
| Standard CFM | **1903** | CFM | Fan motor kW | **1.39** | kW |
| Actual max CFM/ft² | **0.66** | CFM/ft² | Fan static | **3.00** | in wg |

## Outdoor Ventilation Air Data

| | | | | | |
|---|---|---|---|---|---|
| Design airflow CFM | **1124** | CFM | CFM/person | **20.82** | CFM/person |
| CFM/ft² | **0.38** | CFM/ft² | | | |

# Zone Sizing Summary for RTU-15 Music

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

Air System Name ..... **RTU-15 Music**
Equipment Class ..... **PKG ROOF**
Air System Type ..... **VAV**

Number of zones ..... **2**
Floor Area ..... **2995.0** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

## Zone Terminal Sizing Data

| Zone Name | Design Supply Airflow (CFM) | Minimum Supply Airflow (CFM) | Zone CFM/ft² | Reheat Coil Load (MBH) | Reheat Coil Water gpm @ 20.0 °F | Zone Htg Unit Coil Load (MBH) | Zone Htg Unit Water gpm @ 20.0 °F | Mixing Box Fan Airflow (CFM) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 1407 | 613 | 0.77 | 25.5 | 2.55 | 0.0 | - | 0 |
| Zone 2 | 607 | 512 | 0.52 | 21.3 | 2.13 | 0.0 | - | 0 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 29.3 | Oct 1200 | 9.9 | 1835.0 |
| Zone 2 | 12.6 | Jul 1500 | 1.8 | 1160.0 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| MM01 music room | 1 | 29.3 | Oct 1200 | 1407 | 9.9 | 1835.0 | 0.77 |
| *Zone 2* | | | | | | | |
| MM02 music room | 1 | 12.6 | Jul 1500 | 607 | 1.8 | 1160.0 | 0.52 |

# Air System Design Load Summary for RTU-15 Music

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Aug 1300<br>COOLING OA DB / WB 85.2 °F / 70.5 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 163 ft² | 9501 | - | 163 ft² | - | - |
| Wall Transmission | 1027 ft² | 431 | - | 1027 ft² | 2195 | - |
| Roof Transmission | 2995 ft² | 3784 | - | 2995 ft² | 4709 | - |
| Window Transmission | 163 ft² | 501 | - | 163 ft² | 4869 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 2097 W | 7153 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 1498 W | 5109 | - | 0 | 0 | - |
| People | 54 | 12420 | 6480 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **38899** | **6480** | **-** | **11772** | **0** |
| Zone Conditioning | - | 50306 | 6480 | - | 11372 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Return Fan Load | 1974 CFM | 0 | - | 1124 CFM | 0 | - |
| Ventilation Load | 1068 CFM | 2064 | 6637 | 1124 CFM | 25032 | 0 |
| Supply Fan Load | 1974 CFM | 4740 | - | 1124 CFM | -2787 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **57110** | **13117** | **-** | **33618** | **0** |
| Central Cooling Coil | - | 56094 | 13119 | - | 0 | 0 |
| Central Heating Coil | - | 0 | - | - | 0 | - |
| Preheat Coil | - | 0 | - | - | 118 | - |
| Terminal Reheat Coils | - | 0 | - | - | 33499 | - |
| **>> Total Conditioning** | **-** | **56094** | **13119** | **-** | **33617** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Air System Sizing Summary for RTU-16 Media Center Ground Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

| | | | | | |
|---|---|---|---|---|---|
| Air System Name | **RTU-16 Media Center Ground Floor** | | Number of zones | **1** | |
| Equipment Class | **PKG ROOF** | | Floor Area | **4428.0** | ft² |
| Air System Type | **VAV** | | Location | **Worcester, Massachusetts** | |

## Sizing Calculation Information

| | | | | |
|---|---|---|---|---|
| Calculation Months | **Jan to Dec** | | Zone CFM Sizing | **Peak zone sensible load** |
| Sizing Data | **Calculated** | | Space CFM Sizing | **Individual peak space loads** |

## Central Cooling Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Total coil load | **16.3** | Tons | Load occurs at | **Jul 1600** | |
| Total coil load | **196.1** | MBH | OA DB / WB | **86.5 / 70.9** | °F |
| Sensible coil load | **170.3** | MBH | Entering DB / WB | **78.3 / 62.3** | °F |
| Coil CFM at Jul 1600 | **6298** | CFM | Leaving DB / WB | **52.3 / 50.9** | °F |
| Max block CFM at Jul 1600 | **6298** | CFM | Coil ADP | **49.4** | °F |
| Sum of peak zone CFM | **6298** | CFM | Bypass Factor | **0.100** | |
| Sensible heat ratio | **0.869** | | Resulting RH | **40** | % |
| CFM/Ton | **385.5** | | Design supply temp. | **55.0** | °F |
| ft²/Ton | **271.0** | | Zone T-stat Check | **0 of 1** | OK |
| BTU/(hr·ft²) | **44.3** | | Max zone temperature deviation | **1.5** | °F |
| Water flow @ 10.0 °F rise | **N/A** | | | | |

## Central Heating Coil Sizing Data

**No central heating coil loads occurred during this calculation.**

## Preheat Coil Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Max coil load | **0.5** | MBH | Load occurs at | **Des Htg** | |
| Coil CFM at Des Htg | **1975** | CFM | Ent. DB / Lvg DB | **49.8 / 50.0** | °F |
| Max coil CFM | **6298** | CFM | | | |
| Water flow @ 20.0 °F drop | **0.05** | gpm | | | |

## Supply Fan Sizing Data

| | | | | | |
|---|---|---|---|---|---|
| Actual max CFM at Jul 1600 | **6298** | CFM | Fan motor BHP | **6.50** | BHP |
| Standard CFM | **6071** | CFM | Fan motor kW | **5.15** | kW |
| Actual max CFM/ft² | **1.42** | CFM/ft² | Fan static | **3.00** | in wg |

## Outdoor Ventilation Air Data

| | | | | | |
|---|---|---|---|---|---|
| Design airflow CFM | **2388** | CFM | CFM/person | **22.53** | CFM/person |
| CFM/ft² | **0.54** | CFM/ft² | | | |

# Zone Sizing Summary for RTU-16 Media Center Ground Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

Air System Name **RTU-16 Media Center Ground Floor**
Equipment Class ..... **PKG ROOF**
Air System Type ..... **VAV**

Number of zones ..... **1**
Floor Area ..... **4428.0** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Peak zone sensible load**
Space CFM Sizing ..... **Individual peak space loads**

## Zone Terminal Sizing Data

| Zone Name | Design Supply Airflow (CFM) | Minimum Supply Airflow (CFM) | Zone CFM/ft² | Reheat Coil Load (MBH) | Reheat Coil Water gpm @ 20.0 °F | Zone Htg Unit Coil Load (MBH) | Zone Htg Unit Water gpm @ 20.0 °F | Mixing Box Fan Airflow (CFM) |
|---|---|---|---|---|---|---|---|---|
| Zone 1 | 6298 | 1975 | 1.42 | 82.3 | 8.23 | 0.0 | - | 0 |

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 131.1 | Jul 1600 | 32.8 | 4428.0 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| GME1 media (tall roof) | 1 | 75.1 | Jul 1600 | 3608 | 24.8 | 1550.0 | 2.33 |
| GME2 media (med roof) | 1 | 36.4 | Jul 1700 | 1748 | 7.9 | 1515.0 | 1.15 |
| GME3 media (one story) | 1 | 19.7 | Jan 2300 | 944 | 0.0 | 1260.0 | 0.75 |
| GME4 media office | 1 | 0.8 | Jan 2300 | 40 | 0.0 | 103.0 | 0.39 |

# Air System Design Load Summary for RTU-16 Media Center Ground Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Jul 1600<br>COOLING OA DB / WB 86.5 °F / 70.9 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 701 ft² | 58259 | - | 701 ft² | - | - |
| Wall Transmission | 1851 ft² | 925 | - | 1851 ft² | 3956 | - |
| Roof Transmission | 3086 ft² | 4534 | - | 3086 ft² | 4852 | - |
| Window Transmission | 701 ft² | 2583 | - | 701 ft² | 20938 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 4428 ft² | 0 | - | 4428 ft² | 3006 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 3100 W | 10576 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 8753 W | 29865 | - | 0 | 0 | - |
| People | 106 | 24395 | 12805 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **131136** | **12805** | **-** | **32751** | **0** |
| Zone Conditioning | - | 147302 | 12805 | - | 31791 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Return Fan Load | 6298 CFM | 0 | - | 1975 CFM | 0 | - |
| Ventilation Load | 1913 CFM | 5401 | 12962 | 1975 CFM | 43874 | 0 |
| Supply Fan Load | 6298 CFM | 17588 | - | 1975 CFM | -2334 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **170291** | **25767** | **-** | **73331** | **0** |
| Central Cooling Coil | - | 170291 | 25767 | - | 0 | 0 |
| Central Heating Coil | - | 0 | - | - | 0 | - |
| Preheat Coil | - | 0 | - | - | 453 | - |
| Terminal Reheat Coils | - | 0 | - | - | 72879 | - |
| **>> Total Conditioning** | **-** | **170291** | **25767** | **-** | **73331** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Dedicated Outdoor Air System (DOAS) Sizing Summary for VRF Fac Dining Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

Air System Name ..... **VRF Fac Dining Main Floor**
Equipment Class ..... **TERM**
Air System Type ..... **VRF**

Number of zones ..... **1**
Floor Area ..... **401.3** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Sum of space airflow rates**
Space CFM Sizing ..... **Individual peak space loads**

**NOTE: No other data is applicable for a Terminal Units air system without a Dedicated Outdoor Air System (DOAS).**

# Zone Sizing Summary for VRF Fac Dining Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

Air System Name ..... **VRF Fac Dining Main Floor**
Equipment Class ..... **TERM**
Air System Type ..... **VRF**

Number of zones ..... **1**
Floor Area ..... **401.3** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Sum of space airflow rates**
Space CFM Sizing ..... **Individual peak space loads**

## Terminal Unit Sizing Data - Cooling

| Zone Name | Total Coil Load (MBH) | Sens Coil Load (MBH) | Coil Entering DB / WB (°F) | Coil Leaving DB / WB (°F) | Water Flow @ 10.0 °F (gpm) | Time of Peak Coil Load | Zone CFM/ft² |
|---|---|---|---|---|---|---|---|
| Zone 1 | 22.6 | 16.9 | 77.3 / 64.9 | 55.7 / 54.6 | - | Aug 1200 | 1.87 |

## Terminal Unit Sizing Data - Heating, Fan, Ventilation

| Zone Name | Heating Coil Load (MBH) | Heating Coil Ent/Lvg DB (°F) | Htg Coil Water Flow @20.0 °F (gpm) | Fan Design Airflow (CFM) | Fan Motor (BHP) | Fan Motor (kW) | OA Vent Design Airflow (CFM) |
|---|---|---|---|---|---|---|---|
| Zone 1 | 16.5 | 56.1 / 77.2 | - | 751 | 0.000 | 0.000 | 164 |

## VRF Outdoor Unit Sizing Data

| | Cooling [MBH] | Cooling [Tons] | Heating [MBH] |
|---|---|---|---|
| Peak Coincident Indoor Unit Loads | 22.6 | 1.9 | 16.5 |
| Estimated Piping / Line Losses | 0.0 | 0.0 | 0.0 |
| | | | |
| **Total Required ODU Capacity** | 22.6 | 1.9 | 16.5 |

*Note: VRF piping / line losses are based on typical loss factors for this class of equipment. Actual line loss varies widely from one product to another. Therefore, when selecting equipment it is critical to consult manufacturer's guidance to utilize actual line loss data.*

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 15.6 | Oct 1200 | 4.2 | 401.3 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| Main Floor Fac Dining | 1 | 15.6 | Oct 1200 | 751 | 4.2 | 401.3 | 1.87 |

# Air System Design Load Summary for VRF Fac Dining Main Floor

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Aug 1200<br>COOLING OA DB / WB 83.2 °F / 69.9 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 73 ft² | 4686 | - | 73 ft² | - | - |
| Wall Transmission | 328 ft² | 127 | - | 328 ft² | 702 | - |
| Roof Transmission | 401 ft² | 450 | - | 401 ft² | 631 | - |
| Window Transmission | 73 ft² | 179 | - | 73 ft² | 2180 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 401 ft² | 0 | - | 401 ft² | 661 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 281 W | 958 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 401 W | 1369 | - | 0 | 0 | - |
| People | 28 | 6440 | 3360 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **14210** | **3360** | **-** | **4174** | **0** |
| Zone Conditioning | - | 15627 | 3360 | - | 4203 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Exhaust Fan Load | 0 CFM | 0 | - | 0 CFM | 0 | - |
| Ventilation Load | 164 CFM | 1276 | 2314 | 164 CFM | 12269 | 0 |
| Ventilation Fan Load | 0 CFM | 0 | - | 0 CFM | 0 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **16903** | **5674** | **-** | **16473** | **0** |
| Terminal Unit Cooling | - | 16903 | 5685 | - | 0 | 0 |
| Terminal Unit Heating | - | 0 | - | - | 16473 | - |
| **>> Total Conditioning** | **-** | **16903** | **5685** | **-** | **16473** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Dedicated Outdoor Air System (DOAS) Sizing Summary for VRF kitchen office/storage

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

Air System Name ..... **VRF kitchen office/storage**
Equipment Class ..... **TERM**
Air System Type ..... **VRF**

Number of zones ..... **1**
Floor Area ..... **885.0** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Sum of space airflow rates**
Space CFM Sizing ..... **Individual peak space loads**

**NOTE: No other data is applicable for a Terminal Units air system without a Dedicated Outdoor Air System (DOAS).**

# Zone Sizing Summary for VRF kitchen office/storage

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

## Air System Information

Air System Name ..... **VRF kitchen office/storage**
Equipment Class ..... **TERM**
Air System Type ..... **VRF**

Number of zones ..... **1**
Floor Area ..... **885.0** ft²
Location ..... **Worcester, Massachusetts**

## Sizing Calculation Information

Calculation Months ..... **Jan to Dec**
Sizing Data ..... **Calculated**

Zone CFM Sizing ..... **Sum of space airflow rates**
Space CFM Sizing ..... **Individual peak space loads**

## Terminal Unit Sizing Data - Cooling

| Zone Name | Total Coil Load (MBH) | Sens Coil Load (MBH) | Coil Entering DB / WB (°F) | Coil Leaving DB / WB (°F) | Water Flow @ 10.0 °F (gpm) | Time of Peak Coil Load | Zone CFM/ft² |
|---|---|---|---|---|---|---|---|
| Zone 1 | 9.5 | 8.0 | 79.2 / 64.1 | 55.0 / 53.6 | - | Jul 1500 | 0.36 |

## Terminal Unit Sizing Data - Heating, Fan, Ventilation

| Zone Name | Heating Coil Load (MBH) | Heating Coil Ent/Lvg DB (°F) | Htg Coil Water Flow @20.0 °F (gpm) | Fan Design Airflow (CFM) | Fan Motor (BHP) | Fan Motor (kW) | OA Vent Design Airflow (CFM) |
|---|---|---|---|---|---|---|---|
| Zone 1 | 8.8 | 57.4 / 83.9 | - | 318 | 0.000 | 0.000 | 63 |

## VRF Outdoor Unit Sizing Data

| | Cooling [MBH] | Cooling [Tons] | Heating [MBH] |
|---|---|---|---|
| Peak Coincident Indoor Unit Loads | 9.5 | 0.8 | 8.8 |
| Estimated Piping / Line Losses | 0.0 | 0.0 | 0.0 |
| | | | |
| **Total Required ODU Capacity** | 9.5 | 0.8 | 8.8 |

*Note: VRF piping / line losses are based on typical loss factors for this class of equipment. Actual line loss varies widely from one product to another. Therefore, when selecting equipment it is critical to consult manufacturer's guidance to utilize actual line loss data.*

## Zone Peak Sensible Loads

| Zone Name | Zone Cooling Sensible (MBH) | Time of Peak Sensible Cooling Load | Zone Heating Load (MBH) | Zone Floor Area (ft²) |
|---|---|---|---|---|
| Zone 1 | 6.2 | Jul 1700 | 3.9 | 885.0 |

## Space Loads and Airflows

| Zone Name / Space Name | Mult. | Cooling Sensible (MBH) | Time of Peak Sensible Load | Air Flow (CFM) | Heating Load (MBH) | Floor Area (ft²) | Space CFM/ft² |
|---|---|---|---|---|---|---|---|
| *Zone 1* | | | | | | | |
| ML2 toilet | 1 | 0.9 | Aug 1700 | 41 | 0.7 | 140.0 | 0.30 |
| ML3 kitchen office | 1 | 1.3 | Jul 1700 | 62 | 0.5 | 145.0 | 0.43 |
| ML4 storage/recieving | 1 | 3.3 | Jul 0800 | 160 | 2.5 | 435.0 | 0.37 |
| ML5 spare office | 1 | 1.1 | Jul 1500 | 55 | 0.3 | 165.0 | 0.33 |

# Air System Design Load Summary for VRF kitchen office/storage

Project Name: Beal School Master Load - Kevin 08/22/2018
Prepared by: SEAMAN ENGINEERING CORPORATION 11:14PM

| | DESIGN COOLING | | | DESIGN HEATING | | |
|---|---|---|---|---|---|---|
| | COOLING DATA AT Jul 1500<br>COOLING OA DB / WB 87.0 °F / 71.0 °F | | | HEATING DATA AT DES HTG<br>HEATING OA DB / WB 0.0 °F / -1.6 °F | | |
| **ZONE LOADS** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** | **Details** | **Sensible (BTU/hr)** | **Latent (BTU/hr)** |
| Window & Skylight Solar Loads | 25 ft² | 527 | - | 25 ft² | - | - |
| Wall Transmission | 845 ft² | 531 | - | 845 ft² | 1806 | - |
| Roof Transmission | 885 ft² | 1282 | - | 885 ft² | 1391 | - |
| Window Transmission | 25 ft² | 94 | - | 25 ft² | 747 | - |
| Skylight Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Door Loads | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Floor Transmission | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Partitions | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Ceiling | 0 ft² | 0 | - | 0 ft² | 0 | - |
| Overhead Lighting | 620 W | 2114 | - | 0 | 0 | - |
| Task Lighting | 0 W | 0 | - | 0 | 0 | - |
| Electric Equipment | 155 W | 529 | - | 0 | 0 | - |
| People | 2 | 460 | 240 | 0 | 0 | 0 |
| Infiltration | - | 0 | 0 | - | 0 | 0 |
| Miscellaneous | - | 0 | 0 | - | 0 | 0 |
| Safety Factor | 0% / 0% | 0 | 0 | 0% | 0 | 0 |
| **>> Total Zone Loads** | **-** | **5537** | **240** | **-** | **3944** | **0** |
| Zone Conditioning | - | 7378 | 240 | - | 4057 | 0 |
| Plenum Wall Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Roof Load | 0% | 0 | - | 0 | 0 | - |
| Plenum Lighting Load | 0% | 0 | - | 0 | 0 | - |
| Exhaust Fan Load | 0 CFM | 0 | - | 0 CFM | 0 | - |
| Ventilation Load | 63 CFM | 640 | 1243 | 63 CFM | 4705 | 0 |
| Ventilation Fan Load | 0 CFM | 0 | - | 0 CFM | 0 | - |
| Space Fan Coil Fans | - | 0 | - | - | 0 | - |
| Duct Heat Gain / Loss | 0% | 0 | - | 0% | 0 | - |
| **>> Total System Loads** | **-** | **8018** | **1483** | **-** | **8762** | **0** |
| Terminal Unit Cooling | - | 8018 | 1485 | - | 0 | 0 |
| Terminal Unit Heating | - | 0 | - | - | 8762 | - |
| **>> Total Conditioning** | **-** | **8018** | **1485** | **-** | **8762** | **0** |
| **Key:** | **Positive values are clg loads<br>Negative values are htg loads** | | | **Positive values are htg loads<br>Negative values are clg loads** | | |

# Appendix D

# Life Cycle
# &
# Energy Analysis Data

# Lifecycle Summary

Project: Beal School Schematic Life Cycle 8/28/2018
Prepared By: Seaman Engineering Corp. 3:17:37 PM

**Beal School Schematic**

Schematic Life Cycle

Type of Analysis.....Simple Payback Analysis
Length of Analysis.....20 yrs
Discount Rate.....0.00 %

**Table 1. Executive Summary**

| Economic Criteria | Best Design Case for Each Criteria | Value ($) |
|---|---|---|
| Payback Analysis | Schematic Life Cycle Base | - |
| Lowest Annual Operating Cost | Schematic Life Cycle Base | $184,741 |
| Lowest First Cost | Schematic Life Cycle Base | $5,632,726 |

**Table 2. Design Cases Ranked by First Cost**

| Design Case Name | Design Case Short Name | Total Present Worth ($) | Annual Operating Cost ($/yr) | First Cost ($) |
|---|---|---|---|---|
| Schematic Life Cycle Base | Schematic | $11,553,802 | $184,741 | $5,632,726 |
| Schematic Life Cycle Chiller | Schematic | $12,502,939 | $206,318 | $5,832,726 |
| Schematic Life Cycle Biomass | Schematic | $12,377,021 | $199,811 | $5,932,726 |
| Schematic Life Cycle Geothermal | Schematic | $12,702,635 | $203,429 | $6,132,726 |

**Table 3. Incremental Analysis Data**

| Challenger | Base Case | Additional First Cost ($) | Payback Period (yrs) |
|---|---|---|---|
| Schematic | Schematic [Winner] | $200,000 | n/a |
| Schematic | Schematic [Winner] | $300,000 | n/a |
| Schematic | Schematic [Winner] | $500,000 | n/a |

# Analysis Details

Project: Beal School Schematic Life Cycle 8/28/2018
Prepared By: Seaman Engineering Corp. 3:20:11 PM

**Beal School Schematic**

Schematic Life Cycle

Type of Analysis.....Simple Payback Analysis
Length of Analysis.....20 yrs
Discount Rate.....0.00 %

## 1A. Summary of Results

| | |
|---|---|
| Base Case **[Winner]** | Schematic Life Cycle Base [Schematic] |
| Challenger | Schematic Life Cycle Chiller [Schematic] |
| [Schematic] Total Present Worth ($) | $11,553,802 |
| [Schematic] Total Present Worth ($) | $12,502,939 |
| Net Present Worth Savings ($) | $-949,137 |
| Payback Period (yrs) | n/a |

## 1B. Comparative Analysis Details

| | | Cash Flow (Present Worth $) | | | SIR and Payback Calculation (Present Worth $) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Year** | **Date** | **[Schematic] Cash Flow ($)** | **[Schematic] Cash Flow ($)** | **Net Present Worth Savings ($)** | **Operating Cost Savings ($)** | **Cumulative Operating Cost Savings ($)** | **Additional Investment Cost ($)** | **Cumulative Additional Investment Cost ($)** | **Year-End SIR** |
| 0 | Initial | 5,632,726 | 5,832,726 | -200,000 | 0 | 0 | 200,000 | 200,000 | 0.000 |
| 1 | 1 | 192,578 | 215,234 | -22,656 | -22,656 | -22,656 | 0 | 200,000 | -0.113 |
| 2 | 2 | 200,765 | 224,554 | -23,789 | -23,789 | -46,444 | 0 | 200,000 | -0.232 |
| 3 | 3 | 209,318 | 234,296 | -24,978 | -24,978 | -71,423 | 0 | 200,000 | -0.357 |
| 4 | 4 | 218,254 | 244,481 | -26,227 | -26,227 | -97,650 | 0 | 200,000 | -0.488 |
| 5 | 5 | 227,591 | 255,129 | -27,538 | -27,538 | -125,188 | 0 | 200,000 | -0.626 |
| 6 | 6 | 237,348 | 266,263 | -28,915 | -28,915 | -154,103 | 0 | 200,000 | -0.771 |
| 7 | 7 | 247,543 | 277,904 | -30,361 | -30,361 | -184,464 | 0 | 200,000 | -0.922 |
| 8 | 8 | 258,199 | 290,078 | -31,879 | -31,879 | -216,343 | 0 | 200,000 | -1.082 |
| 9 | 9 | 269,335 | 302,808 | -33,473 | -33,473 | -249,816 | 0 | 200,000 | -1.249 |
| 10 | 10 | 280,975 | 316,122 | -35,147 | -35,147 | -284,963 | 0 | 200,000 | -1.425 |
| 11 | 11 | 293,142 | 330,046 | -36,904 | -36,904 | -321,867 | 0 | 200,000 | -1.609 |
| 12 | 12 | 305,862 | 344,611 | -38,749 | -38,749 | -360,616 | 0 | 200,000 | -1.803 |
| 13 | 13 | 319,159 | 359,845 | -40,687 | -40,687 | -401,303 | 0 | 200,000 | -2.007 |
| 14 | 14 | 333,061 | 375,782 | -42,721 | -42,721 | -444,024 | 0 | 200,000 | -2.220 |
| 15 | 15 | 347,596 | 392,453 | -44,857 | -44,857 | -488,881 | 0 | 200,000 | -2.444 |
| 16 | 16 | 362,795 | 409,895 | -47,100 | -47,100 | -535,981 | 0 | 200,000 | -2.680 |
| 17 | 17 | 378,688 | 428,143 | -49,455 | -49,455 | -585,435 | 0 | 200,000 | -2.927 |
| 18 | 18 | 395,308 | 447,236 | -51,928 | -51,928 | -637,363 | 0 | 200,000 | -3.187 |
| 19 | 19 | 412,690 | 467,214 | -54,524 | -54,524 | -691,887 | 0 | 200,000 | -3.459 |
| 20 | 20 | 430,870 | 488,120 | -57,250 | -57,250 | -749,137 | 0 | 200,000 | -3.746 |
| Totals | | 11,553,802 | 12,502,939 | -949,137 | -749,137 | | 200,000 | | |

# Analysis Details

Project: Beal School Schematic Life Cycle 8/28/2018
Prepared By: Seaman Engineering Corp. 3:20:11 PM

## 2A. Summary of Results

| | |
|---|---|
| Base Case **[Winner]** | Schematic Life Cycle Base [Schematic] |
| Challenger | Schematic Life Cycle Biomass [Schematic] |
| [Schematic] Total Present Worth ($) | $11,553,802 |
| [Schematic] Total Present Worth ($) | $12,377,021 |
| Net Present Worth Savings ($) | $-823,219 |
| Payback Period (yrs) | n/a |

## 2B. Comparative Analysis Details

| | | Cash Flow (Present Worth $) | | | SIR and Payback Calculation (Present Worth $) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Year** | **Date** | **[Schematic] Cash Flow ($)** | **[Schematic] Cash Flow ($)** | **Net Present Worth Savings ($)** | **Operating Cost Savings ($)** | **Cumulative Operating Cost Savings ($)** | **Additional Investment Cost ($)** | **Cumulative Additional Investment Cost ($)** | **Year-End SIR** |
| 0 | Initial | 5,632,726 | 5,932,726 | -300,000 | 0 | 0 | 300,000 | 300,000 | 0.000 |
| 1 | 1 | 192,578 | 208,402 | -15,824 | -15,824 | -15,824 | 0 | 300,000 | -0.053 |
| 2 | 2 | 200,765 | 217,380 | -16,615 | -16,615 | -32,438 | 0 | 300,000 | -0.108 |
| 3 | 3 | 209,318 | 226,763 | -17,445 | -17,445 | -49,884 | 0 | 300,000 | -0.166 |
| 4 | 4 | 218,254 | 236,572 | -18,318 | -18,318 | -68,201 | 0 | 300,000 | -0.227 |
| 5 | 5 | 227,591 | 246,825 | -19,234 | -19,234 | -87,435 | 0 | 300,000 | -0.291 |
| 6 | 6 | 237,348 | 257,543 | -20,195 | -20,195 | -107,630 | 0 | 300,000 | -0.359 |
| 7 | 7 | 247,543 | 268,748 | -21,205 | -21,205 | -128,835 | 0 | 300,000 | -0.429 |
| 8 | 8 | 258,199 | 280,464 | -22,265 | -22,265 | -151,100 | 0 | 300,000 | -0.504 |
| 9 | 9 | 269,335 | 292,714 | -23,379 | -23,379 | -174,479 | 0 | 300,000 | -0.582 |
| 10 | 10 | 280,975 | 305,523 | -24,547 | -24,547 | -199,026 | 0 | 300,000 | -0.663 |
| 11 | 11 | 293,142 | 318,917 | -25,775 | -25,775 | -224,801 | 0 | 300,000 | -0.749 |
| 12 | 12 | 305,862 | 332,925 | -27,064 | -27,064 | -251,865 | 0 | 300,000 | -0.840 |
| 13 | 13 | 319,159 | 347,575 | -28,417 | -28,417 | -280,281 | 0 | 300,000 | -0.934 |
| 14 | 14 | 333,061 | 362,898 | -29,838 | -29,838 | -310,119 | 0 | 300,000 | -1.034 |
| 15 | 15 | 347,596 | 378,925 | -31,329 | -31,329 | -341,448 | 0 | 300,000 | -1.138 |
| 16 | 16 | 362,795 | 395,691 | -32,896 | -32,896 | -374,344 | 0 | 300,000 | -1.248 |
| 17 | 17 | 378,688 | 413,229 | -34,541 | -34,541 | -408,885 | 0 | 300,000 | -1.363 |
| 18 | 18 | 395,308 | 431,576 | -36,268 | -36,268 | -445,153 | 0 | 300,000 | -1.484 |
| 19 | 19 | 412,690 | 450,771 | -38,081 | -38,081 | -483,234 | 0 | 300,000 | -1.611 |
| 20 | 20 | 430,870 | 470,855 | -39,985 | -39,985 | -523,219 | 0 | 300,000 | -1.744 |
| Totals | | 11,553,802 | 12,377,021 | -823,219 | -523,219 | | 300,000 | | |

# Analysis Details

Project: Beal School Schematic Life Cycle 8/28/2018
Prepared By: Seaman Engineering Corp. 3:20:11 PM

## 3A. Summary of Results

| | |
|---|---|
| Base Case **[Winner]** | Schematic Life Cycle Base [Schematic] |
| Challenger | Schematic Life Cycle Geothermal [Schematic] |
| [Schematic] Total Present Worth ($) | $11,553,802 |
| [Schematic] Total Present Worth ($) | $12,702,635 |
| Net Present Worth Savings ($) | $-1,148,833 |
| Payback Period (yrs) | n/a |

## 3B. Comparative Analysis Details

| | | Cash Flow (Present Worth $) | | | SIR and Payback Calculation (Present Worth $) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Year** | **Date** | **[Schematic] Cash Flow ($)** | **[Schematic] Cash Flow ($)** | **Net Present Worth Savings ($)** | **Operating Cost Savings ($)** | **Cumulative Operating Cost Savings ($)** | **Additional Investment Cost ($)** | **Cumulative Additional Investment Cost ($)** | **Year-End SIR** |
| 0 | Initial | 5,632,726 | 6,132,726 | -500,000 | 0 | 0 | 500,000 | 500,000 | 0.000 |
| 1 | 1 | 192,578 | 212,200 | -19,622 | -19,622 | -19,622 | 0 | 500,000 | -0.039 |
| 2 | 2 | 200,765 | 221,368 | -20,604 | -20,604 | -40,226 | 0 | 500,000 | -0.080 |
| 3 | 3 | 209,318 | 230,952 | -21,634 | -21,634 | -61,860 | 0 | 500,000 | -0.124 |
| 4 | 4 | 218,254 | 240,969 | -22,715 | -22,715 | -84,575 | 0 | 500,000 | -0.169 |
| 5 | 5 | 227,591 | 251,442 | -23,851 | -23,851 | -108,426 | 0 | 500,000 | -0.217 |
| 6 | 6 | 237,348 | 262,391 | -25,044 | -25,044 | -133,470 | 0 | 500,000 | -0.267 |
| 7 | 7 | 247,543 | 273,839 | -26,296 | -26,296 | -159,766 | 0 | 500,000 | -0.320 |
| 8 | 8 | 258,199 | 285,809 | -27,611 | -27,611 | -187,376 | 0 | 500,000 | -0.375 |
| 9 | 9 | 269,335 | 298,326 | -28,991 | -28,991 | -216,368 | 0 | 500,000 | -0.433 |
| 10 | 10 | 280,975 | 311,416 | -30,441 | -30,441 | -246,808 | 0 | 500,000 | -0.494 |
| 11 | 11 | 293,142 | 325,105 | -31,963 | -31,963 | -278,771 | 0 | 500,000 | -0.558 |
| 12 | 12 | 305,862 | 339,423 | -33,561 | -33,561 | -312,332 | 0 | 500,000 | -0.625 |
| 13 | 13 | 319,159 | 354,398 | -35,239 | -35,239 | -347,571 | 0 | 500,000 | -0.695 |
| 14 | 14 | 333,061 | 370,062 | -37,001 | -37,001 | -384,572 | 0 | 500,000 | -0.769 |
| 15 | 15 | 347,596 | 386,447 | -38,851 | -38,851 | -423,423 | 0 | 500,000 | -0.847 |
| 16 | 16 | 362,795 | 403,588 | -40,794 | -40,794 | -464,217 | 0 | 500,000 | -0.928 |
| 17 | 17 | 378,688 | 421,521 | -42,833 | -42,833 | -507,050 | 0 | 500,000 | -1.014 |
| 18 | 18 | 395,308 | 440,283 | -44,975 | -44,975 | -552,025 | 0 | 500,000 | -1.104 |
| 19 | 19 | 412,690 | 459,914 | -47,224 | -47,224 | -599,249 | 0 | 500,000 | -1.198 |
| 20 | 20 | 430,870 | 480,455 | -49,585 | -49,585 | -648,833 | 0 | 500,000 | -1.298 |
| Totals | | 11,553,802 | 12,702,635 | -1,148,833 | -648,833 | | 500,000 | | |

# Cash Flow Details

Project: Beal School Schematic Life Cycle
Prepared By: Seaman Engineering Corp.

8/28/2018
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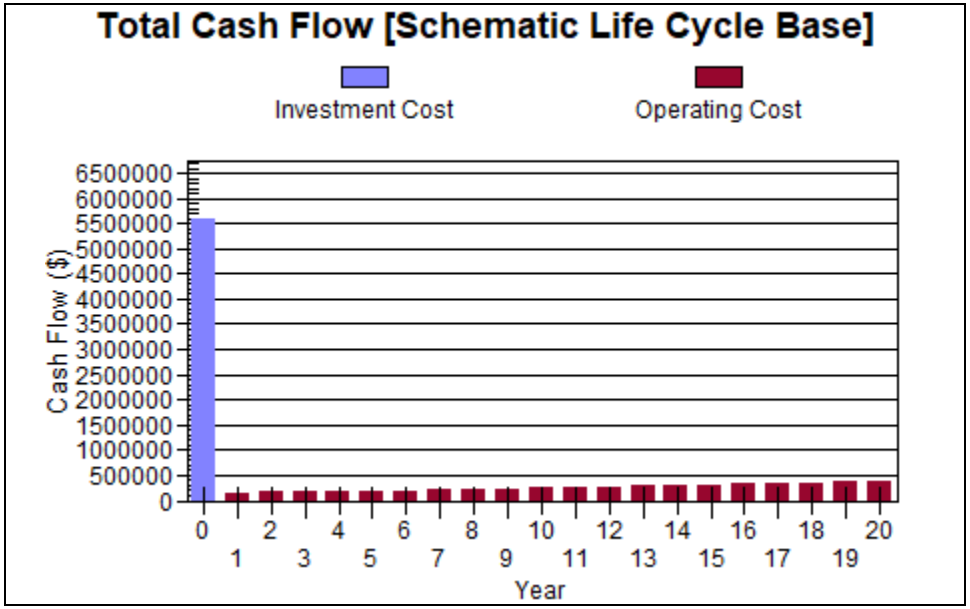
**Beal School Schematic**

Schematic Life Cycle

Type of Analysis ..... Simple Payback Analysis
Length of Analysis ..... 20 yrs
Discount Rate ..... 0.00 %




**1A. Component Cash Flows [Schematic Life Cycle Base], Actual Value**

| Year | Date | Cash Investment ($) | Loan Principal ($) | Loan Interest ($) | Total Investment Cost ($) | Annual Operating Cost ($) | Non-Annual Operating Cost ($) | Total Operating Cost ($) | Total Cash Flow ($) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | Initial | 5,632,726 | 0 | 0 | 5,632,726 | 0 | 0 | 0 | 5,632,726 |
| 1 | 1 | 0 | 0 | 0 | 0 | 192,578 | 0 | 192,578 | 192,578 |
| 2 | 2 | 0 | 0 | 0 | 0 | 200,765 | 0 | 200,765 | 200,765 |
| 3 | 3 | 0 | 0 | 0 | 0 | 209,318 | 0 | 209,318 | 209,318 |
| 4 | 4 | 0 | 0 | 0 | 0 | 218,254 | 0 | 218,254 | 218,254 |
| 5 | 5 | 0 | 0 | 0 | 0 | 227,591 | 0 | 227,591 | 227,591 |
| 6 | 6 | 0 | 0 | 0 | 0 | 237,348 | 0 | 237,348 | 237,348 |
| 7 | 7 | 0 | 0 | 0 | 0 | 247,543 | 0 | 247,543 | 247,543 |

# Cash Flow Details

Project: Beal School Schematic Life Cycle
Prepared By: Seaman Engineering Corp.

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| Year | Date | Cash Investment ($) | Loan Principal ($) | Loan Interest ($) | Total Investment Cost ($) | Annual Operating Cost ($) | Non-Annual Operating Cost ($) | Total Operating Cost ($) | Total Cash Flow ($) |
|---|---|---|---|---|---|---|---|---|---|
| 8 | 8 | 0 | 0 | 0 | 0 | 258,199 | 0 | 258,199 | 258,199 |
| 9 | 9 | 0 | 0 | 0 | 0 | 269,335 | 0 | 269,335 | 269,335 |
| 10 | 10 | 0 | 0 | 0 | 0 | 280,975 | 0 | 280,975 | 280,975 |
| 11 | 11 | 0 | 0 | 0 | 0 | 293,142 | 0 | 293,142 | 293,142 |
| 12 | 12 | 0 | 0 | 0 | 0 | 305,862 | 0 | 305,862 | 305,862 |
| 13 | 13 | 0 | 0 | 0 | 0 | 319,159 | 0 | 319,159 | 319,159 |
| 14 | 14 | 0 | 0 | 0 | 0 | 333,061 | 0 | 333,061 | 333,061 |
| 15 | 15 | 0 | 0 | 0 | 0 | 347,596 | 0 | 347,596 | 347,596 |
| 16 | 16 | 0 | 0 | 0 | 0 | 362,795 | 0 | 362,795 | 362,795 |
| 17 | 17 | 0 | 0 | 0 | 0 | 378,688 | 0 | 378,688 | 378,688 |
| 18 | 18 | 0 | 0 | 0 | 0 | 395,308 | 0 | 395,308 | 395,308 |
| 19 | 19 | 0 | 0 | 0 | 0 | 412,690 | 0 | 412,690 | 412,690 |
| 20 | 20 | 0 | 0 | 0 | 0 | 430,870 | 0 | 430,870 | 430,870 |
| Totals | | 5,632,726 | 0 | 0 | 5,632,726 | 5,921,077 | 0 | 5,921,077 | 11,553,803 |

**1B. Present Worth Cash Flows [Schematic Life Cycle Base]**

| Year | Date | Total Investment Cost ($) | Total Operating Cost ($) | Total Present Worth ($) |
|---|---|---|---|---|
| 0 | Initial | 5,632,726 | 0 | 5,632,726 |
| 1 | 1 | 0 | 192,578 | 192,578 |
| 2 | 2 | 0 | 200,765 | 200,765 |
| 3 | 3 | 0 | 209,318 | 209,318 |
| 4 | 4 | 0 | 218,254 | 218,254 |
| 5 | 5 | 0 | 227,591 | 227,591 |
| 6 | 6 | 0 | 237,348 | 237,348 |
| 7 | 7 | 0 | 247,543 | 247,543 |
| 8 | 8 | 0 | 258,199 | 258,199 |
| 9 | 9 | 0 | 269,335 | 269,335 |
| 10 | 10 | 0 | 280,975 | 280,975 |
| 11 | 11 | 0 | 293,142 | 293,142 |
| 12 | 12 | 0 | 305,862 | 305,862 |
| 13 | 13 | 0 | 319,159 | 319,159 |
| 14 | 14 | 0 | 333,061 | 333,061 |
| 15 | 15 | 0 | 347,596 | 347,596 |
| 16 | 16 | 0 | 362,795 | 362,795 |
| 17 | 17 | 0 | 378,688 | 378,688 |
| 18 | 18 | 0 | 395,308 | 395,308 |

# Cash Flow Details

Project: Beal School Schematic Life Cycle
Prepared By: Seaman Engineering Corp.

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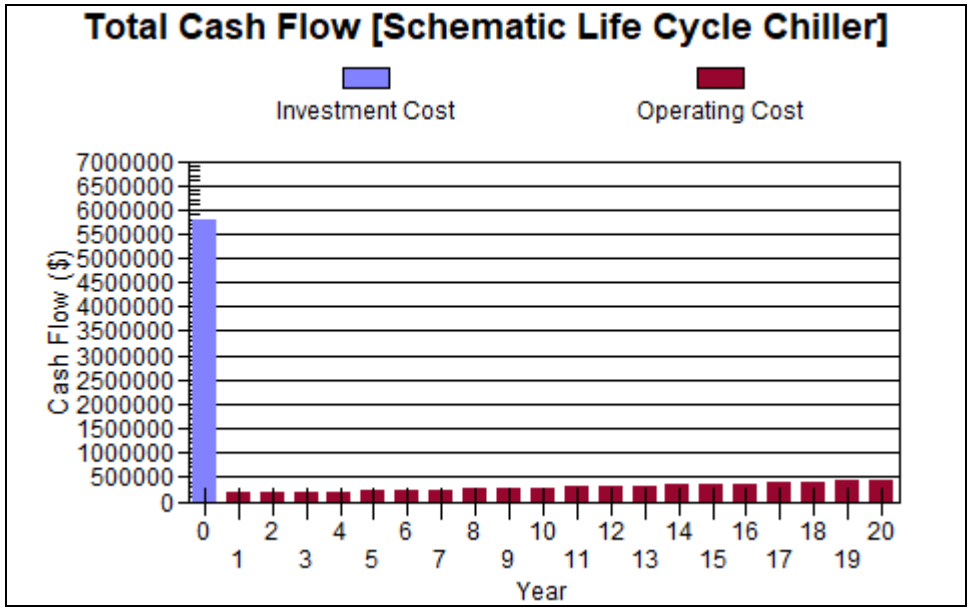
| Year | Date | Total Investment Cost ($) | Total Operating Cost ($) | Total Present Worth ($) |
|---|---|---|---|---|
| 19 | 19 | 0 | 412,690 | 412,690 |
| 20 | 20 | 0 | 430,870 | 430,870 |
| Totals | | 5,632,726 | 5,921,077 | 11,553,803 |




**2A. Component Cash Flows [Schematic Life Cycle Chiller], Actual Value**

| Year | Date | Cash Investment ($) | Loan Principal ($) | Loan Interest ($) | Total Investment Cost ($) | Annual Operating Cost ($) | Non-Annual Operating Cost ($) | Total Operating Cost ($) | Total Cash Flow ($) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | Initial | 5,832,726 | 0 | 0 | 5,832,726 | 0 | 0 | 0 | 5,832,726 |
| 1 | 1 | 0 | 0 | 0 | 0 | 215,234 | 0 | 215,234 | 215,234 |
| 2 | 2 | 0 | 0 | 0 | 0 | 224,554 | 0 | 224,554 | 224,554 |
| 3 | 3 | 0 | 0 | 0 | 0 | 234,296 | 0 | 234,296 | 234,296 |
| 4 | 4 | 0 | 0 | 0 | 0 | 244,481 | 0 | 244,481 | 244,481 |
| 5 | 5 | 0 | 0 | 0 | 0 | 255,129 | 0 | 255,129 | 255,129 |
| 6 | 6 | 0 | 0 | 0 | 0 | 266,263 | 0 | 266,263 | 266,263 |
| 7 | 7 | 0 | 0 | 0 | 0 | 277,904 | 0 | 277,904 | 277,904 |
| 8 | 8 | 0 | 0 | 0 | 0 | 290,078 | 0 | 290,078 | 290,078 |
| 9 | 9 | 0 | 0 | 0 | 0 | 302,808 | 0 | 302,808 | 302,808 |
| 10 | 10 | 0 | 0 | 0 | 0 | 316,122 | 0 | 316,122 | 316,122 |
| 11 | 11 | 0 | 0 | 0 | 0 | 330,046 | 0 | 330,046 | 330,046 |
| 12 | 12 | 0 | 0 | 0 | 0 | 344,611 | 0 | 344,611 | 344,611 |
| 13 | 13 | 0 | 0 | 0 | 0 | 359,845 | 0 | 359,845 | 359,845 |
| 14 | 14 | 0 | 0 | 0 | 0 | 375,782 | 0 | 375,782 | 375,782 |

# Cash Flow Details

Project: Beal School Schematic Life Cycle
Prepared By: Seaman Engineering Corp.

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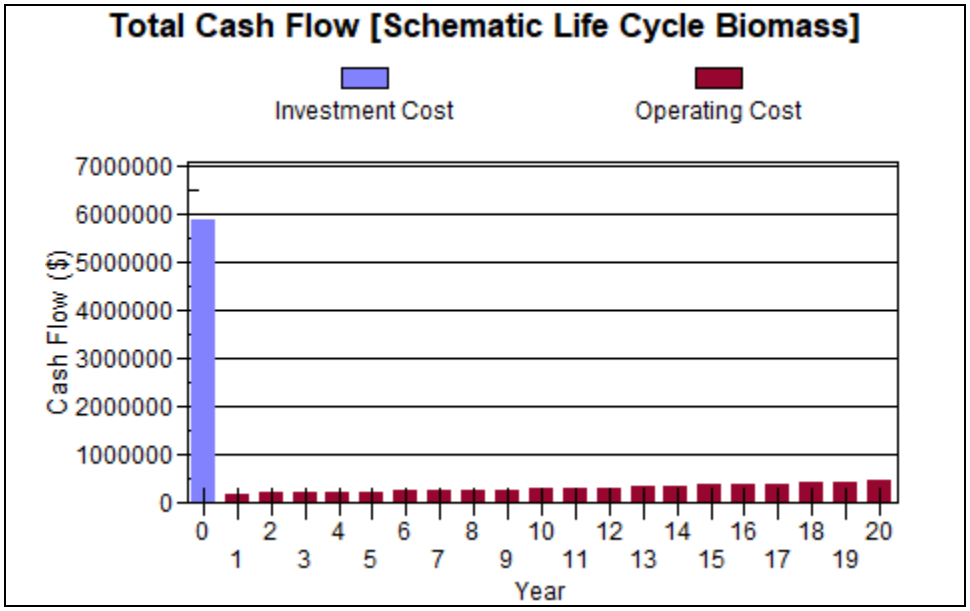
| Year | Date | Cash Investment ($) | Loan Principal ($) | Loan Interest ($) | Total Investment Cost ($) | Annual Operating Cost ($) | Non-Annual Operating Cost ($) | Total Operating Cost ($) | Total Cash Flow ($) |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 15 | 0 | 0 | 0 | 0 | 392,453 | 0 | 392,453 | 392,453 |
| 16 | 16 | 0 | 0 | 0 | 0 | 409,895 | 0 | 409,895 | 409,895 |
| 17 | 17 | 0 | 0 | 0 | 0 | 428,143 | 0 | 428,143 | 428,143 |
| 18 | 18 | 0 | 0 | 0 | 0 | 447,236 | 0 | 447,236 | 447,236 |
| 19 | 19 | 0 | 0 | 0 | 0 | 467,214 | 0 | 467,214 | 467,214 |
| 20 | 20 | 0 | 0 | 0 | 0 | 488,120 | 0 | 488,120 | 488,120 |
| Totals | | 5,832,726 | 0 | 0 | 5,832,726 | 6,670,214 | 0 | 6,670,214 | 12,502,940 |

**2B. Present Worth Cash Flows [Schematic Life Cycle Chiller]**

| Year | Date | Total Investment Cost ($) | Total Operating Cost ($) | Total Present Worth ($) |
|---|---|---|---|---|
| 0 | Initial | 5,832,726 | 0 | 5,832,726 |
| 1 | 1 | 0 | 215,234 | 215,234 |
| 2 | 2 | 0 | 224,554 | 224,554 |
| 3 | 3 | 0 | 234,296 | 234,296 |
| 4 | 4 | 0 | 244,481 | 244,481 |
| 5 | 5 | 0 | 255,129 | 255,129 |
| 6 | 6 | 0 | 266,263 | 266,263 |
| 7 | 7 | 0 | 277,904 | 277,904 |
| 8 | 8 | 0 | 290,078 | 290,078 |
| 9 | 9 | 0 | 302,808 | 302,808 |
| 10 | 10 | 0 | 316,122 | 316,122 |
| 11 | 11 | 0 | 330,046 | 330,046 |
| 12 | 12 | 0 | 344,611 | 344,611 |
| 13 | 13 | 0 | 359,845 | 359,845 |
| 14 | 14 | 0 | 375,782 | 375,782 |
| 15 | 15 | 0 | 392,453 | 392,453 |
| 16 | 16 | 0 | 409,895 | 409,895 |
| 17 | 17 | 0 | 428,143 | 428,143 |
| 18 | 18 | 0 | 447,236 | 447,236 |
| 19 | 19 | 0 | 467,214 | 467,214 |
| 20 | 20 | 0 | 488,120 | 488,120 |
| Totals | | 5,832,726 | 6,670,214 | 12,502,940 |




**3A. Component Cash Flows [Schematic Life Cycle Biomass], Actual Value**

| Year | Date | Cash Investment ($) | Loan Principal ($) | Loan Interest ($) | Total Investment Cost ($) | Annual Operating Cost ($) | Non-Annual Operating Cost ($) | Total Operating Cost ($) | Total Cash Flow ($) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | Initial | 5,932,726 | 0 | 0 | 5,932,726 | 0 | 0 | 0 | 5,932,726 |
| 1 | 1 | 0 | 0 | 0 | 0 | 208,402 | 0 | 208,402 | 208,402 |
| 2 | 2 | 0 | 0 | 0 | 0 | 217,380 | 0 | 217,380 | 217,380 |
| 3 | 3 | 0 | 0 | 0 | 0 | 226,763 | 0 | 226,763 | 226,763 |
| 4 | 4 | 0 | 0 | 0 | 0 | 236,572 | 0 | 236,572 | 236,572 |
| 5 | 5 | 0 | 0 | 0 | 0 | 246,825 | 0 | 246,825 | 246,825 |
| 6 | 6 | 0 | 0 | 0 | 0 | 257,543 | 0 | 257,543 | 257,543 |
| 7 | 7 | 0 | 0 | 0 | 0 | 268,748 | 0 | 268,748 | 268,748 |
| 8 | 8 | 0 | 0 | 0 | 0 | 280,464 | 0 | 280,464 | 280,464 |
| 9 | 9 | 0 | 0 | 0 | 0 | 292,714 | 0 | 292,714 | 292,714 |
| 10 | 10 | 0 | 0 | 0 | 0 | 305,523 | 0 | 305,523 | 305,523 |
| 11 | 11 | 0 | 0 | 0 | 0 | 318,917 | 0 | 318,917 | 318,917 |
| 12 | 12 | 0 | 0 | 0 | 0 | 332,925 | 0 | 332,925 | 332,925 |
| 13 | 13 | 0 | 0 | 0 | 0 | 347,575 | 0 | 347,575 | 347,575 |
| 14 | 14 | 0 | 0 | 0 | 0 | 362,898 | 0 | 362,898 | 362,898 |

# Cash Flow Details

Project: Beal School Schematic Life Cycle
Prepared By: Seaman Engineering Corp.

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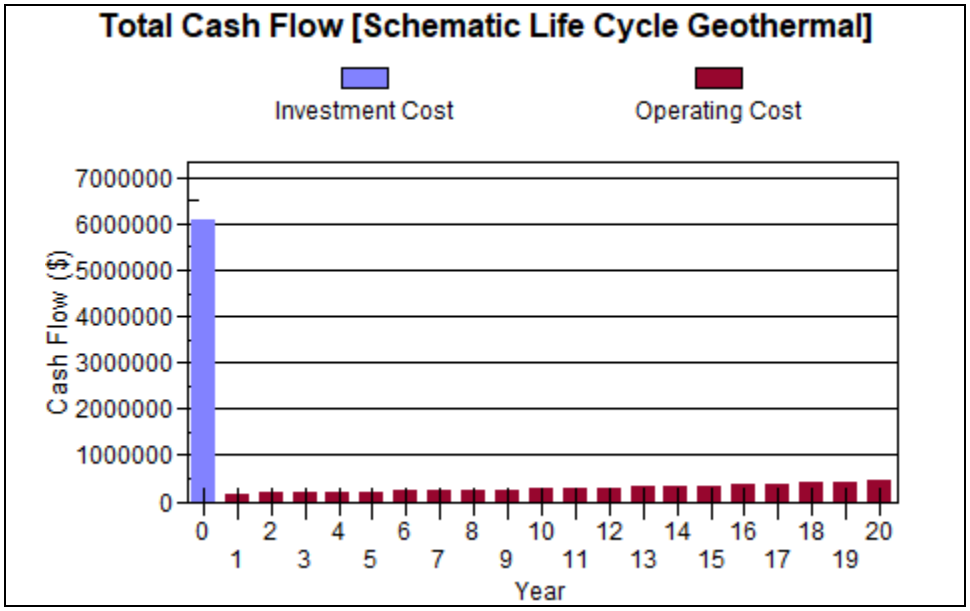
| Year | Date | Cash Investment ($) | Loan Principal ($) | Loan Interest ($) | Total Investment Cost ($) | Annual Operating Cost ($) | Non-Annual Operating Cost ($) | Total Operating Cost ($) | Total Cash Flow ($) |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 15 | 0 | 0 | 0 | 0 | 378,925 | 0 | 378,925 | 378,925 |
| 16 | 16 | 0 | 0 | 0 | 0 | 395,691 | 0 | 395,691 | 395,691 |
| 17 | 17 | 0 | 0 | 0 | 0 | 413,229 | 0 | 413,229 | 413,229 |
| 18 | 18 | 0 | 0 | 0 | 0 | 431,576 | 0 | 431,576 | 431,576 |
| 19 | 19 | 0 | 0 | 0 | 0 | 450,771 | 0 | 450,771 | 450,771 |
| 20 | 20 | 0 | 0 | 0 | 0 | 470,855 | 0 | 470,855 | 470,855 |
| Totals | | 5,932,726 | 0 | 0 | 5,932,726 | 6,444,296 | 0 | 6,444,296 | 12,377,022 |

**3B. Present Worth Cash Flows [Schematic Life Cycle Biomass]**

| Year | Date | Total Investment Cost ($) | Total Operating Cost ($) | Total Present Worth ($) |
|---|---|---|---|---|
| 0 | Initial | 5,932,726 | 0 | 5,932,726 |
| 1 | 1 | 0 | 208,402 | 208,402 |
| 2 | 2 | 0 | 217,380 | 217,380 |
| 3 | 3 | 0 | 226,763 | 226,763 |
| 4 | 4 | 0 | 236,572 | 236,572 |
| 5 | 5 | 0 | 246,825 | 246,825 |
| 6 | 6 | 0 | 257,543 | 257,543 |
| 7 | 7 | 0 | 268,748 | 268,748 |
| 8 | 8 | 0 | 280,464 | 280,464 |
| 9 | 9 | 0 | 292,714 | 292,714 |
| 10 | 10 | 0 | 305,523 | 305,523 |
| 11 | 11 | 0 | 318,917 | 318,917 |
| 12 | 12 | 0 | 332,925 | 332,925 |
| 13 | 13 | 0 | 347,575 | 347,575 |
| 14 | 14 | 0 | 362,898 | 362,898 |
| 15 | 15 | 0 | 378,925 | 378,925 |
| 16 | 16 | 0 | 395,691 | 395,691 |
| 17 | 17 | 0 | 413,229 | 413,229 |
| 18 | 18 | 0 | 431,576 | 431,576 |
| 19 | 19 | 0 | 450,771 | 450,771 |
| 20 | 20 | 0 | 470,855 | 470,855 |
| Totals | | 5,932,726 | 6,444,296 | 12,377,022 |




**4A. Component Cash Flows [Schematic Life Cycle Geothermal], Actual Value**

| Year | Date | Cash Investment ($) | Loan Principal ($) | Loan Interest ($) | Total Investment Cost ($) | Annual Operating Cost ($) | Non-Annual Operating Cost ($) | Total Operating Cost ($) | Total Cash Flow ($) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | Initial | 6,132,726 | 0 | 0 | 6,132,726 | 0 | 0 | 0 | 6,132,726 |
| 1 | 1 | 0 | 0 | 0 | 0 | 212,200 | 0 | 212,200 | 212,200 |
| 2 | 2 | 0 | 0 | 0 | 0 | 221,368 | 0 | 221,368 | 221,368 |
| 3 | 3 | 0 | 0 | 0 | 0 | 230,952 | 0 | 230,952 | 230,952 |
| 4 | 4 | 0 | 0 | 0 | 0 | 240,969 | 0 | 240,969 | 240,969 |
| 5 | 5 | 0 | 0 | 0 | 0 | 251,442 | 0 | 251,442 | 251,442 |
| 6 | 6 | 0 | 0 | 0 | 0 | 262,391 | 0 | 262,391 | 262,391 |
| 7 | 7 | 0 | 0 | 0 | 0 | 273,839 | 0 | 273,839 | 273,839 |
| 8 | 8 | 0 | 0 | 0 | 0 | 285,809 | 0 | 285,809 | 285,809 |
| 9 | 9 | 0 | 0 | 0 | 0 | 298,326 | 0 | 298,326 | 298,326 |
| 10 | 10 | 0 | 0 | 0 | 0 | 311,416 | 0 | 311,416 | 311,416 |
| 11 | 11 | 0 | 0 | 0 | 0 | 325,105 | 0 | 325,105 | 325,105 |
| 12 | 12 | 0 | 0 | 0 | 0 | 339,423 | 0 | 339,423 | 339,423 |
| 13 | 13 | 0 | 0 | 0 | 0 | 354,398 | 0 | 354,398 | 354,398 |
| 14 | 14 | 0 | 0 | 0 | 0 | 370,062 | 0 | 370,062 | 370,062 |

# Cash Flow Details

Project: Beal School Schematic Life Cycle
Prepared By: Seaman Engineering Corp.

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| Year | Date | Cash Investment ($) | Loan Principal ($) | Loan Interest ($) | Total Investment Cost ($) | Annual Operating Cost ($) | Non-Annual Operating Cost ($) | Total Operating Cost ($) | Total Cash Flow ($) |
|---|---|---|---|---|---|---|---|---|---|
| 15 | 15 | 0 | 0 | 0 | 0 | 386,447 | 0 | 386,447 | 386,447 |
| 16 | 16 | 0 | 0 | 0 | 0 | 403,588 | 0 | 403,588 | 403,588 |
| 17 | 17 | 0 | 0 | 0 | 0 | 421,521 | 0 | 421,521 | 421,521 |
| 18 | 18 | 0 | 0 | 0 | 0 | 440,283 | 0 | 440,283 | 440,283 |
| 19 | 19 | 0 | 0 | 0 | 0 | 459,914 | 0 | 459,914 | 459,914 |
| 20 | 20 | 0 | 0 | 0 | 0 | 480,455 | 0 | 480,455 | 480,455 |
| Totals | | 6,132,726 | 0 | 0 | 6,132,726 | 6,569,908 | 0 | 6,569,908 | 12,702,634 |

**4B. Present Worth Cash Flows [Schematic Life Cycle Geothermal]**

| Year | Date | Total Investment Cost ($) | Total Operating Cost ($) | Total Present Worth ($) |
|---|---|---|---|---|
| 0 | Initial | 6,132,726 | 0 | 6,132,726 |
| 1 | 1 | 0 | 212,200 | 212,200 |
| 2 | 2 | 0 | 221,368 | 221,368 |
| 3 | 3 | 0 | 230,952 | 230,952 |
| 4 | 4 | 0 | 240,969 | 240,969 |
| 5 | 5 | 0 | 251,442 | 251,442 |
| 6 | 6 | 0 | 262,391 | 262,391 |
| 7 | 7 | 0 | 273,839 | 273,839 |
| 8 | 8 | 0 | 285,809 | 285,809 |
| 9 | 9 | 0 | 298,326 | 298,326 |
| 10 | 10 | 0 | 311,416 | 311,416 |
| 11 | 11 | 0 | 325,105 | 325,105 |
| 12 | 12 | 0 | 339,423 | 339,423 |
| 13 | 13 | 0 | 354,398 | 354,398 |
| 14 | 14 | 0 | 370,062 | 370,062 |
| 15 | 15 | 0 | 386,447 | 386,447 |
| 16 | 16 | 0 | 403,588 | 403,588 |
| 17 | 17 | 0 | 421,521 | 421,521 |
| 18 | 18 | 0 | 440,283 | 440,283 |
| 19 | 19 | 0 | 459,914 | 459,914 |
| 20 | 20 | 0 | 480,455 | 480,455 |
| Totals | | 6,132,726 | 6,569,908 | 12,702,634 |

# Annual Cost Summary

Beal School Master Load - Kevin 08/22/2018
SEAMAN ENGINEERING CORPORATION 11:10PM

**Table 1. Annual Costs**

| Component | Base Building Cond Blr ($) | Biomass Boiler ($) | Geothermal ($) | Water Chiller AHU ($) |
|---|---|---|---|---|
| Air System Fans | 31,049 | 31,049 | 31,048 | 31,048 |
| Cooling | 15,233 | 15,233 | 23,732 | 18,484 |
| Heating | 63,448 | 77,802 | 50,682 | 62,694 |
| Pumps | 5,012 | 5,728 | 27,966 | 17,799 |
| Heat Rejection Fans | 0 | 0 | 0 | 6,293 |
| **HVAC Sub-Total** | **114,741** | **129,811** | **133,429** | **136,318** |
| Lights | 48,483 | 48,483 | 47,421 | 47,421 |
| Electric Equipment | 33,841 | 33,841 | 34,125 | 34,125 |
| Misc. Electric | 0 | 0 | 0 | 0 |
| Misc. Fuel Use | 0 | 0 | 0 | 0 |
| **Non-HVAC Sub-Total** | **82,324** | **82,324** | **81,546** | **81,546** |
| **Grand Total** | **197,065** | **212,135** | **214,975** | **217,864** |

**Table 2. Annual Cost per Unit Floor Area**

| Component | Base Building Cond Blr ($/ft²) | Biomass Boiler ($/ft²) | Geothermal ($/ft²) | Water Chiller AHU ($/ft²) |
|---|---|---|---|---|
| Air System Fans | 0.232 | 0.232 | 0.235 | 0.235 |
| Cooling | 0.114 | 0.114 | 0.180 | 0.140 |
| Heating | 0.474 | 0.581 | 0.383 | 0.474 |
| Pumps | 0.037 | 0.043 | 0.212 | 0.135 |
| Heat Rejection Fans | 0.000 | 0.000 | 0.000 | 0.048 |
| **HVAC Sub-Total** | **0.857** | **0.970** | **1.009** | **1.031** |
| Lights | 0.362 | 0.362 | 0.359 | 0.359 |
| Electric Equipment | 0.253 | 0.253 | 0.258 | 0.258 |
| Misc. Electric | 0.000 | 0.000 | 0.000 | 0.000 |
| Misc. Fuel Use | 0.000 | 0.000 | 0.000 | 0.000 |
| **Non-HVAC Sub-Total** | **0.615** | **0.615** | **0.617** | **0.617** |
| **Grand Total** | **1.472** | **1.584** | **1.626** | **1.648** |
| Gross Floor Area (ft²) | 133894.3 | 133894.3 | 132206.6 | 132206.6 |
| Conditioned Floor Area (ft²) | 133894.3 | 133894.3 | 132206.6 | 132206.6 |

Note: Values in this table are calculated using the Gross Floor Area.

**Table 3. Component Cost as a Percentage of Total Cost**

| Component | Base Building Cond Blr (%) | Biomass Boiler (%) | Geothermal (%) | Water Chiller AHU (%) |
|---|---|---|---|---|
| Air System Fans | 15.8 | 14.6 | 14.4 | 14.3 |
| Cooling | 7.7 | 7.2 | 11.0 | 8.5 |
| Heating | 32.2 | 36.7 | 23.6 | 28.8 |
| Pumps | 2.5 | 2.7 | 13.0 | 8.2 |
| Heat Rejection Fans | 0.0 | 0.0 | 0.0 | 2.9 |
| **HVAC Sub-Total** | **58.2** | **61.2** | **62.1** | **62.6** |
| Lights | 24.6 | 22.9 | 22.1 | 21.8 |
| Electric Equipment | 17.2 | 16.0 | 15.9 | 15.7 |
| Misc. Electric | 0.0 | 0.0 | 0.0 | 0.0 |
| Misc. Fuel Use | 0.0 | 0.0 | 0.0 | 0.0 |
| **Non-HVAC Sub-Total** | **41.8** | **38.8** | **37.9** | **37.4** |
| **Grand Total** | **100.0** | **100.0** | **100.0** | **100.0** |

**Table 1. Annual Costs**

| Component | Base Building Cond Blr ($) | Biomass Boiler ($) | Geothermal ($) | Water Chiller AHU ($) |
|---|---|---|---|---|
| **HVAC Components** | | | | |
| Electric | 51,298 | 52,014 | 133,434 | 74,247 |
| Natural Gas | 63,443 | 0 | 0 | 62,074 |
| Fuel Oil | 0 | 0 | 0 | 0 |
| Propane | 0 | 77,797 | 0 | 0 |
| Remote HW | 0 | 0 | 0 | 0 |
| Remote Steam | 0 | 0 | 0 | 0 |
| Remote CW | 0 | 0 | 0 | 0 |
| **HVAC Sub-Total** | **114,741** | **129,811** | **133,434** | **136,321** |
| **Non-HVAC Components** | | | | |
| Electric | 82,319 | 82,319 | 81,546 | 81,546 |
| Natural Gas | 0 | 0 | 0 | 0 |
| Fuel Oil | 0 | 0 | 0 | 0 |
| Propane | 0 | 0 | 0 | 0 |
| Remote HW | 0 | 0 | 0 | 0 |
| Remote Steam | 0 | 0 | 0 | 0 |
| **Non-HVAC Sub-Total** | **82,319** | **82,319** | **81,546** | **81,546** |
| **Grand Total** | **197,061** | **212,130** | **214,980** | **217,867** |

**Table 2. Annual Energy Consumption**

| Component | Base Building Cond Blr | Biomass Boiler | Geothermal | Water Chiller AHU |
|---|---|---|---|---|
| **HVAC Components** | | | | |
| Electric (kWh) | 301,755 | 305,966 | 784,906 | 436,746 |
| Natural Gas (*) | 42,295 | 0 | 0 | 41,383 |
| Fuel Oil (na) | 0 | 0 | 0 | 0 |
| Propane (*) | 0 | 311 | 0 | 0 |
| Remote HW (na) | 0 | 0 | 0 | 0 |
| Remote Steam (na) | 0 | 0 | 0 | 0 |
| Remote CW (na) | 0 | 0 | 0 | 0 |
| | | | | |
| **Non-HVAC Components** | | | | |
| Electric (kWh) | 484,232 | 484,232 | 479,684 | 479,684 |
| Natural Gas (*) | 0 | 0 | 0 | 0 |
| Fuel Oil (na) | 0 | 0 | 0 | 0 |
| Propane (*) | 0 | 0 | 0 | 0 |
| Remote HW (na) | 0 | 0 | 0 | 0 |
| Remote Steam (na) | 0 | 0 | 0 | 0 |
| | | | | |
| **Totals** | | | | |
| Electric (kWh) | 785,987 | 790,198 | 1,264,590 | 916,430 |
| Natural Gas (*) | 42,295 | 0 | 0 | 41,383 |
| Fuel Oil (na) | 0 | 0 | 0 | 0 |
| Propane (*) | 0 | 311 | 0 | 0 |
| Remote HW (na) | 0 | 0 | 0 | 0 |
| Remote Steam (na) | 0 | 0 | 0 | 0 |
| Remote CW (na) | 0 | 0 | 0 | 0 |

(*) Energy Units differ among Buildings.

**Table 3. Annual Emissions**

| Component | Base Building Cond Blr | Biomass Boiler | Geothermal | Water Chiller AHU |
|---|---|---|---|---|
| CO2 Equivalent (lb) | 0 | 0 | 0 | 0 |

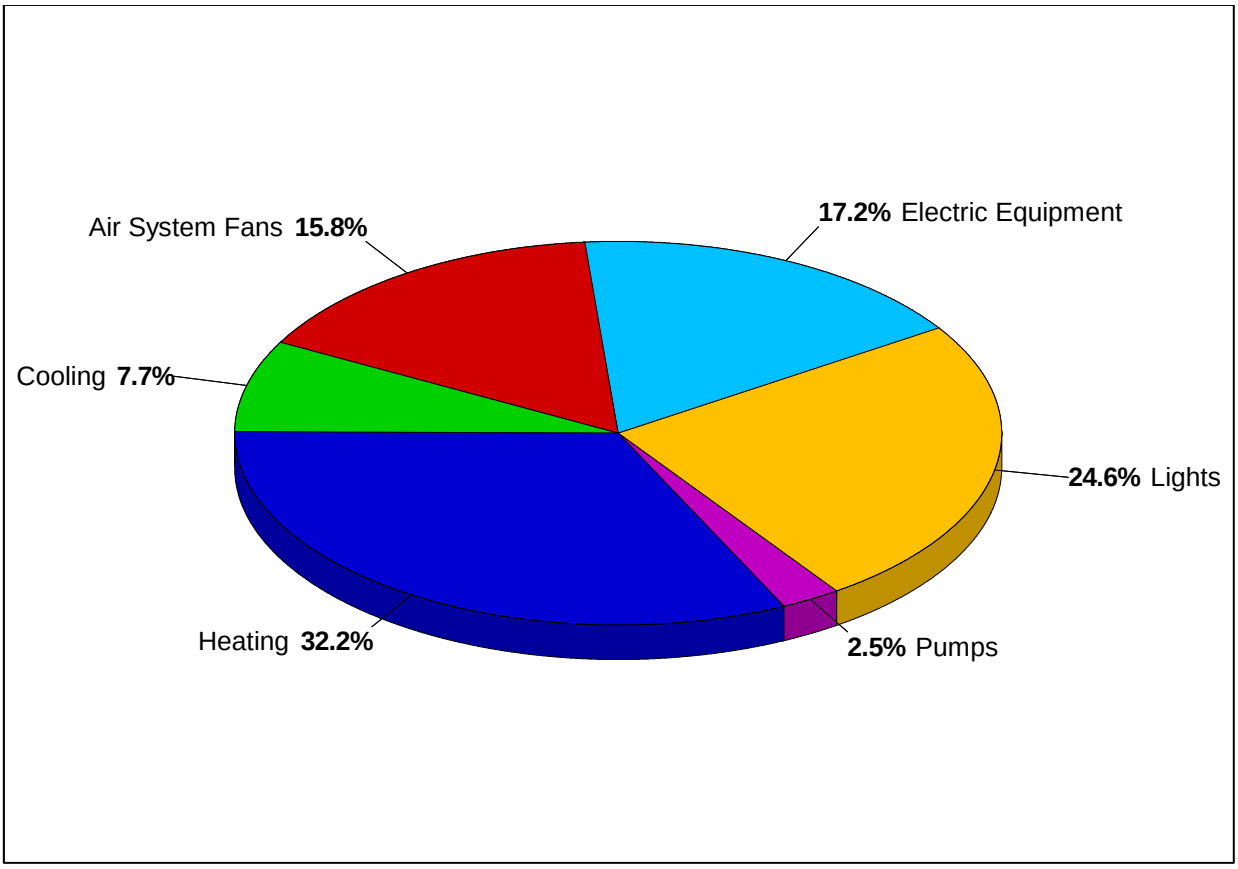
**Table 4. Annual Cost per Unit Floor Area**

| Component | Base Building Cond Blr ($/ft²) | Biomass Boiler ($/ft²) | Geothermal ($/ft²) | Water Chiller AHU ($/ft²) |
|---|---|---|---|---|
| **HVAC Components** | | | | |
| Electric | 0.383 | 0.389 | 1.009 | 0.562 |
| Natural Gas | 0.474 | 0.000 | 0.000 | 0.470 |
| Fuel Oil | 0.000 | 0.000 | 0.000 | 0.000 |
| Propane | 0.000 | 0.581 | 0.000 | 0.000 |
| Remote HW | 0.000 | 0.000 | 0.000 | 0.000 |
| Remote Steam | 0.000 | 0.000 | 0.000 | 0.000 |
| Remote CW | 0.000 | 0.000 | 0.000 | 0.000 |
| **HVAC Sub-Total** | **0.857** | **0.970** | **1.009** | **1.031** |
| **Non-HVAC Components** | | | | |
| Electric | 0.615 | 0.615 | 0.617 | 0.617 |
| Natural Gas | 0.000 | 0.000 | 0.000 | 0.000 |
| Fuel Oil | 0.000 | 0.000 | 0.000 | 0.000 |
| Propane | 0.000 | 0.000 | 0.000 | 0.000 |
| Remote HW | 0.000 | 0.000 | 0.000 | 0.000 |
| Remote Steam | 0.000 | 0.000 | 0.000 | 0.000 |
| **Non-HVAC Sub-Total** | **0.615** | **0.615** | **0.617** | **0.617** |
| **Grand Total** | **1.472** | **1.584** | **1.626** | **1.648** |
| Gross Floor Area (ft²) | 133894.3 | 133894.3 | 132206.6 | 132206.6 |
| Conditioned Floor Area (ft²) | 133894.3 | 133894.3 | 132206.6 | 132206.6 |

Note: Values in this table are calculated using the Gross Floor Area.

**Table 5. Component Cost as a Percentage of Total Cost**

| Component | Base Building Cond Blr (%) | Biomass Boiler (%) | Geothermal (%) | Water Chiller AHU (%) |
|---|---|---|---|---|
| **HVAC Components** | | | | |
| Electric | 26.0 | 24.5 | 62.1 | 34.1 |
| Natural Gas | 32.2 | 0.0 | 0.0 | 28.5 |
| Fuel Oil | 0.0 | 0.0 | 0.0 | 0.0 |
| Propane | 0.0 | 36.7 | 0.0 | 0.0 |
| Remote HW | 0.0 | 0.0 | 0.0 | 0.0 |
| Remote Steam | 0.0 | 0.0 | 0.0 | 0.0 |
| Remote CW | 0.0 | 0.0 | 0.0 | 0.0 |
| **HVAC Sub-Total** | **58.2** | **61.2** | **62.1** | **62.6** |
| **Non-HVAC Components** | | | | |
| Electric | 41.8 | 38.8 | 37.9 | 37.4 |
| Natural Gas | 0.0 | 0.0 | 0.0 | 0.0 |
| Fuel Oil | 0.0 | 0.0 | 0.0 | 0.0 |
| Propane | 0.0 | 0.0 | 0.0 | 0.0 |
| Remote HW | 0.0 | 0.0 | 0.0 | 0.0 |
| Remote Steam | 0.0 | 0.0 | 0.0 | 0.0 |
| **Non-HVAC Sub-Total** | **41.8** | **38.8** | **37.9** | **37.4** |
| **Grand Total** | **100.0** | **100.0** | **100.0** | **100.0** |

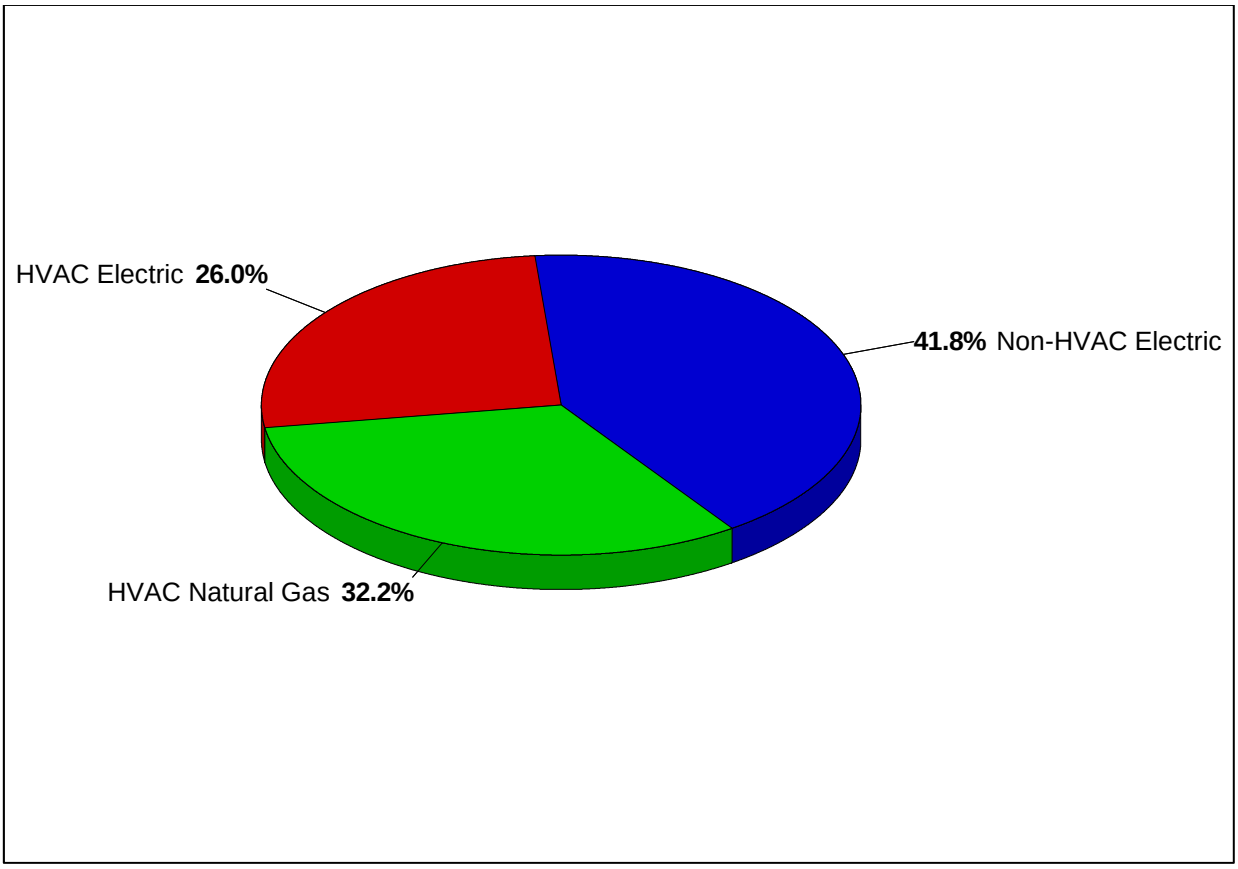



### 1. Annual Costs

| Component | Annual Cost ($) | ($/ft²) | Percent of Total (%) |
|---|---|---|---|
| Air System Fans | 31,049 | 0.232 | 15.8 |
| Cooling | 15,233 | 0.114 | 7.7 |
| Heating | 63,448 | 0.474 | 32.2 |
| Pumps | 5,012 | 0.037 | 2.5 |
| Heat Rejection Fans | 0 | 0.000 | 0.0 |
| **HVAC Sub-Total** | **114,741** | **0.857** | **58.2** |
| Lights | 48,483 | 0.362 | 24.6 |
| Electric Equipment | 33,841 | 0.253 | 17.2 |
| Misc. Electric | 0 | 0.000 | 0.0 |
| Misc. Fuel Use | 0 | 0.000 | 0.0 |
| **Non-HVAC Sub-Total** | **82,324** | **0.615** | **41.8** |
| **Grand Total** | **197,065** | **1.472** | **100.0** |

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **133894.3** ft²
Conditioned Floor Area **133894.3** ft²

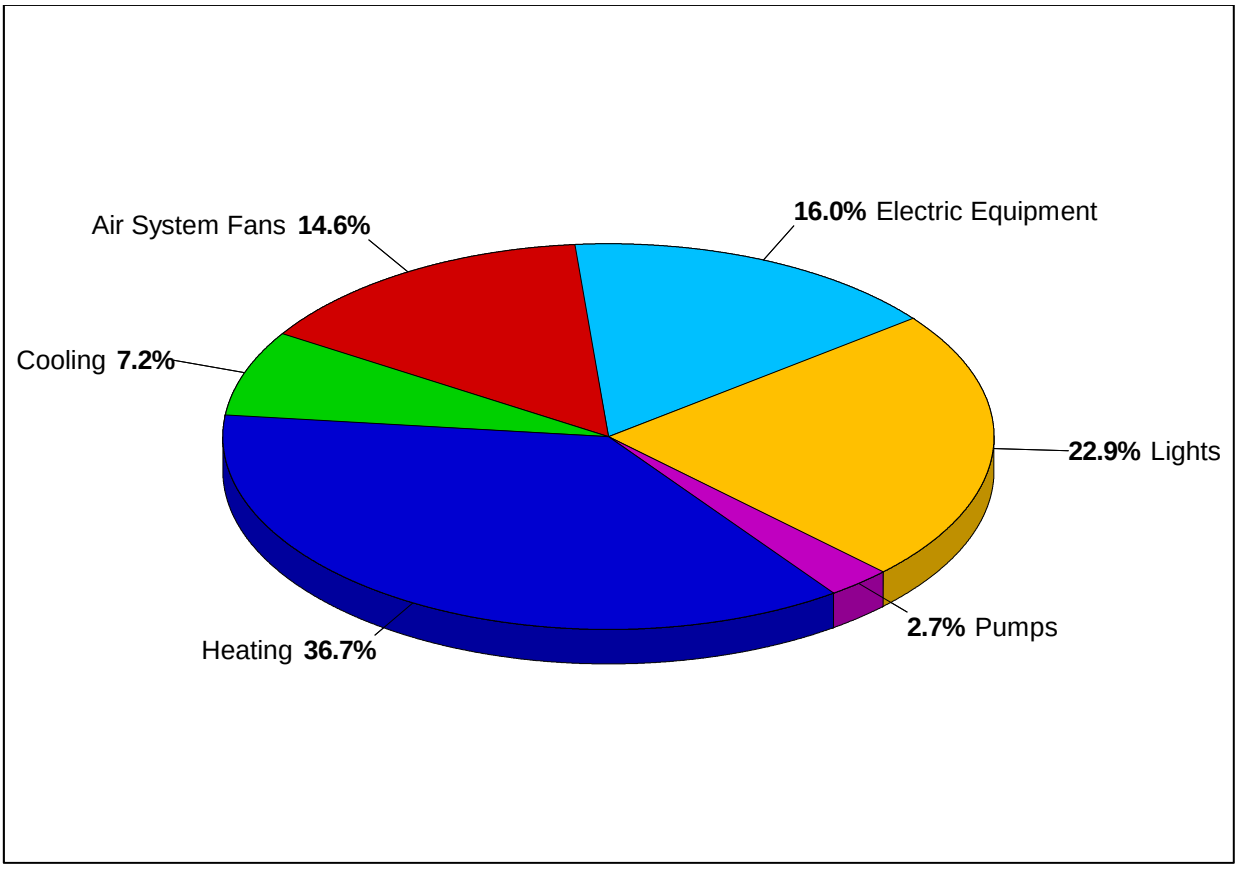



### 1. Annual Costs

| Component | Annual Cost ($/yr) | ($/ft²) | Percent of Total (%) |
|---|---|---|---|
| **HVAC Components** | | | |
| Electric | 51,298 | 0.383 | 26.0 |
| Natural Gas | 63,443 | 0.474 | 32.2 |
| Fuel Oil | 0 | 0.000 | 0.0 |
| Propane | 0 | 0.000 | 0.0 |
| Remote Hot Water | 0 | 0.000 | 0.0 |
| Remote Steam | 0 | 0.000 | 0.0 |
| Remote Chilled Water | 0 | 0.000 | 0.0 |
| **HVAC Sub-Total** | **114,741** | **0.857** | **58.2** |
| **Non-HVAC Components** | | | |
| Electric | 82,319 | 0.615 | 41.8 |
| Natural Gas | 0 | 0.000 | 0.0 |
| Fuel Oil | 0 | 0.000 | 0.0 |
| Propane | 0 | 0.000 | 0.0 |
| Remote Hot Water | 0 | 0.000 | 0.0 |
| Remote Steam | 0 | 0.000 | 0.0 |
| **Non-HVAC Sub-Total** | **82,319** | **0.615** | **41.8** |
| **Grand Total** | **197,061** | **1.472** | **100.0** |

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **133894.3** ft²
Conditioned Floor Area **133894.3** ft²

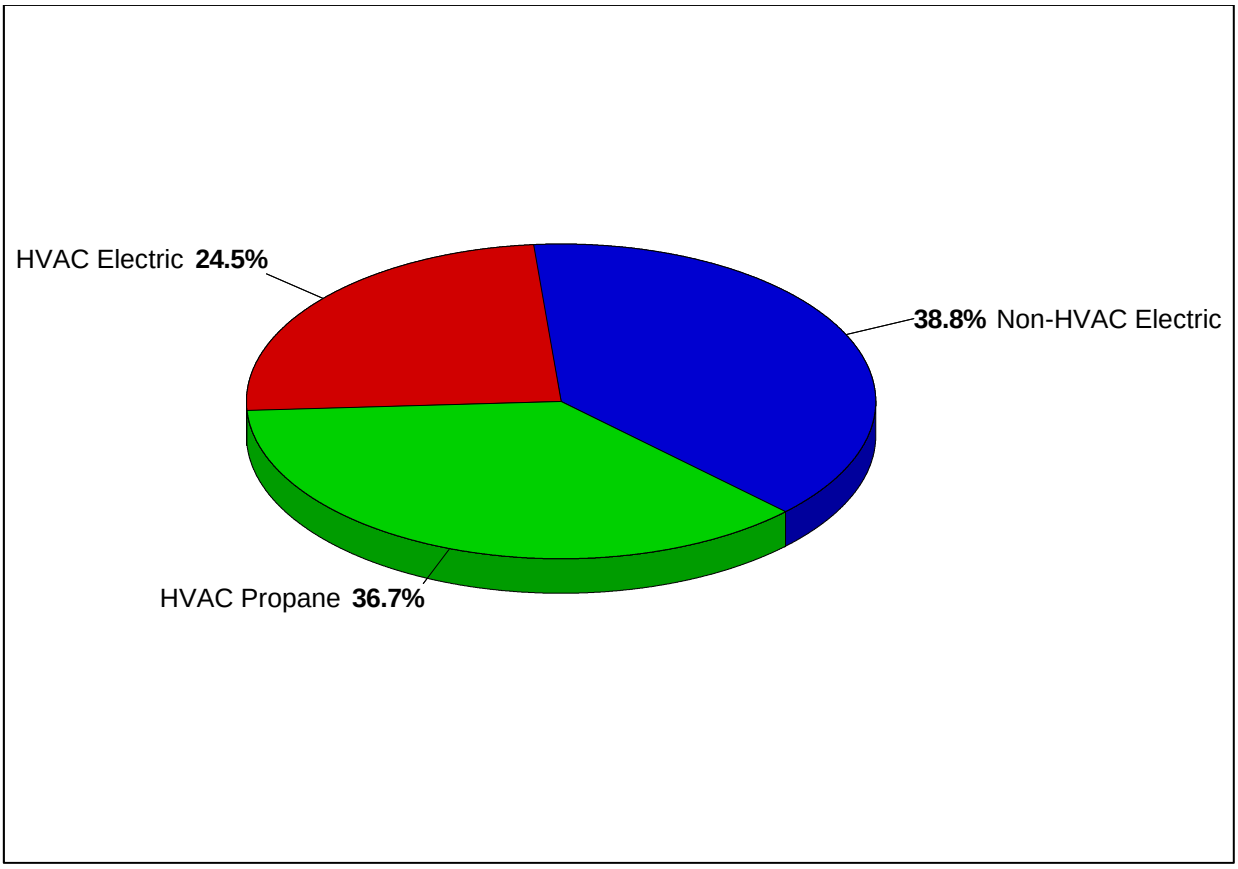



### 1. Annual Costs

| Component | Annual Cost ($) | ($/ft²) | Percent of Total (%) |
|---|---|---|---|
| Air System Fans | 31,049 | 0.232 | 14.6 |
| Cooling | 15,233 | 0.114 | 7.2 |
| Heating | 77,802 | 0.581 | 36.7 |
| Pumps | 5,728 | 0.043 | 2.7 |
| Heat Rejection Fans | 0 | 0.000 | 0.0 |
| **HVAC Sub-Total** | **129,811** | **0.970** | **61.2** |
| Lights | 48,483 | 0.362 | 22.9 |
| Electric Equipment | 33,841 | 0.253 | 16.0 |
| Misc. Electric | 0 | 0.000 | 0.0 |
| Misc. Fuel Use | 0 | 0.000 | 0.0 |
| **Non-HVAC Sub-Total** | **82,324** | **0.615** | **38.8** |
| **Grand Total** | **212,135** | **1.584** | **100.0** |

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **133894.3** ft²
Conditioned Floor Area **133894.3** ft²

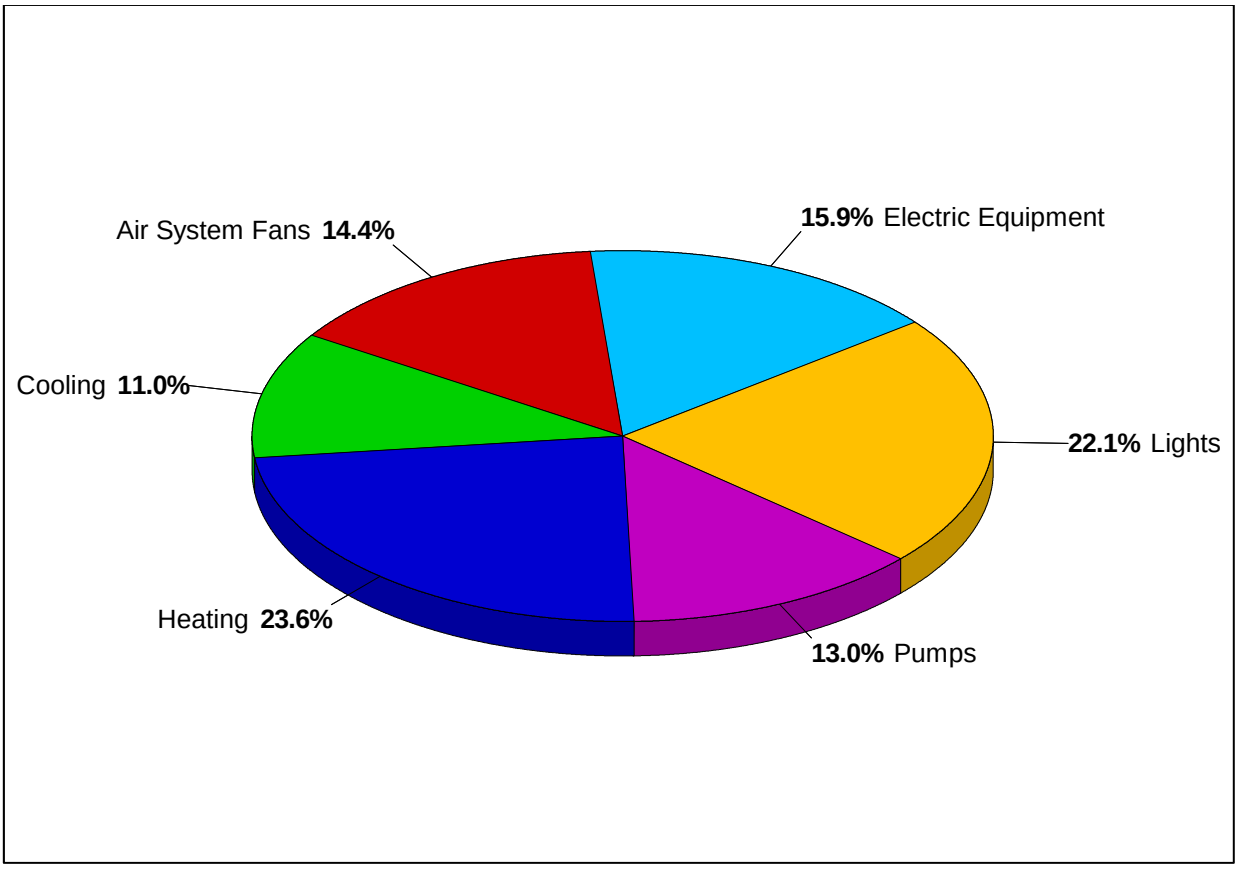



### 1. Annual Costs

| Component | Annual Cost ($/yr) | ($/ft²) | Percent of Total (%) |
|---|---|---|---|
| **HVAC Components** | | | |
| Electric | 52,014 | 0.389 | 24.5 |
| Natural Gas | 0 | 0.000 | 0.0 |
| Fuel Oil | 0 | 0.000 | 0.0 |
| Propane | 77,797 | 0.581 | 36.7 |
| Remote Hot Water | 0 | 0.000 | 0.0 |
| Remote Steam | 0 | 0.000 | 0.0 |
| Remote Chilled Water | 0 | 0.000 | 0.0 |
| **HVAC Sub-Total** | **129,811** | **0.970** | **61.2** |
| **Non-HVAC Components** | | | |
| Electric | 82,319 | 0.615 | 38.8 |
| Natural Gas | 0 | 0.000 | 0.0 |
| Fuel Oil | 0 | 0.000 | 0.0 |
| Propane | 0 | 0.000 | 0.0 |
| Remote Hot Water | 0 | 0.000 | 0.0 |
| Remote Steam | 0 | 0.000 | 0.0 |
| **Non-HVAC Sub-Total** | **82,319** | **0.615** | **38.8** |
| **Grand Total** | **212,130** | **1.584** | **100.0** |

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **133894.3** ft²
Conditioned Floor Area **133894.3** ft²

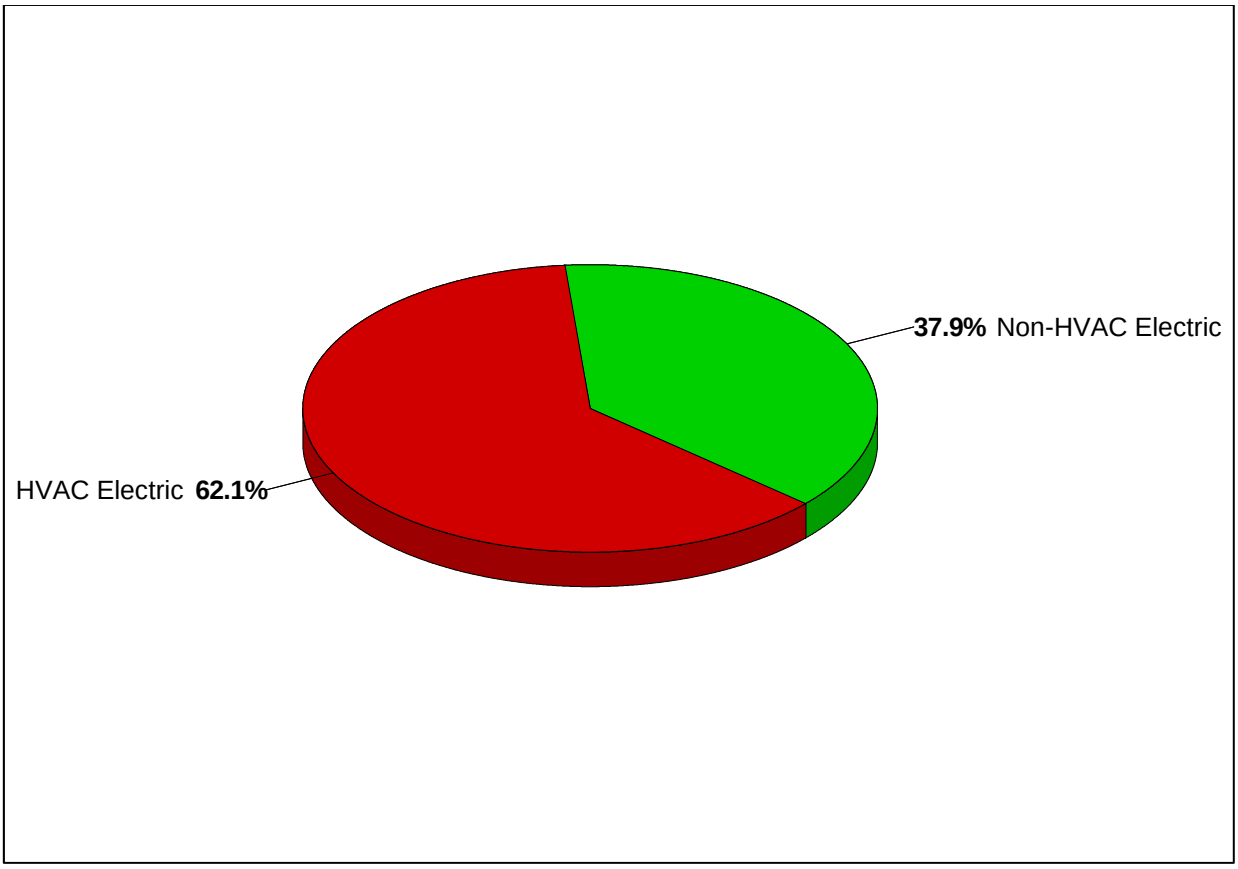



### 1. Annual Costs

| Component | Annual Cost ($) | ($/ft²) | Percent of Total (%) |
|---|---|---|---|
| Air System Fans | 31,048 | 0.235 | 14.4 |
| Cooling | 23,732 | 0.180 | 11.0 |
| Heating | 50,682 | 0.383 | 23.6 |
| Pumps | 27,966 | 0.212 | 13.0 |
| Heat Rejection Fans | 0 | 0.000 | 0.0 |
| **HVAC Sub-Total** | **133,429** | **1.009** | **62.1** |
| Lights | 47,421 | 0.359 | 22.1 |
| Electric Equipment | 34,125 | 0.258 | 15.9 |
| Misc. Electric | 0 | 0.000 | 0.0 |
| Misc. Fuel Use | 0 | 0.000 | 0.0 |
| **Non-HVAC Sub-Total** | **81,546** | **0.617** | **37.9** |
| **Grand Total** | **214,975** | **1.626** | **100.0** |

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **132206.6** ft²
Conditioned Floor Area **132206.6** ft²

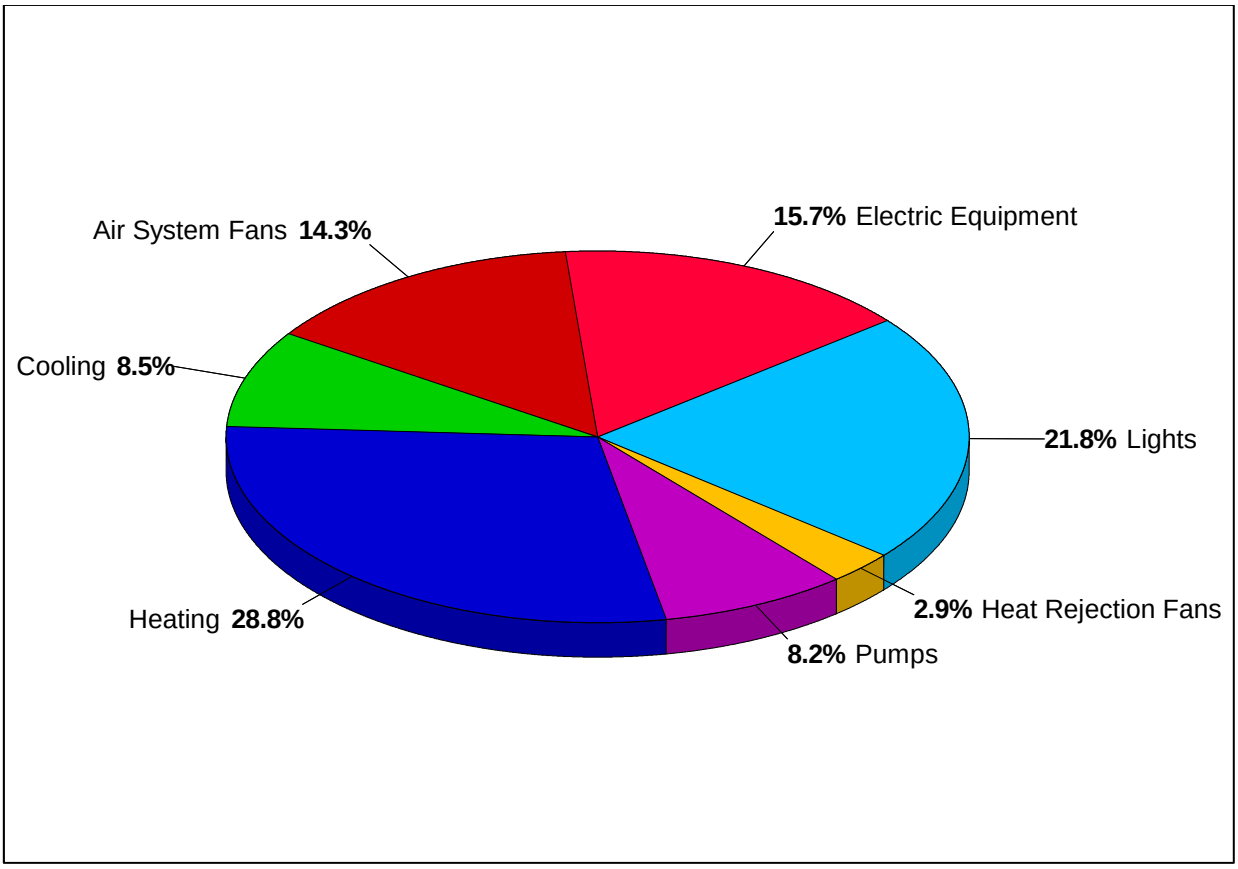



### 1. Annual Costs

| Component | Annual Cost ($/yr) | ($/ft²) | Percent of Total (%) |
|---|---|---|---|
| **HVAC Components** | | | |
| Electric | 133,434 | 1.009 | 62.1 |
| Natural Gas | 0 | 0.000 | 0.0 |
| Fuel Oil | 0 | 0.000 | 0.0 |
| Propane | 0 | 0.000 | 0.0 |
| Remote Hot Water | 0 | 0.000 | 0.0 |
| Remote Steam | 0 | 0.000 | 0.0 |
| Remote Chilled Water | 0 | 0.000 | 0.0 |
| **HVAC Sub-Total** | **133,434** | **1.009** | **62.1** |
| **Non-HVAC Components** | | | |
| Electric | 81,546 | 0.617 | 37.9 |
| Natural Gas | 0 | 0.000 | 0.0 |
| Fuel Oil | 0 | 0.000 | 0.0 |
| Propane | 0 | 0.000 | 0.0 |
| Remote Hot Water | 0 | 0.000 | 0.0 |
| Remote Steam | 0 | 0.000 | 0.0 |
| **Non-HVAC Sub-Total** | **81,546** | **0.617** | **37.9** |
| **Grand Total** | **214,980** | **1.626** | **100.0** |

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **132206.6** ft²
Conditioned Floor Area **132206.6** ft²

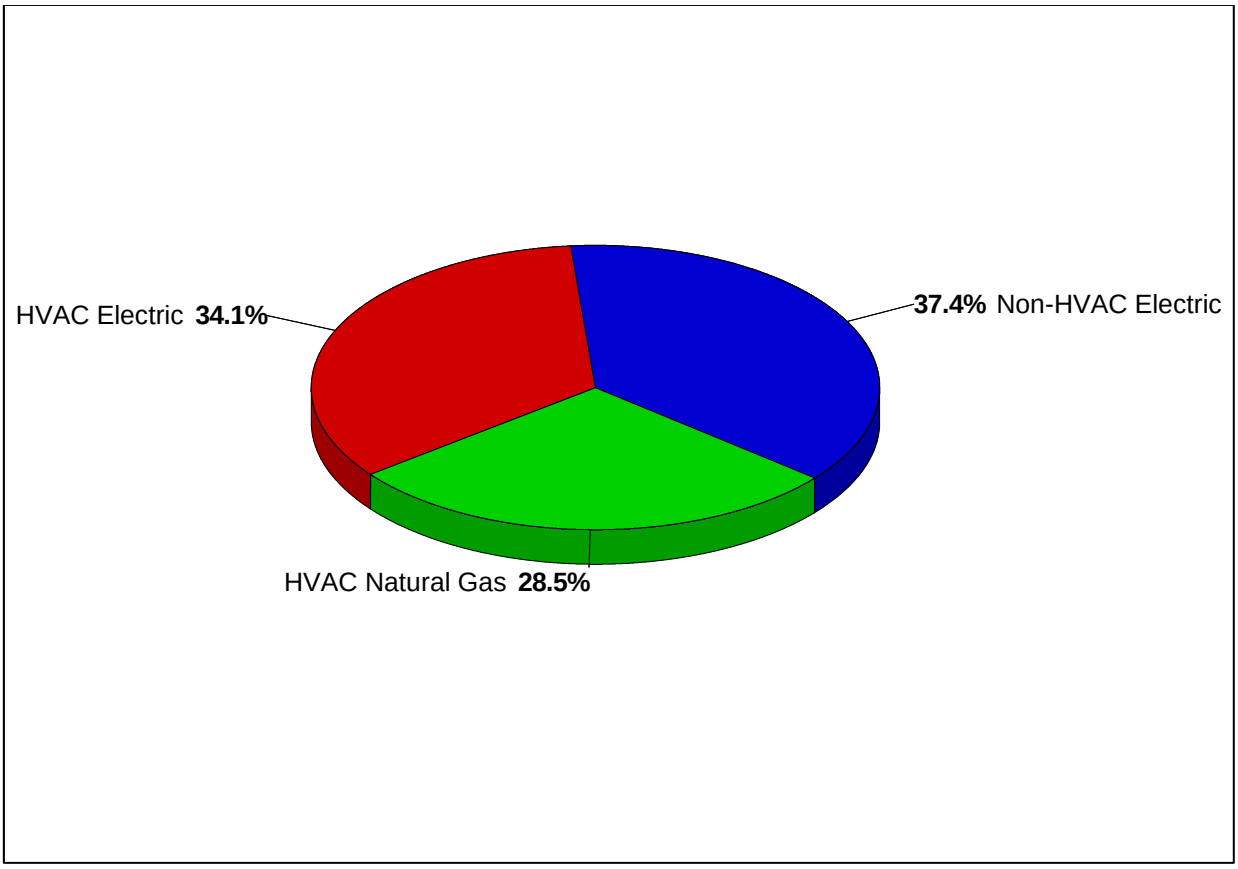



### 1. Annual Costs

| Component | Annual Cost ($) | ($/ft²) | Percent of Total (%) |
|---|---|---|---|
| Air System Fans | 31,048 | 0.235 | 14.3 |
| Cooling | 18,484 | 0.140 | 8.5 |
| Heating | 62,694 | 0.474 | 28.8 |
| Pumps | 17,799 | 0.135 | 8.2 |
| Heat Rejection Fans | 6,293 | 0.048 | 2.9 |
| **HVAC Sub-Total** | **136,318** | **1.031** | **62.6** |
| Lights | 47,421 | 0.359 | 21.8 |
| Electric Equipment | 34,125 | 0.258 | 15.7 |
| Misc. Electric | 0 | 0.000 | 0.0 |
| Misc. Fuel Use | 0 | 0.000 | 0.0 |
| **Non-HVAC Sub-Total** | **81,546** | **0.617** | **37.4** |
| **Grand Total** | **217,864** | **1.648** | **100.0** |

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **132206.6** ft²
Conditioned Floor Area **132206.6** ft²




### 1. Annual Costs

| Component | Annual Cost ($/yr) | ($/ft²) | Percent of Total (%) |
|---|---|---|---|
| **HVAC Components** | | | |
| Electric | 74,247 | 0.562 | 34.1 |
| Natural Gas | 62,074 | 0.470 | 28.5 |
| Fuel Oil | 0 | 0.000 | 0.0 |
| Propane | 0 | 0.000 | 0.0 |
| Remote Hot Water | 0 | 0.000 | 0.0 |
| Remote Steam | 0 | 0.000 | 0.0 |
| Remote Chilled Water | 0 | 0.000 | 0.0 |
| **HVAC Sub-Total** | **136,321** | **1.031** | **62.6** |
| **Non-HVAC Components** | | | |
| Electric | 81,546 | 0.617 | 37.4 |
| Natural Gas | 0 | 0.000 | 0.0 |
| Fuel Oil | 0 | 0.000 | 0.0 |
| Propane | 0 | 0.000 | 0.0 |
| Remote Hot Water | 0 | 0.000 | 0.0 |
| Remote Steam | 0 | 0.000 | 0.0 |
| **Non-HVAC Sub-Total** | **81,546** | **0.617** | **37.4** |
| **Grand Total** | **217,867** | **1.648** | **100.0** |

Note: Cost per unit floor area is based on the gross building floor area.

Gross Floor Area ..... **132206.6** ft²
Conditioned Floor Area **132206.6** ft²

ART Engineering
we build the future.
38 Front Street FL 3, Worcester, MA 01608 Office: 508.797.0333

# Beal Early Childhood Center

## Schematic Design

Basis of Design - Electrical

The following is a basis of design for new construction of a new 141,600 sq-ft 790-student K-4 school. The Study proposes an electrical service to accommodate power needs for system power, lighting, HVAC; as well spare capacity for future expansion. The summary includes design of a fire alarm and building emergency notification and evacuation instruction system. The summary includes the design of a code-compliant tele/data infrastructure to support Wi-Fi, networked phone system, networked AV teaching tools and an integrated and networked security system.

1.1 UTILITIES

A. Provide electrical primary duct bank to a utility company padmount transformer on the exterior of the building.

B. Provide secondary electrical service conductors to the main electrical room.

C. Provide telecommunications underground duct system to the entrance facility room.

1.2 ELECTRICAL SERVICE

A. Provide 2000A MCB, GFP, 480/277V, 65KAIC switchboard.

B. Provide 480/277V and 208/120V panelboards; and distribution feeders.

C. Provide 480V to 208/120V stepdown transformers.

1.3 EMERGENCY POWER

A. Provide emergency/standby generator, transfer and distribution equipment. Emergency equipment must be separated from normal and standby power equipment per the Massachusetts Electrical Code.

B. All emergency equipment and feeders must be installed in 2-hour rated rooms or must be 2-hour rated listed assembly.

1.4 LIGHTING AND LIGHTING CONTROL SYSTEM

A. Provide emergency egress and exit lighting.

B. Provide ambient lighting utilizing light fixtures with high efficient LED lamps.

C. Provide network lighting control system based on DALI protocol including programmable low voltage switching, vacancy sensors and daylight harvesting.

D. Integrate lighting controls with HVAC system to optimize energy performance of the building.

1.5 GENERAL PURPOSE POWER

A. Provide wiring devices, electrical distribution and branch circuits.

1.6 FIRE ALARM AND PUBLIC SAFETY DAS SYSTEM

A. Provide voice evacuation fire alarm system.

B. Provide public safety radio distributed antenna system (DAS).

C. Fire alarm panel and the DAS system will be in 2-hour rated emergency electrical room.

1.7 VOICE/DATA COMMUNICATIONS

A. Provide telecommunications room and closets.

B. Provide telecommunications cabling infrastructure per the BICSI standards. Utilize Category 6A cabling infrastructure for horizontal cabling and laser optimized 50/125 fiber optic cable for backbone cabling.

C. Telecommunications equipment will be installed in dedicated rooms.

D. Provide data network switches based on Cisco IOS or Cisco NX-OS.

E. Provide wireless access points based on Aerohive access points running the Aerohive HiveOS and configurable via Aerohive HiveManager Online.

F. Provide VoIP telephone system and handsets based on NEC SV8300 or NEC SV9300 and will be integrated with the High School's NEC SV8300 cluster.

1.8 AUDIO-VIDEO SYSTEMS

A. Provide public address and clock systems based on Rauland Telecenter U-based system and will be fully integrated with the district's existing system.

B. Provide media distribution system based on Safari Montage.

C. Provide audio-video systems in classrooms and common areas. All classroom projectors shall be Epson interactive short-throw projectors and be capable of finger-based control.

D. Provide sound system in the gym, cafeteria and media center.

1.9 SECURITY SYSTEMS:

A. Provide video surveillance system based on Brivo.

B. Provide access control based on Brivo with HID 26-bit cards and fobs.

C. Provide intrusion detection system based on DMP.

Nitsch Engineering

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# MEMORANDUM

**TO:** Kathryn Crockett, AIA, LEED AP
Lamoureux Pagano Associates

**FROM:** Jared E. Gentilucci, PE, CPESC, LEED AP BD+C

**DATE:** August 1, 2018

**RE:** Beal Elementary School
Schematic Design
Basis of Design Report

Nitsch Project #12345

## CIVIL ENGINEERING BASIS OF DESIGN

### Site Development Summary

The Beal Elementary School will be constructed on the Glavin Center site located at 214 Lake Street in Shrewsbury, Massachusetts. All of the existing buildings, pavment, curbing, and most utilities will be demolished. The site construction scope includes new paved roadways, parking lots, building and site utilities, an play field, playgrounds, and the relocation of Lake Street. Most of the site and adjacent section of Lake Street will be impacted by the project.

The following is a descriptive summary of the site civil project elements and permitting requirements necessary to construct the project.

### Soils

Based on National Resources Conservation Service (NRCS) data, the soil on the site is primarily Paxton fine sandy loam (NRCS Map Units 305B and 305C). Soil mapped as Paxton typically consists of compact glacial till with a hardpan layer two to three feet below grade. Paxton is designated as hydrologic soil group (HSG) C soil, and frequently exhibits a perched seasonal groundwater table. Paxton typically does not represent a significant development constraint relative to building construction, although groundwater management measures may be needed.

Note that previous development activities may have affected the original soil conditions to the extent that some of the typical characteristics of Paxton soil (hardpan, perched groundwater) might no longer be reflected in the current soil conditions.

The project's Geotechnical Engineer has indicated that the onsite soil is not suitable for use as fill below the new building foundation. A considerable amount of fill, approximately 16,500 cubic yards, will be required below the building footprint to bring it up to proposed grade. Some options being considered for onsite sources of fill include pulverizing the existing pavement and gravel base and crushing the existing buildings to create structural fill that can be used below the new building.

The project's Environmental Consultant has determined the onsite soil does contain arsenic. Disposal of this soil is expensive so reducing the amount of cut is crucial. Current calculations indicate a cut volume of approximately 24,500 cubic yards. As the design progresses changes to the site grading will aim to reduce this cut volume. The property across Lake Street, which is owned by the Town of Shrewsbury, will likely be used to get rid of any excess soil.

Areas mapped as Paxton 305B are designated as Prime Farmland, and Paxton 305C as Farmland of Statewide Importance. Although the site is developed and does not includes a current or known recent previous agricultural use, development of open space mapped with these soils could be subject to review by the Massachusetts Department of Agriculture.

**Access Drives and Parking**

The project includes the complete replacement of the existing parking lots and access drives/roadways. The school requires 130 day-to-day parking spaces for faculty, staff, and visitors. When larger events occur up to 350 parking spaces will be required. The main parking lot, located to the east of the new building, contains 133 parking spaces. A secondary parking lot at the southern edge of the site contains 52 parking spaces. Additional overflow parking spaces for special events will be located around the perimeter of the main parking lot (as parallel parking spaces), around the perimeter of the main loop road (as parallel parking spaces), and at the paved play area to the south of the building. These areas contain 22, 76, and 72 parking spaces respectively. Total parking count for the site is 355 spaces. Accessible spaces are being provided in the main parking lot.

The project includes the construction of new access drives/roadways off Lake Street that run around the perimeter of the site, across the front of the new school, and around the main parking lot. The main site entrance at the north end of Lake Street is intended for staff, faculty, visitors, and parents. Student drop-off/pickup is located in the paved play area to the south of the building and provides adequate room along the loop road for queuing. The secondary site entrance at the south end of Lake Street is intended for buses to enter and exit the site. The access drives have been designed to accommodate passenger vehicles, buses, emergency vehicles, and delivery trucks including tractor-trailers. The loading dock for the proposed school will be located on the southeast side of the building.

Lake Street will be realigned horizontally and vertically to improve on poor stopping sight distances and intersection distances at the main entrance. The knoll in the road will be lowered, which will improve driver visibility significantly.

The existing asphalt pavement to be demolished for the building and site construction can be pulverized and reclaimed for reuse as base material for the new building, new roadways, parking areas, and sidewalks or as general fill material.

**Sanitary Sewer**

Existing sanitary sewer service for the site runs to the northwest and ties into the town sewer system in Industrial Drive via an easement on the adjacent property to the north. The connection to this system will be reused for the proposed school.

The new onsite sanitary sewer system will consist of polyvinyl chloride (PVC) pipe and precast concrete manholes. An exterior grease trap will be installed to accept flow from the kitchen sewer service. Based on Plumbing Code, grease trap sizing is estimated at 5 gallons per meal. At 790 student meals per day the grease trap will be 4,000 gallons. Internal gas/sand traps are being provided by the Plumbing Engineer.

Based on 310 CMR 15.000 (Title 5), an elementary school with cafeteria and gymnasium but no showers produces sanitary sewer flow of 8 gallons per day per person. With a student count of 790 and a faculty and staff count of 130, the school will produce 7,360 gallons per day of sanitary sewer flow.

**Water**

Domestic water and fire protection service to the new school will be provided via a new 8-inch DI water service main that runs around the perimeter of the site and connects to the service in Lake Street as well as the service

from Industrial Drive. The water main in Lake Street will be replaced when the roadway is realigned. Domestic water and fire protection services will consist of a 4-inch DI pipe and an 8-inch DI pipe respectively. Both services will enter the Mechanical Room at the southern face of the building. Each service will be provided with a dedicated gate valve. Final sizing of the building water services will be determined by the Plumbing and Fire Protection Engineers.

Water demand is typically estimated at 110% of the estimated sanitary sewer flow. With an estimated sanitary sewer flow is 7,360 gpd for the new school, the water demand is estimated to be 8,100 gpd.

Fire hydrants have been located along the loop road surrounding the school, within 100 feet of fire department connections, and one new hydrant has been included on Lake Street. Final placement of hydrant will be coordinate with the Shrewsbury Fire Department.

**Storm Drainage**

A new storm drainage system will be required to collect runoff from the building roof, roadways, walkways, and landscape areas. The storm drainage system will consist of precast concrete catch basins and drain manholes, corrugated polyethylene pipe (CPP), area drains, and water quality structures. Low impact development (LID) systems such as water quality swales, infiltration trenches, and bioretention basins will be incorporated into the stormwater management system design where possible. Stormwater runoff will discharge from the site to the existing connection to the west.

The stormwater management system for the project will be designed to meet the Department of Environmental Protection's (DEP) Stormwater Management Standards to the maximum extent practicable as a combination of new development and redevelopment. The corresponding DEP Standards and anticipated project compliance are listed below:

**Department of Environmental Protection's Stormwater Management Standards**

**Project Type:** The project site is previously developed and the proposed work will result in an increase in impervious area. Therefore, the project is considered a mix of new development and redevelopment under the DEP Stormwater Management Standards.

> **Standard 1:** No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.
>
> Compliance: The project will comply with this standard. There will be no untreated stormwater discharges from the site.
>
> Water quality treatment BMPs will be incorporated into the stormwater management system to provide adequate treatment of stormwater prior to discharge. These water quality BMPs will potentially include pretreatment BMPs such as Deep Sump Catch Basins and Vegetated Filter Strips, and Treatment BMPs such as Proprietary Water Quality Structures, Bioretention Basins, Water Quality Swales, Infiltration Trenches, and Subsurface Infiltration Structures.
>
> **Standard 2:** Stormwater management systems shall be designed so that the post-development peak discharge rates do not exceed pre-development peak discharge rates.
>
> Compliance: The project will comply with this standard. The stormwater management system will be designed to mitigate post-development peak discharge rates to less than pre-development levels for the 2-year, 10-year, 100-year 24-hour storm events. The project includes an increase in the impervious

area resulting in higher rate and volume of runoff. Underground recharge/detention systems will be included in the stormwater design to mitigate the increase in runoff rate.

**Standard 3:** Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater BMPs, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

Compliance: The project will comply with this standard to the maximum extent practicable. Infiltration BMPs will be incorporated into the proposed stormwater management system where feasible and will be sized to capture and infiltrate the required recharge volume for the proposed site. The required recharge volume is based on the total impervious cover and the NRCS Hydrologic Soil Group for the project site. For this site, the soil has been categorized as Paxton sandy loam, which falls under Hydrologic Soil Group C. Infiltration systems will be incorporated into the stormwater management system where feasible to provide the required recharge volume.

**Standard 4:** Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

Compliance: The project will comply with this standard. Structured and non-structured water quality systems and BMPs will be incorporated into the design and sized to provide 80% TSS removal. A Long-Term Pollution Prevention Plan (post-construction) for the storm drainage system will be developed that will define suitable practices for post-construction source control and pollution prevention for the site. The plan will identify good housekeeping practices, provisions for storing materials and waste products inside or under cover, vehicle washing controls, requirements for routine inspection and maintenance of stormwater BMPs, spill prevention and response plans, provisions for landscaping maintenance, requirements for storage and use of fertilizers, herbicides, and pesticides, provisions for solid waste management, snow disposal and plowing plans relative to the proposed infiltration BMPs, winter road salt and/or sand use and storage restrictions, street sweeping schedules, provisions for preventing illicit discharges to the stormwater management system, training for personnel involved with implementing the plan, and a list of emergency contacts.

**Standard 5:** For land uses with higher potential pollutant loads, source control, and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If, through source control and/or pollution prevention, all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snowmelt and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L.c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

Compliance: Not applicable. The project is not associated with Higher Potential Pollutant Loads (as defined under Standard 5 in Volume 1, Chapter 1 of the DEP Stormwater Management Handbook).

**Standard 6:** Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply and stormwater discharges near or to any other critical area…

Compliance: Not applicable. The site does not contain critical areas and will not discharge untreated stormwater to a sensitive resource area.

**Standard 7:** A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

Compliance: The project is a combination of new development and redevelopment. The project will improve existing conditions to comply with the Stormwater Management Standards.

**Standard 8:** A plan to control construction-related impacts, including erosion, sedimentation, and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

Compliance: The project will comply with this standard. Sedimentation and erosion controls will be incorporated as part of the design of this project and employed during site construction. Land disturbance will be kept to a minimum and the phasing of the work will be planned so that only the areas actively being developed are exposed. All other areas should have natural vegetation preserved, have good temporary cover, or permanent vegetation established. Permanent structures, temporary or permanent vegetation and mulch/erosion netting should be employed as quickly as possible after land is disturbed. Disturbed areas will be protected from stormwater runoff by installing erosion control or stormwater management measures to prevent water from entering and running over disturbed areas, and to prevent erosion damage to downstream facilities. Perimeter control practices will be installed to isolate the construction site from surrounding areas. Siltation fence, temporary covers for drainage structures, and temporary settlement basins will be utilized where applicable.

The project will disturb more than one (1) acre of land and therefore a Notice of Intent (NOI) under the Environmental Protection Agency's (EPA) National Pollution Discharge Elimination System (NPDES) program will be required. As part of this application, the Applicant is required to prepare a Storm Water Pollution Prevention Plan (SWPPP) and implement the measures in the SWPPP. The SWPPP, which is to be kept onsite during the entire construction phase, includes erosion and sediment controls (stabilization practices and structural practices), temporary and permanent stormwater management measures, Contractor inspection schedules and reporting of all SWPPP features, materials management, waste disposal, offsite vehicle tracking, spill prevention and response, sanitation, and non-stormwater discharges.

**Standard 9:** A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

Compliance: The project will comply with this standard. An operations and maintenance plan including long-term BMP operation requirements will be prepared to assure proper maintenance and functioning of the proposed stormwater management system.

**Standard 10:** All illicit discharges to the stormwater management system are prohibited.

Compliance: The project will comply with this standard. There will be no illicit connections associated with this project.

## Gas

Gas service for the new building will be provided via a connection to the existing gas main in Lake Street. This service pipe will run from the main site entrance, along the loop road, and south to the Mechanical Room at the southern face of the new building.

The MEP Engineer will coordinate with the local gas company to determine the building gas loads, required size of service, and if the gas main requires any upgrades. All new gas piping will be installed by the local gas company, and trenching, backfill, and surface restoration will be the responsibility of the Contractor. See the MEP section for additional information on the gas service.

## Electric

New underground electric service will originate from a utility pole on Lake Street and run to the transformer on the northwest face of the building. See the Electrical Engineering section for additional information on the electric service.

## Telecommunications

New underground telecom service will originate from a utility pole on Lake Street and run to the telecom room, which is located at the north end of the building. See the Electrical Engineering section for additional information on the telecommunications service.

## LEED Goals

Construction activity produces disturbed soils, erosion, and sedimentation. A sustainable practice during construction includes implementing erosion and sedimentation controls to contain sediment onsite, thereby preventing it from entering adjacent properties, municipal storm drainage systems, wetlands, and water bodies. Erosion and sedimentation controls include silt fencing, straw bales and wattles, inlet protection at catch basins and area drains, temporary sediment basins, and temporary stabilization through the use of seeding and mulching. LEED SS Prerequisite 1, Construction Activity Pollution Prevention, requires that the project create and implement an Erosion and Sedimentation Plan, also referred to as a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP outlines the Contractor's minimum responsibilities for onsite erosion and sedimentation control.

A stormwater management system that produces a high level of water quality helps to sustain rivers, lakes, wetlands, and the ecosystems in these environments. The stormwater management system for the project will incorporate deep sump catch basins with hoods, area drains with sumps, water quality structures, and infiltration and LID BMPs to treat stormwater runoff prior to discharge to the existing drainage system. Low impact development (LID) techniques including water quality swales, bioretention basins, and infiltration trenches will be incorporated into the design where feasible.

## Permitting

### Wetland Protection Act (310 CMR 10.00)

The Wetlands Protection Act ensures the protection of Massachusetts' inland and coastal wetlands, tidelands, great ponds, rivers, and floodplains. It regulates activities in coastal and wetland areas and contributes to the protection of ground and surface water quality, the prevention of flooding and storm damage, and the protection of wildlife and aquatic habitat.

There are no wetlands onsite or within 100 feet of the site. Therefore, there are no permits required through the Shrewsbury Conservation Commission.

**National Heritage and Endangered Species Program**

A review of the MassGIS data for Natural Heritage and Endangered Species Program (NHESP) indicates that the project site is not a Priority Habitat of Rare Species or an Estimated Habitat of Rare Wildlife. Therefore, there are no permits required through the NHESP.

**Floodplain**

Floodplain information was obtained from the Flood Insurance Rate Map (FIRM) community map number 25027C0638E. The campus is within a Zone X, which is identified as an area outside the 100-year floodplain. Therefore, there are no permits required with respect to the floodplain.

**Environmental Protection Agency National Pollutant Discharge Elimination System Permit**

The total disturbed area for the project will exceed one acre and therefore the project will be required to obtain a National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) through the United States Environmental Protection Agency (EPA). A NPDES permit provides coverage for stormwater discharges from the site during the construction phase. To apply for a NPDES permit, the Owner and Contractor will each need to complete and submit a Notice of Intent (NOI) form to the EPA. Once the EPA receives both completed NOI forms, there is a 14-day waiting period until coverage begins. A NPDES permit must be obtained prior to the beginning of construction.

The NPDES permit requires that a Stormwater Pollution Prevention Plan (SWPPP) be prepared prior to submission of the NOI forms to the EPA. The SWPPP outlines the Contractor's requirements for onsite erosion and sediment control, including methods, source control, maintenance, and inspections.

**Town of Shrewsbury Planning Board**

The project will require site plan review and approval from the Shrewsbury Planning Board. Submission of the application and required documents should be done at the end of the Design Development phase so enough time for review and approval is given prior to finalizing Construction Documents for the project.

**Massachusetts Environmental Policy Act (MEPA) Regulations (301 CMR 11.00)**

The following is an evaluation of the MEPA Environmental Notification Form (ENF) review thresholds for the project:

**Land** [301 CMR 11.03 (1)( b)]

1. Direct alteration of 25 or more acres of land, unless the Project is consistent with an approved conservation farm plan or forest cutting plan or other similar generally accepted agricultural or forestry practices.

**The estimated proposed area of disturbance is 18 acres. Threshold not exceeded.**

2. Creation of five or more acres of impervious area.

**The estimated increase in impervious area is 1.7 acres. Threshold not exceeded.**

3. Conversion of land held for natural resources purposes in accordance with Article 97 of the Amendments

to the Constitution of the Commonwealth to any purpose not in accordance with Article 97.

**Not Applicable.**

4. Conversion of land in active agricultural use to nonagricultural use, provided the land includes soils classified as prime, state-important or unique by the United States Department of Agriculture, unless the Project is accessory to active agricultural use or consists solely of one single-family dwelling.

**Not Applicable.**

5. Release of an interest in land held for conservation, preservation or agricultural or watershed preservation purposes.

**Not Applicable.**

6. Approval in accordance with M.G.L. c. 121A of a New urban redevelopment project or a fundamental change in an approved urban redevelopment project, provided that the Project consists of 100 or more dwelling units or 50,000 or more sf of non-residential space.

**Not Applicable.**

7. Approval in accordance with M.G.L. c. 121B of a New urban renewal plan or a major modification of an existing urban renewal plan.

**Not Applicable.**

**Rare Species [301 CMR 11.03 (2)(b)]**

1. Alteration of designated significant habitat.

   Based on the 13th edition of the Natural Heritage Atlas, as compiled by the Natural Heritage and Endangered Species Program, the site does not fall within a priority habitat of rare species or an estimated habitat of rare wildlife.

   **Not Applicable.**

2. Greater than two acres of disturbance of designated priority habitat, as defined in 321 CMR 10.02, that results in a take of a state-listed endangered or threatened species or species of special concern.

   Based on the 13th edition of the Natural Heritage Atlas, as compiled by the Natural Heritage and Endangered Species Program, the site does not fall within a priority habitat of rare species or an estimated habitat of rare wildlife.

   **Not Applicable.**

**Wetlands** [301 CMR 11.03 (3)(b)]

1. Provided that a Permit is required:
   a. alteration of coastal dune, barrier beach or coastal bank;
   b. alteration of 500 or more linear feet of bank along a fish run or inland bank;
   c. alteration of 1,000 or more sf of salt marsh or outstanding resource waters;
   d. alteration of 5,000 or more sf of bordering or isolated vegetated wetlands;

e. new fill or structure or expansion of existing fill or structure, except a pile-supported structure, in a velocity zone or regulatory floodway; or
f. alteration of ½ or more acres of any other wetlands.

The project does not include the disturbance of any wetland resource areas. **Threshold not exceeded.**

2. Construction of a new roadway or bridge providing access to a barrier beach or a new utility line providing service to a structure on a barrier beach.

**Not Applicable.**

3. Dredging of 10,000 or more cy of material.

**Not Applicable.**

4. Disposal of 10,000 or more cy of dredged material, unless at a designated in-water disposal site.

**Not Applicable.**

5. Provided that a Chapter 91 License is required, New or existing unlicensed non-water dependent use of waterways or tidelands, unless the Project is an overhead utility line, a structure of 1,000 or less sf base area accessory to a single-family dwelling, a temporary use in a designated port area, or an existing unlicensed structure in use prior to January 1, 1984.

**Not Applicable.**

6. Construction, reconstruction or Expansion of an existing solid fill structure of 1,000 or more sf base area or of a pile-supported or bottom-anchored structure of 2,000 or more sf base area, except a seasonal, pile-held or bottom-anchored float, provided the structure occupies flowed tidelands or other waterways.

**Not Applicable.**

**Water** [301 CMR 11.03 (4)(b)]

1. New withdrawal or Expansion in withdrawal of 100,000 or more gpd from a water source that requires New construction for the withdrawal.

The project is estimated to produce a minimal increase in water consumption**. Threshold not exceeded.**

2. New withdrawal or Expansion in withdrawal of 500,000 or more gpd from a water supply system above the lesser of current system-wide authorized withdrawal volume or three-years' average system-wide actual withdrawal volume.

The project is estimated to produce a minimal increase in water consumption. **Threshold not exceeded.**

3. Construction of one or more new water mains five or more miles in length.

**Not Applicable.**

4. Construction of a new drinking water treatment plant with a Capacity of 1,000,000 or more gpd.

**Not Applicable.**

5. Expansion of an existing drinking water treatment plant by the greater of 1,000,000 gpd or 10% of existing Capacity.

   **Not Applicable.**

6. Alteration requiring a variance in accordance with the Watershed Protection Act, unless the Project consists solely of one single-family dwelling.

   **Not Applicable.**

7. Non-bridged stream crossing 1,000 or less feet upstream of a public surface drinking water supply for purpose of forest harvesting activities.

   **Not Applicable.**

**Wastewater** [301 CMR 11.03 (5)(b)]

1. Construction of a New wastewater treatment and/or disposal facility with a Capacity of 100,000 or more gpd.

   **Not Applicable.**

2. Expansion of an existing wastewater treatment and/or disposal facility by the greater of 100,000 gpd or 10% of existing Capacity.

   **Not Applicable.**

3. Construction of one or more new sewer mains:

   a. that will result in an Expansion in the flow to a wastewater treatment and/or disposal facility by 10% of existing Capacity;
   b. five or more miles in length; or
   c. ½ or more miles in length, provided the sewer mains are not located in the right of way of existing roadways.

   **Not Applicable.**

4. New discharge or Expansion in discharge:

   a. to a sewer system of 100,000 or more gpd of sewage, industrial wastewater or untreated stormwater;
   b. to a surface water of:

      i. 100,000 or more gpd of sewage;
      ii. 20,000 or more gpd of industrial wastewater; or
      iii. any amount of sewage, industrial wastewater or untreated stormwater requiring a variance from applicable water quality regulations; or

   c. to groundwater of:

      i. 10,000 or more gpd of sewage within an area, zone or district established, delineated or identified as necessary or appropriate to protect a public drinking water supply, an area established to protect a

nitrogen sensitive embayment, an area within 200 feet of a tributary to a public surface drinking water supply, or an area within 400 feet of a public surface drinking water supply;
ii. 50,000 or more gpd of sewage within any other area;
iii. 20,000 or more gpd of industrial wastewater; or
iv. any amount of sewage, industrial wastewater or untreated stormwater requiring approval by the Department of Environmental Protection of a variance from Title 5 of the State Environmental Code for new construction.

The Project is estimated to produce a minimal increase in sanitary sewer flows to a municipal sanitary sewer system. **Threshold not exceeded.**

5. New Capacity or Expansion in Capacity for:

a. combustion or disposal of any amount of sewage sludge, sludge ash, grit, screenings, or other sewage sludge residual materials; or
b. storage, treatment, or processing of 50 or more wet tpd of sewage sludge or sewage sludge residual materials.

**Not Applicable.**

**Transportation** [301 CMR 11.03 (6)(b)]

1. Unless the Project consists solely of an internal or onsite roadway or is located entirely on the site of a non-roadway Project:

a. construction of a New roadway one-quarter or more miles in length; or
b. widening of an existing roadway by four or more feet for one-half or more miles.

The reconstruction of Lake Street is approximately 1000 feet in length. **Threshold not exceeded**.

2. Construction, widening or maintenance of a roadway or its right-of-way that will:

a. alter the bank or terrain located ten more feet from the existing roadway for one-half or more miles, unless necessary to install a structure or equipment;
b. cut five or more living public shade trees of 14 or more inches in diameter at breast height; or
c. eliminate 300 or more feet of stone wall.

The reconstruction of Lake Street is approximately 1000 feet in length. **Threshold not exceeded**.

3. Expansion of an existing runway at an airport.

**Not Applicable.**

4. Construction of a new taxiway at an airport.

**Not Applicable.**

5. Expansion of an existing taxiway at Logan Airport.

**Not Applicable.**

6. Expansion of an existing terminal at Logan Airport by 100,000 or more sf.

**Not Applicable.**

7. Expansion of an existing terminal at any other airport by 25,000 or more sf.

   **Not Applicable.**

8. Construction of new or expansion of existing air cargo buildings at an airport by 100,000 or more sf.

   **Not Applicable.**

9. Conversion of a military airport to a non-military airport.

   **Not Applicable.**

10. Construction of a new rail or rapid transit line for transportation of passengers or freight.

    **Not Applicable.**

11. Discontinuation of passenger or freight service along a rail or rapid transit line.

    **Not Applicable.**

12. Abandonment of a substantially intact rail or rapid transit right-of-way.

    **Not Applicable.**

13. Generation of 2,000 or more new ADTs on roadways providing access to a single location.

    The project will result in approximately 1,500 new ADTs. **Threshold not exceeded.**

14. Generation of 1,000 or more new ADTs on roadways providing access to a single location and construction of 150 or more New parking spaces at a single location.

    The number of new striped parking spaces will approximate the number of existing parking spaces. **Threshold not exceeded.**

15. Construction of 300 or more New parking spaces at a single location.

    The number of new striped parking spaces will approximate the number of existing parking spaces. **Threshold not exceeded.**

**Energy** [301 CMR 11.03 (7)(b)]

1. Construction of a new electric generating facility with a Capacity of 25 or more MW.

   **Not Applicable.**

2. Expansion of an existing electric generating facility by 25 or more MW.

   **Not Applicable.**

3. Construction of a new fuel pipeline five or more miles in length.

   **Not Applicable.**

4. Construction of electric transmission lines with a Capacity of 69 or more kv, provided the transmission lines are one or more miles in length along New, unused or abandoned right of way.

   **Not Applicable.**

**Air** [301 CMR 11.03 (8)(b)]

1. Construction of a New major stationary source with federal potential emissions, after construction and the imposition of required controls, of: 100 tpy of PM as PM10, CO, lead or SO2; 50 tpy of VOC or NOx; 10 tpy of any HAP; or 25 tpy of any combination of HAPs.

   ***This review threshold should be reviewed and completed by the Mechanical Engineering Consultant.***

2. Modification of an existing major stationary source resulting in a "significant net increase" in actual emissions, provided that the stationary source or facility is major for the pollutant, emission of which is increased by: 15 tpy of PM as PM10; 100 tpy of CO; 40 tpy of SO2; 25 tpy of VOC or NOx; 0.6 tpy of lead.

   ***This review threshold should be reviewed and completed by the Mechanical Engineering Consultant.***

**Solid and Hazardous Waste** [301 CMR 11.03 (9)(b)]

1. New capacity or expansion in capacity for combustion or disposal of any quantity of solid waste, or storage, treatment or processing of 50 or more tpd of solid waste, unless the Project is exempt from site assignment requirements.

   **Not Applicable.**

2. Provided that a permit is required in accordance with M.G.L. c. 21D, new capacity or expansion in capacity for the storage, recycling, treatment or disposal of hazardous waste.

   **Not Applicable.**

**Historical** [301 CMR 11.03 (10)(b)]

Unless the Project is subject to a Determination of No Adverse Effect by the Massachusetts Historical Commission or is consistent with a Memorandum of Agreement with the Massachusetts Historical Commission that has been the subject of public notice and comment:

1. Demolition of all or any exterior part of any Historic Structure listed in or located in any Historic District listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth; or

   The project does not include any listed historical structures or known archeological assets. **Threshold not applicable.**

2. Destruction of all or any part of any Archaeological Site listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth.

   The project does not include any listed historical structures or known archeological assets. **Threshold not applicable.**

**Area of Environmental Concern (ACEC)** [301 CMR 11.03 (11)(b)]

Any Project within a designated ACEC, unless the Project consists solely of one single-family dwelling.

**The project site does not fall within an ACEC. Threshold not applicable.**

**Regulations** [301 CMR 11.03 (12)(b)]

Promulgation of new or revised regulations, of which a primary purpose is protecting against damage to the environment, that significantly reduce:

1. Standards for environmental protection;
2. Opportunities for public participation in permitting or other review processes; or
3. Public access to information generated or provided in accordance with the regulations.

**Not Applicable.**

The following pre-construction municipal, state, and federal permit applications/processes are likely to be required.

| Agency / Dept | Permit / Description | Project Stage | Typical Duration |
|---|---|---|---|
| Shrewsbury Planning Board | **Site Plan Review**<br>Local review for compliance with municipal site design standards | Application submitted coincident with completion of Design Development Documents | 3-4 months |
| EPA | **Notice of Intent for Site Construction Activities**<br>Submission required as part of the National Pollutant Discharge Elimination System (NPDES) for stormwater discharges from construction sites. | Draft Stormwater Pollution Prevention Plan (SWPPP) to be included with WPA Notice of Intent. Final SWPPP adopted by Contractor and EPA NOI filed at least 10 days prior to initiation of construction activities | <1 month |

**SCHEMATIC DESIGN**
**Basis of Design for Beal Elementary School**

August 1, 2018

**Studio 2112 Landscape Architecture, Inc.**
840 Summer St., #102
Boston, Massachusetts 02127

SITE LANDSCAPE APPROACH

The existing buildings at the Glavin Center comprise a compound-style of smaller structures at different elevations across the site. In order to accommodate a larger, single building footprint the site requires regrading. The project takes advantage of the grade change across the site from east to west by adding a lower level of occupied space that opens towards the expansive views to the west. The landscape design has a more 'private' western side to the building for outdoor natural classroom spaces and utility areas to the northwest.

The site grading and layout help to buffer the new construction from Lake Street through landforms, planting islands in parking lots and site elements nestled in the landscape. The large copper beech tree shall be protected during construction as it represents a significant landscape element on the site to remain. Layered planting on the entry hillside will screen the building from the driveway and provide a visual and physical buffer for the program of the school.

SITE CIRCULATION - VEHICULAR

The existing perimeter road location on the site will be reused for the Elementary school. The driveway will be regraded along the northern side to provide a 5% driveway and adjacent walkway with access to the main entry. New pavement and granite curb will be installed the full length.

The project will retain the two vehicular access points off of Lake Street. Staff and bus access will be to the south with queuing space around the perimeter road in the main parking lot. Buses are intended to enter and exit in the same curb cut location and will drop off/pick up students directly in front of the main entry at the architectural canopy. During the design phase we have demonstrated stacking for a minimum of 15 buses within the site, off of Lake Street, with the potential to stack more as needed.

The main entry point for parents and visitors is the northern driveway. For pick up and drop off stacking it is assumed parents will stack along the perimeter road and pick up their children in the asphalt play area to the south of the site. Parents are intended to exit at the same curb cut eliminating the conflict between buses and parents. Visitors are intended to use the northern driveway as well and can access the main entry and parking lot through the connection south.

The main parking area has space for 133 spaces including 5 van accessible handicap spots and 2 electric charging stations for LEED v4 points. An additional parking lot to the south of the site has striped spaces for 52 cars and the site accommodates an overflow parking condition of 98 parallel spaces along the perimeter roads and 72 spaces in the asphalt play pick up/drop off area to the south of the site. Total striped spaces is 185, total space including overflow is 355. These spaces are currently drawn at a standard of 9' wide x 18' long, there is the potential of gaining space if 25% were allowed to go to compact space design which is 8' x 16'.

Service access and delivery can occur at the loading dock to the south east corner of the building. The loading elevation is at the first floor height of 570 and the grading allows for a 4' tall loading dock.

Vehicles are meant to pull forward and back directly in to the dock. The space contained within the site walls accommodates the compactor, dumpster, service vehicles and a ramp for access to the loading dock level. Retaining walls at the edge of the space provide physical separation as well as screening.

Additional service access to the generator, transformer and electrical room is addressed by an 8' wide vehicular pathway to the northwest corner of the site and a concrete paved area outside of the lower facilities storage area.

## SITE CIRCULATION – PEDESTRIAN

A series of concrete sidewalks provide clear and separate pedestrian circulation throughout the site. The roadways and sidewalks are all graded at a maximum of 5% providing universal access throughout the site.

There is a main pathway through the parking lot towards the entry that has one set of stairs, the accessible parking spaces are all directly adjacent to the main door providing greatest ease of access and shortest route. Both playground areas are accessible from the school via concrete walkways. The multipurpose play field has an accessible sidewalk to access the east side seatwall and field.

The Sensory Garden and Butterfly Grove to the west of the site are both universally accessible through walkways, site grading and programmatic elements.

## SITE ELEMENTS

Desired programmatic elements have been worked into the site layout in appropriate and complementary locations. The multipurpose field is in a centralized location at the northeast corner of the site situated in a graded bowl providing safety from the adjacent driveway, informal seating space for spectators on the slope with direct access from the gym.

Adjacent to the field is Playground A enclosed in a 4' high ornamental fence with gate access. The entire space is poured in place rubber with various play equipment elements. Between the playground and the driveway the site is graded to create a bioswale and larger rain garden to the northwest. This space diverts stormwater away from the roadway and into a planted area for infiltration. The surface stormwater features provide an educational opportunity for the school to study and demonstrate sustainable practices.

The Butterfly Grove provides a space for exterior learning and exploring in close proximity to the maker space in the Library. Planting here will attract various insects, butterflies and birds. The Sensory Garden to the southwest is the space for raised planter beds and community gardens. The beds are designed as integrated within the organic forms of the space which will serve as an oasis for students and teachers. Planters are accessible from the walkway side and platform steps can provide access at various heights for various ages. A planted wall provides an opportunity for vines and other climbing material and a storage shed and compost area support the programmatic function of the space.

At the south side of the building the large asphalt play area is the drop off/pick up space for parents and overflow parking spaces for events. A graded slope with integrated amphitheater style seating and stairs connects up to the second playground. The accessible path to the playground is along the sidewalk connecting to the space at elevation 561. Vehicular guardrails provide enclosure to the play spaces without a full fence.

The main entry plaza sits below an architectural canopy and incorporates fixed seat walls, planting beds and a flagpole for school ceremonies.

A circular outdoor classroom annex is proposed underneath the existing beech tree at the northeast corner of the site. The space is accessible by a <5% walkway with a seating retaining wall and stabilized aggregate paving providing a level area for intimate classes.

PLANTING

This preliminary planting palette for the site has been kept simple, featuring durable, low-maintenance native shrubs and trees. An allee of shade trees flanks the main visitor drive to the north. Smaller flowering trees and some evergreens break down the scale of the larger trees as you get closer to the building. Shade trees in the parking areas help to break up the expanse of asphalt and assist in LEED points for the project. Shrubs and perennials provide an understory layer in rain garden areas at the building entry. Much of the site is proposed with no-mow fescue sod or seed to provide low maintenance coverage for the bulk of the property. The tree plant list is prepared using MassNRC's ALB Reforestation List. Within this palette every effort has been made to create interest throughout the seasons.

COLBURN & GUYETTE
foodservice designers | consultants

# BEAL EARLY CHILDHOOD CENTER

## SHREWSBURY, MA

**FOODSERVICE BASIS OF DESIGN NARRATIVE**
JUNE 29, 2018

## OVERVIEW

The new Beal Early Childhood Center population will be approximately 790 students, Kindergarten through 4th grade. The kitchen and servery will be approximately 2,800 square feet. Based on the Programming Meeting dated November 14, 2017, the new kitchen and servery should be based on the Floral Street School.

The Food Service Director reported that participation in the lunch program is ±50% and has been at that level for the past 20 years. There will be 3 meal periods which will be made up of rolling waves of students in intervals of 15 minutes. Each meal period will be 25 minutes.

## BASIS OF DESIGN

Typical back of house functions will be provided. This will include dry storage space and a walk-in cooler/freezer. Several stainless steel prep tables, some with sinks and a disposer, will provide work space for food preparation. The cook line will consisit of two (2) Double Combi Ovens, a 4-Burner Range with Oven and a 40 Gallon Tilting Kettle, with the associated exhaust hood and fire suppression system. A blast chiller will also be provided. The dishroom will have a drop-off window for the student to bring their soiled wares for cleaning. The dishroom will have a Conveyor Dishmachine, Pot Sink, Handsink and Mop Sink Cabinet. An Ice Machine with Bin will be provided. In addition to these typical elements a Washer/Dry Stack will be provided.

The Servery will have two U-Shaped serving lines. Each one will consist of one hot station, a soup station, two cold stations and open countertop. The height of the serving counters will be appropriate for children in grades K-4. The serving counters will have back support counters, two 2-Door Reach-In Refrigerators and two 2-Door Heated Cabinets. There will also be several reach-in refrigerated merchandisers for the students to self-serve. There will be one centralized 2-sided cashier station to process the two serving lines. And beyond the cashier station will be the condiment/utensil counter.

# 4.1.2 SCHEMATIC DESIGN BINDER

## J. LEED-S

1. LEED Certification
2. LEED v4 Scorecard
3. Photovoltaic Narrative

This is an acknowledgement that the Beal Elementary School Building Committee has identified a goal of 2% additional reimbursement from the MSBA High Efficiency Green School Program. As their Designer, I have submitted a completed LEED for Schools v4 scorecard showing a minimum of fifty (50) attempted points, which will meet that goal.

This is also to certify that the building specifications, drawings and cost estimates provided with this Schematic Design Submittal include systems described in the attached LEED v4 scorecard.

A completed LEED scorecard is included on the following pages, and a narrative of the sustainable design approach and LEED milestones can be found in the. Narrative Building Systems.

Kathryn Crockett AIA
Lamoureux Pagano Associates Architects

9·12·18

# LEED for Schools v4
# Project Scorecard

**Project Name:** Beal Early Childhood Center
**Project Address**: Glavin Center Site
**Date Updated:** June 22, 2018

**Targeted LEED v4 Rating: Silver**

| Phase | Yes | M+ | M- | No | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | 0 | 0 | 0 | | **General Project Information** | 0 | Response. |
| D | Y | | | | Plf1 | **Project Information** | 1 | Team |
| | Yes | M+ | M- | No | | | | |
| | 0 | 1 | 0 | 0 | | **Integrative Process** | 1 | Response. |
| D | | 1 | | | IPc1 | **Integrative Process** | 1 | Team |
| | Yes | M+ | M- | No | | | | |
| | 3 | 1 | 1 | 10 | | **Location & Transportation** | 15 | Response. |
| D | | | | 0 | LTc1 | **LEED for Neighborhood Development Location** | 15 | |
| D | 1 | | | | LTc2 | **Sensitive Land Protection** | 1 | Nitsch |
| D | | | | 2 | LTc3 | **High Priority Site** | 2 | TGE |
| D | 2 | | | 3 | LTc4 | **Surrounding Density and Diverse Uses** | 5 | TGE |
| D | | | | 4 | LTc5 | **Access to Quality Transit** | 4 | TGE |
| D | | | 1 | | LTc6 | **Bicycle Facilities** | 1 | TGE |
| D | | | | 1 | LTc7 | **Reduced Parking Footprint** | 1 | Nitsch |
| D | | 1 | | | LTc8 | **Green Vehicles** | 1 | ART, Nitsch |
| | Yes | M+ | M- | No | | | | |
| | 3 | 3 | 3 | 3 | | **Sustainable Sites** | 12 | Response. |
| C | Y | | | | SSp1 | **Construction Activity Pollution Prevention** | Required | Nitsch, CM |
| D | Y | | | | SSp2 | **Environmental Site Assessment** | Required | |
| D | 1 | | | | SSc1 | **Site Assessment** | 1 | LPA, Nitsch |
| D | | 2 | | | SSc2 | **Site Development - Protect or Restore Habitat** | 2 | Nitsch |
| D | | 1 | | | SSc3 | **Open Space** | 1 | Nitsch, TGE |
| D | | | 3 | | SSc4 | **Rainwater Management** | 3 | Nitsch |
| D | | | | 2 | SSc5 | **Heat Island Reduction** | 2 | LPA, Nitsch |
| D | 1 | | | | SSc6 | **Light Pollution Reduction** | 1 | ART |
| D | | | | 1 | SSc7 | **Site Master Plan** | 1 | |
| D | 1 | | | | SSc8 | **Joint Use of Facilities** | 1 | School, TGE |
| | Yes | M+ | M- | No | | | | |
| | 3 | 3 | 0 | 6 | | **Water Efficiency** | 12 | Response. |
| D | Y | | | | WEp1 | **Outdoor Water Use Reduction** | Required | Nitsch |
| D | Y | | | | WEp2 | **Indoor Water Use Reduction** | Required | SEC |
| D | Y | | | | WEp3 | **Building-level Water Metering** | Required | SEC, School |
| D | 1 | 1 | | | WEc1 | **Outdoor Water Use Reduction** | 2 | Nitsch |
| D | 1 | 2 | | 4 | WEc2 | **Indoor Water Use Reduction** | 7 | SEC |
| D | | | | 2 | WEc3 | **Cooling Tower Water Use** | 2 | |
| D | 1 | | | | WEc4 | **Water Metering** | 1 | SEC |
| | Yes | M+ | M- | No | | | | |
| | 17 | 10 | 2 | 2 | | **Energy & Atmosphere** | 31 | Response. |
| C | Y | | | | EAp1 | **Fundamental Commissioning and Verification** | Required | CxA |
| D | Y | | | | EAp2 | **Minimum Energy Performance** | Required | TGE, SEC, ART |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| D | Y | | | | EAp3 | **Building-level Energy Metering** | Required | SEC, School |
| D | Y | | | | EAp4 | **Fundamental Refrigerant Management** | Required | SEC |
| C | 5 | 1 | | | EAc1 | **Enhanced Commissioning** | 6 | CxA |
| D | 11 | 5 | | | EAc2 | **Optimize Energy Performance** | 16 | TGE, SEC, ART |
| D | 1 | | | | EAc3 | **Advanced Energy Metering** | 1 | SEC, ART |
| C | | | | 2 | EAc4 | **Demand Response** | 2 | |
| D | | 3 | | | EAc5 | **Renewable Energy Production** | 3 | ART, TGE |
| D | | 1 | | | EAc6 | **Enhanced Refrigerant Management** | 1 | SEC |
| C | | | 2 | | EAc7 | **Green Power and Carbon Offsets** | 2 | School, TGE |
| | Yes | M+ | M- | No | | | | |
| | 4 | 0 | 4 | 5 | | **Materials & Resources** | 13 | Response. |
| D | Y | | | | MRp1 | **Storage & Collection of Recyclables** | Required | School, LPA |
| C | Y | | | | MRp2 | **Construction and Demolition Waste Management Planning** | Required | CM |
| C | | | 3 | 2 | MRc1 | **Building Life-cycle Impact Reduction** | 5 | TGE |
| C | 1 | | | 1 | MRc2 | **Building Product Disclosure and Optimization**-Environmental Product Declarations | 2 | CM, LPA |
| C | | | 1 | 1 | MRc3 | **Building Product Disclosure and Optimization**-Sourcing of Raw Materials | 2 | CM, LPA |
| C | 1 | | | 1 | MRc4 | **Building Product Disclosure and Optimization**-Material Ingredients | 2 | CM, LPA |
| C | 2 | | | | MRc5 | **Construction and Demolition Waste Management** | 2 | CM |
| | Yes | M+ | M- | No | | | | |
| | 6 | 5 | 3 | 2 | | **Indoor Environmental Quality** | 16 | Response. |
| D | Y | | | | IEQp1 | **Minimum IAQ Performance** | Required | SEC |
| D | Y | | | | IEQp2 | **Environmental Tobacco Smoke (ETS) Control** | Required | School, LPA |
| D | Y | | | | IEQp3 | **Minimum Acoustical Performance** | Required | Acous. Eng |
| D | 2 | | | | IEQc1 | **Enhanced IAQ Strategies** | 2 | SEC |
| C | | 1 | | 2 | IEQc2 | **Low-Emitting Materials** | 3 | CM, LPA |
| C | 1 | | | | IEQc3 | **Construction IAQ Management Plan** | 1 | CM |
| C | 1 | | 1 | | IEQc4 | **IAQ Assessment** | 2 | CM |
| D | 1 | | | | IEQc5 | **Thermal Comfort** | 1 | SEC |
| D | 1 | 1 | | | IEQc6 | **Interior Lighting** | 2 | ART |
| D | | 2 | 1 | | IEQc7 | **Daylight** | 3 | TGE |
| D | | 1 | | | IEQc8 | **Quality Views** | 1 | TGE |
| D | | | 1 | | IEQc9 | **Acoustic Performance** | 1 | Acous. Eng |
| | Yes | M+ | M- | No | | | | |
| | 4 | 2 | 0 | 0 | | **Innovation** | 6 | Response. |
| D | 1 | | | | INc1 | **Innovation in Design: TBD (Ex: Green Cleaning and Integrated Pest Management)** | 1 | Team |
| D | 1 | | | | INc2 | **Innovation in Design: TBD (Ex: Green Building Education)** | 1 | Team |
| D | 1 | | | | INc3 | **Innovation in Design: TBD (Ex: Low Hg Lighting)** | 1 | Team |
| C | | 1 | | | INc4 | **Innovation in Design: TBD (Ex: Student Gardens, CHPS credit, Green Restaurant)** | 1 | Team |
| C | | 1 | | | INc5 | **Innovation in Design: TBD (Must be Pilot Credit)** | 1 | Team |
| C | 1 | | | | INc6 | **LEED Accredited Professional** | 1 | TGE |
| | Yes | M+ | M- | No | | | | |
| | 1 | 3 | 0 | 0 | | **Regional Priority Credits** - earn up to 4 points | 4 | Response. |
| D | | 1 | | | Credit 1 | **Renewable Energy Production** (threshold: 2 points) | 1 | TGE |
| D | 1 | | | | Credit 2 | **Optimize Energy Performance** (threshold: 8 points) | 1 | TGE |
| D | | 1 | | | Credit 3 | **Surrounding Density and Diverse Uses** (threshold: 4 points) | 1 | TGE |
| D | | 1 | | | Credit 4 | **Outdoor water use reduction** (threshold: 2 points) | 1 | TGE |
| C | | | 0 | | Credit 5 | **Building Life-Cycle Impact Reduction** (threshold: 2 points) | 1 | TGE |
| D | | 0 | | | Credit 6 | **Site Development- Protect and Restore** (threshold: 2 points) | 1 | TGE |
| | Yes | M+ | M- | No | | | | |
| | 41 | 28 | 13 | 28 | | **Project Totals (Certification Estimates)** | 110 | |

**Certified:** 40-49 points, **Silver:** 50-59 points, **Gold:** 60-79 points, **Platinum:** 80+ points

The Town of Shrewsbury has its own power and telecommunications company called the Shrewsbury Electric and Cable Operations (SELCO). In an ongoing effort to provide alternative energy sources, SELCO has established a photovoltaic farm at a capped landfill site. One hundred percent of the Beal Elementary School projected power needs will be allocated to the photovoltaic farm power generation.

Additionally, the Beal Elementary School roof will be designed to accommodate photovoltaic panel arrays if desired to be installed at a later date.

A preliminary analysis shows that approximately 40,000 sq. ft. of the Beal project roof could effectively accommodate photovoltaic panels resulting in 1440 PV modules.

Using the assumption that 1 sq. ft. = 14.4W (0.014kW and assuming 400W PV modules, a system of the size would yield 576kW.

The building is estimated to consume 141,600 sf x 7 kWh/sf = 991,200 kWh.

The 576 kW system would produce approximately 576 kW x 1250 = 720,000 kWh or a projected 72% of the building's electrical power annually.

# 4.1.2 SCHEMATIC DESIGN BINDER

K. ADA – AAB Compliance

The proposed Beal Elementary School, as new construction, is required to comply fully with the Rules and Regulations of 521 CMR: Architectural Access Board. This is an acknowledgement that the proposed design is in accordance with those requirements; and also complies with ADA Standards for Accessibility (unless superseded by MA-AAB rules and regulations).

Additionally, all of the proposed grading for the site's roadways and walkways are under 5% classifying them as sloped walks and therefore making the entire site accessible.

# 4.1.2 SCHEMATIC DESIGN BINDER

L. Room Data Sheets

# Beal Elementary School

214 Lake Street, Shrewsbury, MA 01545

# MSBA Schematic Design Room Data Sheets

SEPTEMBER 12, 2018

**MSBA**
Massachusetts School Building Authority
40 Broad Street, Suite 500, Boston, MA 02111

**OWNER**
Town of Shrewsbury, MA
100 Maple Avenue, Shrewsbury, MA 01545

**OPM**
PMA Consultants, LLC
35 Braintree Hill Office, Suite 300, Braintree, MA 02184

**DESIGNER**
Lamoureux Pagano & Associates, Inc.
108 Grove Street, Suite 300, Worcester, MA 01605

Prepared by:

LAMOUREUX · PAGANO
ARCHITECTS PROJECT MANAGERS

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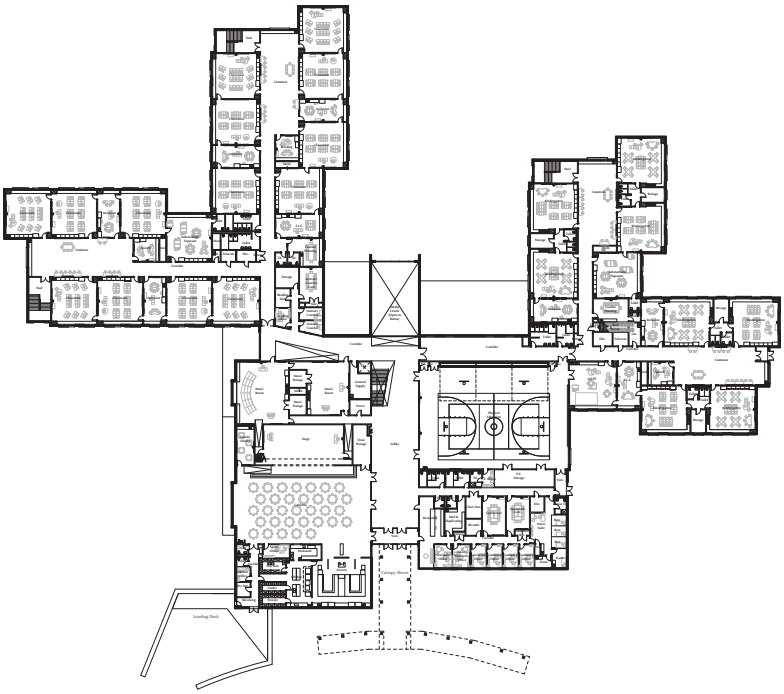
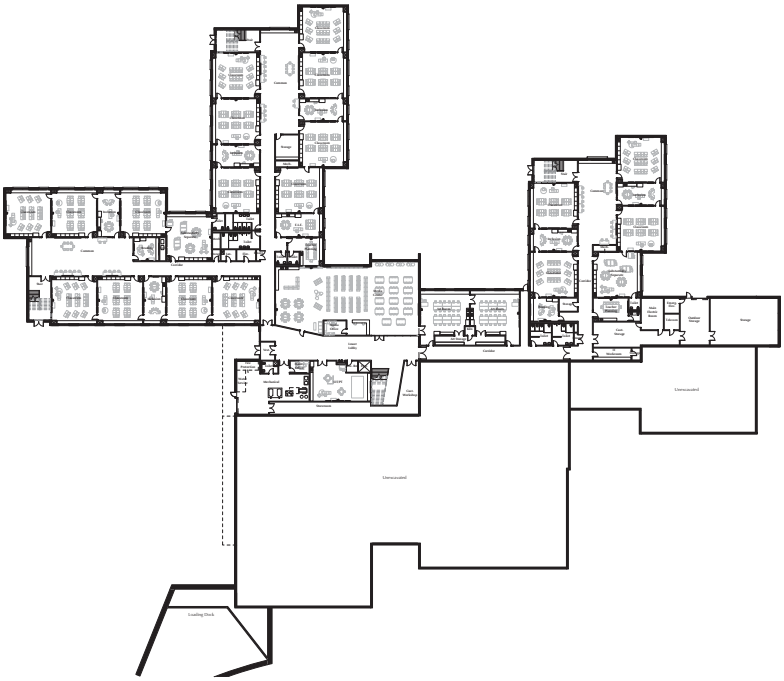
## KEY PLAN



MAIN FLOOR



GROUND FLOOR

## MILLWORK / CASEWORK KEY

M1 48″w x 84″h lockable teacher wardrobe with clothes pole and 5 shelves for storage

M2 48″w x 84″h supply cabinet with lockable doors, center divider and 5 adjustable shelves

M3 34″h base cabinet with drawers and doors and plastic laminate counter top and backsplash. May contain a sink (refer to plan). 30″h wall cabinet with doors

M3A 34″h ADA compliant base cabinet with sink and doors and plastic laminate counter top and backsplash. 30″h wall cabinet with doors

M4 34″ high base cabinet unit with plastic laminate counter/backsplash, pencil grille at base and top. Half of cabinets to be open shelving (in center); other half to be lockable (at ends)

M4A 34″ high base cabinet unit with plastic laminate counter/backsplash, pencil grille at base and top. Vertical slots at 2″ wide (clear) for art storage.

M5 30″h ADA compliant base unit with sink, plastic laminate counter and backsplash. 30″ h wall cabinets with doors

M6 24″d plastic laminate work surface with painted aluminum support brackets

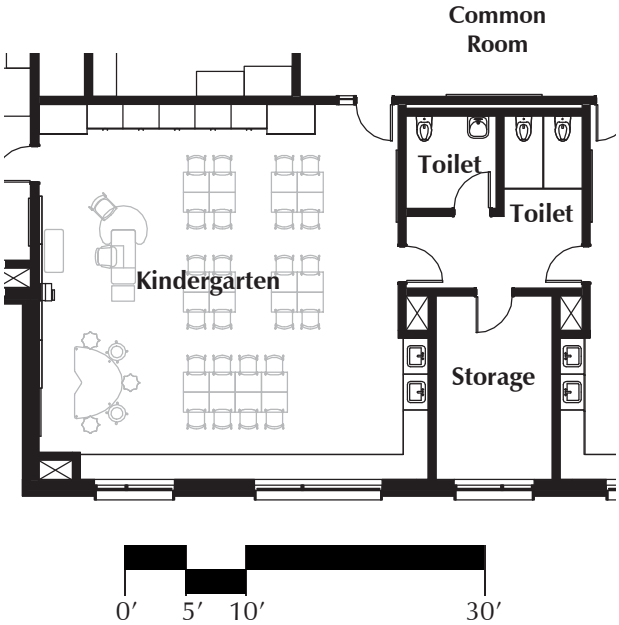
M8 Plastic laminate adjustable shelving on heavy duty brackets and standards with vertical every 36″, 4″ high base, and plastic laminate cap

M9 34″ high base unit with doors and plastic laminate counter with 12″d x 12″w x 5″ h mailbox open cubby units with label holders

M10 Custom 30″h desk unit with 12″ h deal shelf above. All counters solid surface with grommets for wire management. Drawer/door and file base units

M11 Coat and backpack cubby units: 48″ h x 18″ d open storage unit with tiled bench at 18″ high (open boot storage below bench) and 2 rows of heavy duty coat hooks above; vertical dividers at 36″; 4″ h base. 36″ high storage cabinets with tack board doors above cubby units

# 1. KINDERGARTEN CLASSROOM




## GENERAL CRITERIA

Description:
Early Childhood Education classroom intended to support a variety of teaching methods for Kindergarten. Provisions for a teacher and one aide per classroom.

Area: 1,135 SF
Quantity: 8
Users:
(1) Teacher
(1) Aide
(20-24) Students (30 max.)

Adjacencies:
Communicating door(s) to adjacent classroom(s)
Toilet Rooms

Near:
Common Room
Tot Lot

## MILLWORK / CASEWORK

- M1 - Teacher Wardrobe
- M2 - Lockable storage cabinet
- M3 - Base/wall cabinet unit w/sink
- M5 - Low base/wall cabinet unit w/sink
- M4 - Under-window shelving w/doors, open shelving at center
- M11 - Cubbies with upper lockable shelving
- Countertops at child height

## SPECIALTIES

Visual Display boards / accessories:
- (1) 8′-0″ Interactive Display Board
- (1) Short throw projector
- (1) Technology cart
- (2) 5′-0″ Magnetic white boards
- (1) 6′-0″ Tack board

Window Treatments:
Woven fabric translucent shades

# 1. KINDERGARTEN CLASSROOM

## TECHNICAL CRITERIA

Finish Hardware:
- Classroom lockset
- Door closer
- Side lite in door
- Communicating door:
  - ↳ Classroom Security Lockset

Architectural Finishes:
- Floor: Linoleum
- Base: 4″ resilient vinyl
- Walls: GWB; painted
- Ceiling: ACT

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between Kindergarten classrooms and adjacent spaces: 50-52

Plumbing:
- (1) Accessible sink with hot/cold water and integral drinking fountain at child height.
- (1) Standard height sink for teacher

Mechanical:
- Air conditioning

Lighting:
- (6) 8 ft. pendant mounted dimmable LED fixtures with (2) combination occupancy/ daylight sensors
- ON/OFF controls at the door and multi-scene controls at the front of the classroom

Electrical:
- (8) General duplex receptacles
- (2) GFCI receptacles at counter sink area; (1) duplex receptacle at counters
- (1) Quad receptacle for projector
- (2) Quad receptacles for teacher workstation
- (1) General duplex receptacle inside millwork for charging cabinet
- (1) Single outlet for speech reinforcement amplifier

Data / Communication:
- (2) Hardwired voice/data outlet (1 voice/2 data ports) for teacher workstation
- (1) Hardwired data outlet (2 data ports) for projector
- (1) Interactive short-throw projector connection
- (1) Connection for speech reinforcement system
- (1) Hardwired data outlet (2 data ports) for wireless access point
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset
- (1) Overhead speaker speech reinforcement system

Public Address / Clock:
- (1) Analog clock
- (2) Emergency Call Switches
- (1) PA ceiling speaker

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (1) 110cd speaker-strobe
- (1) 75 candela audiovisual device

# 1. KINDERGARTEN CLASSROOM

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- (2) Paper towel dispensers (at each sink area)
- (3) Soap dispensers (one at each sink)
- (3) Toilet paper dispensers (one at each toilet)

Furniture:

- (1) Teacher desk and chair
- (1) Adjustable height table attachment for teacher desk
- (1) Aide chair
- (6) Rectangular or square tables to seat (4-5) students each OR 24 desks
- (24) Student chairs
- (1) Activity table with chairs for (5) students and a teacher OR (1) Horseshoe table with chairs for (5) students and a teacher

Equipment/Technology:

Equipment:

- (1) Interactive short-throw projector
- (1) Interactive display board
- (1) Technology cart
- Interactive audio system

Mobile Technology:

- (1) Teacher laptop
- (20) Student tablets
- (1) Charging cabinet

Equipment in GC Contract:

- (1) Overhead speech reinforcement speaker

## OTHER INFORMATION

- Communicating doors between classrooms
- Common areas will connect all classrooms in classroom cluster

## NOTES:

Area rug provided by Owner

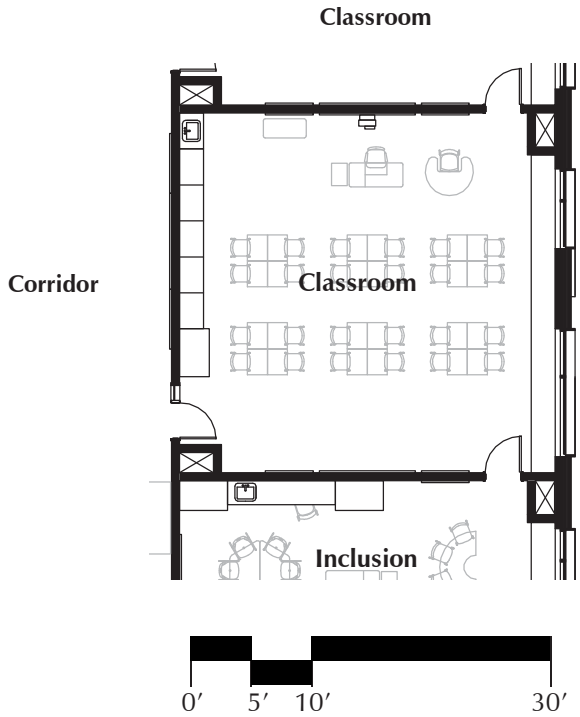
## 1. KINDERGARTEN CLASSROOM

Review Comments:

Reviewed by:

| Name, Title: | Date: |
|---|---|
| X | 08/06/18 |
| | |
| | |
| | |

## 2. GENERAL CLASSROOM




### GENERAL CRITERIA

Description:
Typical classroom intended to support a variety of teaching methods for Grades 1-4. Provisions for a teacher and one aide per classroom.

Area: 925 SF & 965 SF
Quantity: 30 @ 925 SF & 2 @ 965 SF

Users:
(1) Teacher
(20-24) Students (30 max.)
Aides as required

Adjacencies:
- Communicating door(s) to adjacent classroom(s) when possible
- Common Room

### MILLWORK / CASEWORK

- M1 - Teacher Wardrobe
- M3A - Base/wall cabinet unit w/ accessible sink
- M4 - Under-window shelving w/doors, open shelving at center
- M11 - Cubbies with upper lockable shelving
- Countertops at child height

### SPECIALTIES

Visual Display boards / accessories:
- (1) 8′-0″ Interactive Display Board
- (1) Short throw projector
- (1) Technology cart
- (1) 8′-0″ Magnetic white board
- (2) 5′-0″ Tack boards
- (2) 5′-0″ Magnetic white boards

Window Treatments:
Woven fabric translucent shades

# 2. GENERAL CLASSROOM

## TECHNICAL CRITERIA

Finish Hardware:
- Classroom lockset
- Door closer
- Side lite in door
- Communicating door:
  - ↳ Classroom Security Lockset

Architectural Finishes:
- Floor: Linoleum
- Base: 4″ resilient vinyl
- Walls: GWB; painted
- Ceiling: ACT

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between general classrooms and adjacent spaces: 50-52

Plumbing:
- (1) Accessible sink with hot/cold water and integral drinking fountain at child height.

Mechanical:
- Air conditioning

Lighting:
- (6) 8 ft. pendant mounted dimmable LED fixtures with (2) combination occupancy/ daylight sensors
- ON/OFF controls at the door and multi-scene controls at the front of the classroom

Electrical:
- (8) General duplex receptacles
- (1) GFCI receptacle at sink area
- (1) Quad receptacle for projector
- (2) Quad receptacles for teacher workstation
- (1) General duplex receptacle inside millwork for charging cabinet

Data / Communication:
- (1) Hardwired data outlet (2 data ports) for projector
- (1) Hardwired data outlet (2 data ports) for wireless access point
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset
- (1) Overhead speaker speech reinforcement system
- (2) Hardwired voice/data outlets (1 voice/2 data ports) for teacher workstation
- (1) Interactive short-throw projector connection
- (1) Connection for speech reinforcement system

Public Address / Clock:
- (1) Analog clock
- (2) Emergency Call Switches
- (1) PA ceiling speaker

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (1) 110cd speaker-strobe
- (1) 75 candela audiovisual device

# 2. GENERAL CLASSROOM

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- (1) Paper towel dispenser (at sink)
- (1) Soap dispenser (at sink)

Furniture:

- (1) Teacher desk and chair
- (1) Adjustable height table attachment for teacher desk
- (1) Aide chair
- (24) Flat top student desks with storage
- (24) Student chairs
- (1) Activity table with chairs for (5) students and a teacher

Equipment/Technology:

- (1) Interactive short-throw projector
- (1) Interactive display board
- (1) Technology cart
- Interactive audio system

Mobile Technology:

- (1) Teacher laptop
- (20) Student tablets
- (1) Charging cabinet

Equipment included GC Contract:

- (1) Overhead speech reinforcement speaker

## OTHER INFORMATION

- Communicating doors between classrooms where possible
- Common areas will connect all classrooms in grade cluster

## NOTES:

Area rug provided by Owner

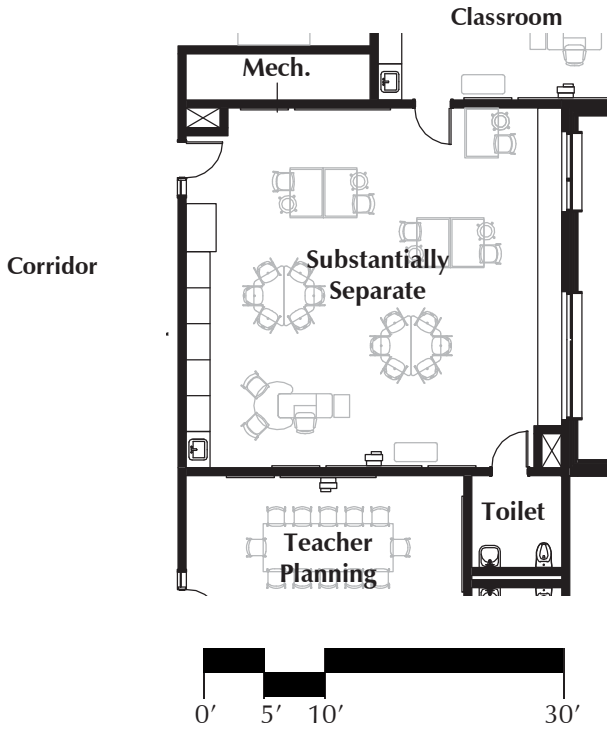
## 2. GENERAL CLASSROOM

Review Comments:

Reviewed by:

Name, Title: Date:

## 3. SUBSTANTIALLY SEPARATE




### GENERAL CRITERIA

Description:
There will be four self-contained SPED classrooms. Each "L" wing includes one self-contained SPED classrom per level. These spaces provide separate but adjacent classrooms in cases where students with special needs require a separate settting for instruction.

Dedicaticated SPED toilets require adequate space for wheechair accessibility and one adjustable height changing table.

Area: 1,005 SF (925 SF classroom w/ 80 SF toilet)
Quantity: 4
Users:
(12) Students
(1) Teacher
Aides as required

Adjacencies:
- Adjacency to general education classrooms
- Direct access to dedicated toilet

### MILLWORK / CASEWORK

- M1 - Teacher Wardrobe
- M4 - Under-window shelving, all open
- M3A - Base/wall cabinet unit w/ accessible sink
- M11 - Cubbies with upper lockable shelving

### SPECIALTIES

Visual Display boards / accessories:
- (1) 8′-0″ Interactive Display Board
- (1) Short throw projector
- (1) Technology cart
- (1) 8′-0″ Magnetic white board
- (2) 5′-0″ Magnetic white boards
- (1) 4′-0″ Tack board

Window Treatments:
Woven fabric translucent shades

## 3. SUBSTANTIALLY SEPARATE

### TECHNICAL CRITERIA

Finish Hardware:
Main Door
- ↳ Classroom lock set
- ↳ Side lite

Communicating door(s)
- ↳ Classroom Security lock set

Architectural Finishes:
- Floor: Linoleum
- Base: 4″ resilient vinyl
- Walls: GWB; painted
- Ceiling: ACT

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between Self Contained SPED and adjacent spaces: 50-52

Plumbing:
- (1) Accessible sink with hot/cold water and integral drinking fountain at child height.
- Sink to be adjacent to toilet room with space for diaper changing and storage as required

Mechanical:
- Air conditioning

Lighting:
- (6) 8 ft. pendant mounted dimmable LED fixtures with (2) combination occupancy/ daylight sensors
- ON/OFF controls at the door and multi-scene controls at the front of the classroom

Electrical:
- (8) General duplex receptacles
- (1) GFCI receptacle at counter sink area; (2) duplex receptacles at counters
- (1) Quad receptacle for projector
- (2) Quad receptacles for teacher workstation
- (1) General duplex receptacle inside millwork for charging cabinet
- (1) Single outlet for speech reinforcement amplifier

Data / Communication:
- (1) Hardwired data outlet (2 data ports) for projector
- (1) Hardwired data outlet (2 data ports) for wireless access point
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset
- (1) Overhead speaker speech reinforcement system
- (2) Hardwired voice/data outlets (1 voice/2 data ports) for teacher workstation
- (1) Interactive short-throw projector connections
- (1) Connection for speech reinforcement system

Public Address / Clock:
- (1) Analog clock
- (2) Emergency Call Switches
- (1) PA ceiling speaker

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (1) 110cd speaker-strobe
- (1) 75 candela audiovisual device

## 3. SUBSTANTIALLY SEPARATE

### FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- (2) Paper towel dispensers (at each sink area)
- (1) Toilet paper dispenser
- (2) Soap dispensers (at each sink area)
- (2) Free standing waste receptacle(s)
- (1) Changing station with storage

Furniture:

- (1) Teacher desk and chair
- (1) Adjustable height table attachment for teacher desk
- (2) Wheeled chairs for aides
- (1) Cubicle fixed to wall
- (4-5) Cubicles freestanding
- (12) Student chairs
- (2) Group work tables with (6) chairs ea.
- (1) Technology Cart

Equipment/Technology:

- (1) Interactive short-throw projector
- (1) Interactive display board
- (1) Technology cart
- Interactive audio system

Mobile Technology:

- (1) Charging cabinet

Equipment Included in GC Contract:

- (1) Overhead speech reinforcement speaker

### OTHER INFORMATION

- Communicating doors to adjacent classrooms

### NOTES:

Area rug provided by owner

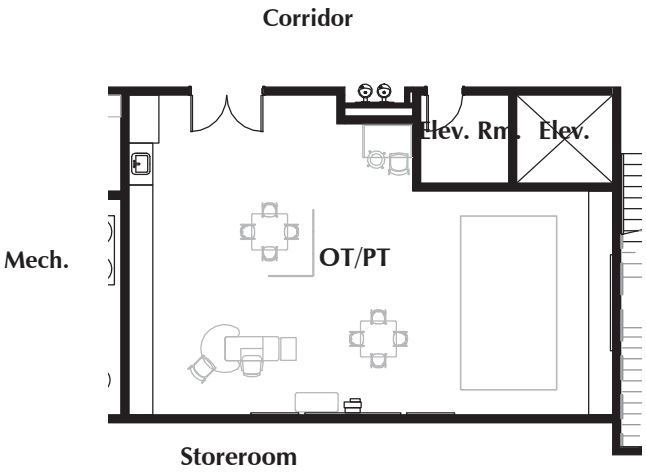
## 3. SUBSTANTIALLY SEPARATE

Review Comments:

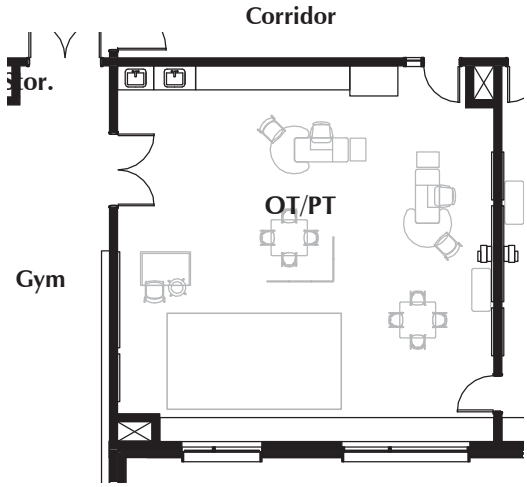
Reviewed by:

Name, Title: Date:

## 4. OT/PT




Ground Floor OT/PT




Main Floor OT/PT

### GENERAL CRITERIA

Description:
Special Education space to teach students manual and physical dexterity. Students rotate into this space during the day. The primary OT/PT room closer to the gym may be larger than the other due to greater need to support co-treatment services, which may require additional staff and space.

Area: 950 SF (Ground Flr.) and 950 SF (Main Flr.)
Quantity: 2
Users: (1-3) OT/PT staff
(6) Students maximum
Aides as required

Adjacencies:
- One adjacent to Gymnasium
- One adjacent to Nurse
- Exit door
- Elevator

### MILLWORK / CASEWORK

- M1 - Teacher wardrobe
- M3 - Base/wall cabinet unit w/sink
- M5 - Low cabinet base with accessible sink (for primary OT/PT room)
- M4 - (30″ deep) Under-window/low open shelving

### SPECIALTIES

Visual Display boards / accessories:
- (1) 8′-0″ Interactive Display Board
- (1) Short throw projector
- (1) Technology cart
- (1) 8′-0″ Magnetic white board
- (2) 5′-0″ Magnetic white boards

Window Treatments:
Woven fabric translucent shades
Miscellaneous:
Wall mounted mirrors on one wall

# 4. OT/PT

## TECHNICAL CRITERIA

Finish Hardware:
Main Door
- ↳ Classroom lockset
- ↳ Side lite

Communicating Door
- ↳ Classroom Security lock set

Architectural Finishes:
- Floor: Linoleum
- Base: 4″ resilient vinyl
- Walls: Abuse resistant GWB (painted), Secure wall pads
- Ceiling: Exposed structure (painted) w/ ability to hang swing

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between self contained SPED and adjacent spaces: 50-52

Plumbing:
- (1) Accessible sink with hot/cold water and integral drinking fountain at child height.
- (1) Non-accessible sink with hot/cold water

Mechanical:
- Air conditioning

Lighting:
- (6) 8 ft. recessed dimmable Dali controlled LED fixtures with (2) combination occupancy/ daylight sensors
- ON/OFF controls at the door and multi-scene controls at the front of the classroom

Electrical:
- (6) General duplex receptacles
- (1) Quad receptacle for teacher workstation
- (1) Quad receptacle for projector

Data / Communication:
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset
- (1) Hardwired data outlet (2 data ports) for wireless access point
- (1) Hardwired data outlet (2 data ports) for projector
- (1) Interactive short-throw projector connections
- (1) Overhead speaker speech reinforcement system
- (2) Hardwired voice/data outlets (1 voice/2 data ports) for teacher workstation

Public Address / Clock:
- (1) Analog clock
- (2) Emergency Call Switches
- (1) Talk back speaker

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (1) 110cd speaker-strobe
- (1) 75 candela audiovisual device

# 4. OT/PT

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- Paper towel and soap dispensers at all sinks

Fixtures included in GC Contract:

- Wall-mounted mirror on one wall
- Perimeter wall pads

Furniture:

- (1) Teacher desk and chair (Additional teacher desk required in the main floor OT/PT room)
- (1) Adjustable height table attachment for teacher desk (Additional one required in the main floor OT/PT room)
- (1) Aide chair
- (1) Cubicle (movable)
- (2) Group tables w/ 4-6 chairs
- 8′-0″ wide foldable treatment table

Equipment/Technology:

- (1) Interactive display board
- (1) Short throw projector
- (1) Technology cart
- Ceiling-mounted swing (structure required)
- Manipulatives
- Floor mats

Mobile Technology:

- (2) Teacher laptops

Equipment Included in GC Contract:

- (1) Overhead speech reinforcement speaker

## OTHER INFORMATION

- Communicating door to gym in main floor OT/PT room

## NOTES:

- Need full list of desired OT/PT equipment

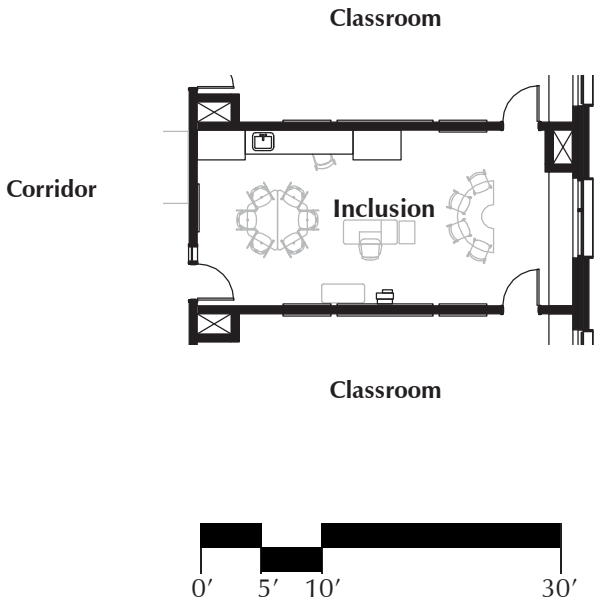
## 4. OT/PT

Review Comments:

Reviewed by:

Name, Title: Date:

## 5. RESOURCE ROOM/ INCLUSION




### GENERAL CRITERIA

Description:
Flexible teachers' space to be used for curriculum planning and storage, team teacher collaboration, and private parent-teacher meetings.

Area: 450 SF
Quantity: 12
Users:
(1-2) Teachers
(6-8) Students
Aides as required

Adjacencies:
- Adjacent with visibility to the common room for supervision where practical
- Dispersed among classrooms

### MILLWORK / CASEWORK

- M1 - (2) Teacher wardrobes
- M3A - Accessible sink and base cabinet; lockable upper cabinets
- M4 - Lockable under-window shelving
- 30″ High counter (desk height) next to sink base cabinet

### SPECIALTIES

Visual Display boards / accessories:
- (1) 8′-0″ Interactive Display Board
- (1) Short throw projector
- (1) Technology cart
- (2) 5′-0″ Magnetic white boards
- (1) 6′-0″ Tack board

Window Treatments:
Woven fabric translucent shades

# 5. RESOURCE ROOM/ INCLUSION

## TECHNICAL CRITERIA

Finish Hardware:
Main Door
- ↳ Classroom lockset
- ↳ Side lite

Communicating Door
- ↳ Classroom Security lock set

Architectural Finishes:
- Floor: Linoleum
- Base: 4″ resilient vinyl
- Walls: GWB; painted
- Ceiling: ACT

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between self contained SPED and adjacent spaces: 50-52

Plumbing:
- (1) Accessible sink with hot/cold water and integral drinking fountain at child height.

Mechanical:
- Air conditioning

Lighting:
- (2) 8 ft. pendant mounted dimmable LED fixtures with (2) combination occupancy/ daylight sensors
- ON/OFF controls at the door and multi-scene controls at the front of the classroom

Electrical:
- (4) General duplex receptacles
- (1) Quad receptacle for projector
- (1) Quad receptacle for teacher workstation
- (1) General duplex receptacle inside millwork for charging cabinet

Data / Communication:
- (1) Hardwired data outlet (2 data ports) for wireless access point
- (1) Hardwired data outlet (2 data ports) for projector
- (1) Interactive short-throw projector connections
- (1) Hardwired data outlet (2 data ports) for teacher work station
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset
- (1) Overhead speaker speech reinforcement system

Public Address / Clock:
- (1) Analog clock
- (2) Emergency Call Switches
- (1) Talk back speaker

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (1) 110cd speaker-strobe

# 5. RESOURCE ROOM/ INCLUSION

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

N/A

Furniture:

- (1) Teacher desk and chair
- (1) Aide rolling chair
- (2) Group work tables - 1 (modular) with (6) chairs & 1 horseshoe table to seat (4) students and one teacher
- (1) Technology cart/table

Equipment/Technology:

- (1) Interactive short-throw projector
- (1) Interactive display board
- (1) Technology cart

Mobile Technology:

- N/A

Equipment Included in GC Contract:

- (1) Overhead speech reinforcement speaker

## OTHER INFORMATION

## NOTES:

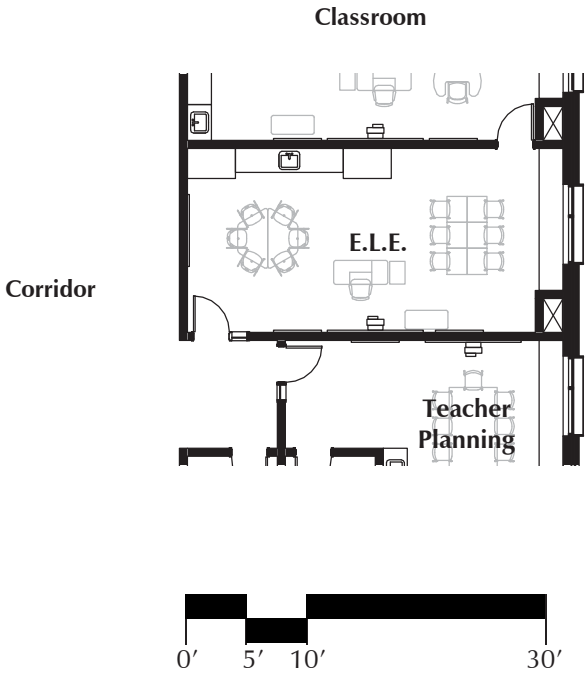
## 5. RESOURCE ROOM/ INCLUSION

Review Comments:

Reviewed by:

Name, Title: Date:

## 6. ELE ENGLISH LANGUAGE EDUCATION




### GENERAL CRITERIA

Description:
This classroom is outfitted to practice speaking and listening to the subject language.

Area: 470 SF
Quantity: 3
Users:
(1) Teacher
(8-12) Students

Adjacencies:
- Centrally located on each floor to each "L" wing
- Instructional coaches where possible

### MILLWORK / CASEWORK

M1 - Teacher wardrobe
M2 - Storage unit
M3A - Accessible sink and base cabinet; lockable upper cabinets
M4 - Lockable under-window shelving

### SPECIALTIES

Visual Display boards / accessories:
- (1) 8′-0″ Interactive Display Board
- (1) Short throw projector
- (1) Technology cart
- (2) 5′-0″ Magnetic white boards
- (1) 6′-0″ Tack board

Window Treatments:
Woven fabric translucent shades

# 6. ELE ENGLISH LANGUAGE EDUCATION

## TECHNICAL CRITERIA

Finish Hardware:
Main Door
- ↳ Classroom lockset
- ↳ Side lite

Communicating Door
- ↳ Classroom Security lock set

Architectural Finishes:
- Floor: Linoleum
- Base: 4″ resilient vinyl
- Walls: GWB; painted
- Ceiling: ACT

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between general classrooms and adjacent spaces: 50-52

Plumbing:
- (1) Accessible sink with hot/cold water and integral drinking fountain at child height.

Mechanical:
- Air conditioning

Lighting:
- (2) 8 ft. pendant mounted dimmable LED fixtures with (2) combination occupancy/ daylight sensors
- ON/OFF controls at the door and multi-scene controls at the front of the classroom

Electrical:
- (4) General duplex receptacles
- (1) Quad receptacle for teacher workstation
- (1) Quad receptacle for projector
- (1) General duplex receptacle inside millwork for charging cabinet
- (1) Single outlet for speech reinforcement amplifier
- (1) GFCI receptacle at sink area; (2) duplex receptacles at counters

Data / Communication:
- (1) Hardwired data outlet (2 data ports) for wireless access point
- (1) Interactive short-throw projector connection
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset
- (1) Hardwired data outlet (2 data ports) for projector
- (1) Overhead speaker speech reinforcement system
- (2) Hardwired voice/data outlet (1 voice/2 data ports) for teacher workstation
- (1) Connection for speech reinforcement system

Public Address / Clock:
- (1) Analog clock
- (2) Emergency Call Switches
- (1) Talk back speaker

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (1) 110cd speaker-strobe
- (1) 75 candela audiovisual device

# 6. ELE ENGLISH LANGUAGE EDUCATION

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- Soap and Paper towel dispenser at sink

Furniture:

- (1) Teacher desk and chair
- (6) Flat top student desks with storage (No desks in room in Kindergarten wing)
- (6) Student chairs
- (1) Group horseshoe table to seat (4) students and one teacher OR
- (1) Group work table (modular) with (6) chairs
- (1) Technology cart/table

Equipment/Technology:

- (1) Interactive short-throw projector
- (1) Interactive display board
- (1) Technology cart

Mobile Technology:

- (1) Teacher laptop
- (#) Student tablets
- (1) Charging cabinet

Equipment included GC Contract:

- (1) Overhead speech reinforcement speaker

## OTHER INFORMATION

- Communicating doors to adjacent classrooms

## NOTES:

Area rug provided by owner for ELE room in Kindergarten wing only

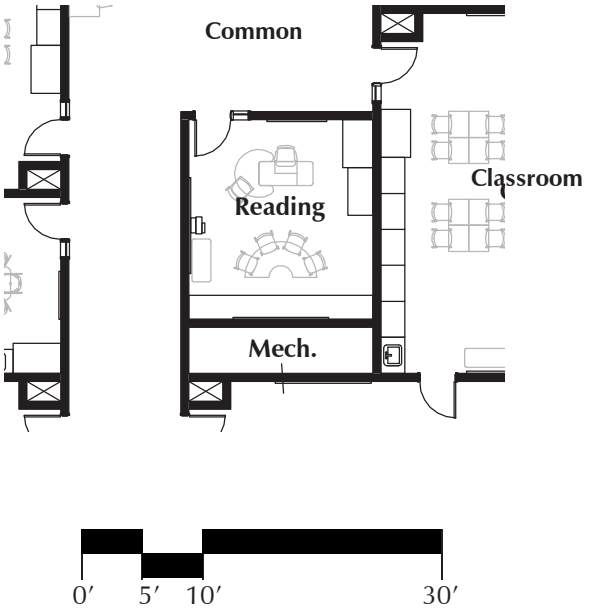
## 6. ELE ENGLISH LANGUAGE EDUCATION

Review Comments:

Reviewed by:

Name, Title: Date:

# 7. READING




## GENERAL CRITERIA

Description:
A flexible space intended for instruction of reading, writing, research, testing and after school homework.

Area: 250 SF
Quantity: 3
Users:
(1) Teacher
(3-6) Students
Aides as required

Adjacencies:
- Centrally located to each classroom cluster near a common room
- Near Instructional Coaches where possible

## MILLWORK / CASEWORK

- M1 - Teacher Wardrobe
- M3 - Lockable base and upper cabinets
- M4 - Lockable low shelving

## SPECIALTIES

Visual Display boards / accessories:
- (1) 8′-0″ Interactive Display Board
- (1) Short throw projector
- (1) Technology cart
- (1) 8′-0″ Magnetic white board
- (1) 6′-0″ Tack board

Window Treatments:
N/A

# 7. READING

## TECHNICAL CRITERIA

Finish Hardware:
Main Door
- ↳ Classroom lockset
- ↳ Side lite

Communicating Door
- ↳ Classroom Security lock set

Architectural Finishes:
- Floor: Linoleum
- Base: 4″ resilient vinyl
- Walls: GWB; painted
- Ceiling: ACT

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between general classrooms and adjacent spaces: 55

Plumbing:
- N/A

Mechanical:
- Air conditioning

Lighting:
- (1) 8 ft. pendant mounted dimmable LED fixtures with (2) combination occupancy/ daylight sensors
- ON/OFF controls at the door and multi-scene controls at the front of the classroom

Electrical:
- (4) General duplex receptacles
- (1) Quad receptacle for teacher workstation
- (1) Quad receptacle for projector
- (1) General duplex receptacle inside millwork for charging cabinet
- (1) Single outlet for speech reinforcement amplifier

Data / Communication:
- (1) Hardwired data outlet (2 data ports) for wireless access point
- (1) Interactive short-throw projector connection
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset
- (1) Hardwired data outlet (2 data ports) for projector
- (1) Overhead speaker speech reinforcement system
- (2) Hardwired voice/data outlet (1 voice/2 data ports) for teacher workstation
- (1) Connection for speech reinforcement system

Public Address / Clock:
- (1) Analog clock
- (2) Emergency Call Switches
- (1) Talk back speaker

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (1) 110cd speaker-strobe
- (1) 75 candela audiovisual device

# 7. READING

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

N/A

Furniture:

- (1) Teacher desk and chair
- (1) Adjustable height table attachment for teacher desk
- (1) Aide chair
- (1) Group table- kidney shaped, horseshoe or other w/ (6) chairs

Equipment/Technology:

- (1) Interactive short-throw projector
- (1) Interactive display board
- (1) Technology cart

Mobile Technology:

- (1) Teacher laptop
- (#) Student tablets
- (1) Charging cabinet

Equipment included GC Contract:

- (1) Overhead speech reinforcement speaker

## OTHER INFORMATION

No communicating doors

## NOTES:

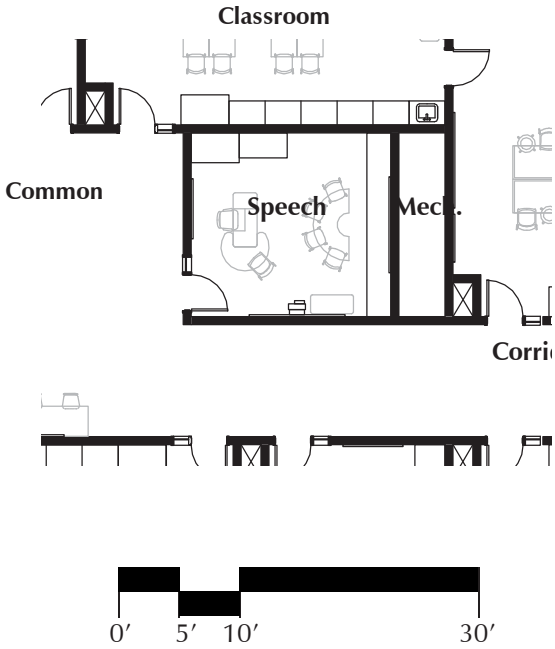
## 7. READING

Review Comments:

Reviewed by:

Name, Title: Date:

## 8. SPEECH




### GENERAL CRITERIA

Description:
Space used for the specialized instruction of Speech for students with special language needs and students with disabilities. A speech room is located on each floor level of the school with one in the Kindergarten wing.

Area: 250 SF
Quantity: 2
Users:
(1) Teacher
(1-6) Students
Aides as required

Adjacencies:
- Classroom clusters

Orientation/Views:
Could be an interior space (no windows)

### MILLWORK / CASEWORK

- M1 - Teacher wardrobe
- M3 - Lockable base and upper cabinets
- M4 - Low shelving w/doors, open shelving at center

### SPECIALTIES

Visual Display boards / accessories:
- (1) 8′-0″ Interactive Display Board
- (1) Short throw projector
- (1) Technology cart
- (1) 8′-0″ Magnetic white board
- (1) 6′-0″ Tack board

Window Treatments:
N/A

# 8. SPEECH

## TECHNICAL CRITERIA

Finish Hardware:
Main Door
- ↳ Classroom lockset
- ↳ Side lite

Communicating Door
- ↳ Classroom Security lock set

Architectural Finishes:
- Floor: Linoleum
- Base: 4″ resilient vinyl
- Walls: GWB; painted
- Ceiling: ACT

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between general classrooms and adjacent spaces: 55

Plumbing:
- N/A

Mechanical:
- Individual climate control
- Air conditioning

Lighting:
- (1) 8 ft. pendant mounted dimmable LED fixtures with (2) combination occupancy/ daylight sensors
- ON/OFF controls at the door and multi-scene controls at the front of the classroom

Electrical:
- (4) General duplex receptacles
- (1) Quad receptacle for teacher workstation
- (1) Quad receptacle for projector
- (1) General duplex receptacle inside millwork for charging cabinet

Data / Communication:
- (1) Hardwired data outlet (2 data ports) for wireless access point
- (1) Interactive short-throw projector connections
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset
- (1) Hardwired data outlet (2 data ports) for projector
- (1) Overhead speaker speech reinforcement system
- (2) Hardwired voice/data outlet (1 voice/2 data ports) for teacher workstation

Public Address / Clock:
- (1) Analog clock
- (2) Emergency Call Switches
- (1) Talk back speaker

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (1) 110cd speaker-strobe
- (1) 15 candela audiovisual device

# 8. SPEECH

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

N/A

Furniture:

- (1) Teacher desk and chair
- (1) Adjustable height table attachment for teacher desk
- (1) Aide chair
- (1) Group horseshoe table w/ (6) student chairs

Equipment/Technology:

- (1) Interactive short-throw projector
- (1) Interactive display board
- (1) Technology cart

Mobile Technology:

- (1) Teacher laptop
- (#) Student tablets
- (1) Charging cabinet

Equipment included GC Contract:

- (1) Overhead speech reinforcement speaker

## OTHER INFORMATION

No communicating doors

## NOTES:

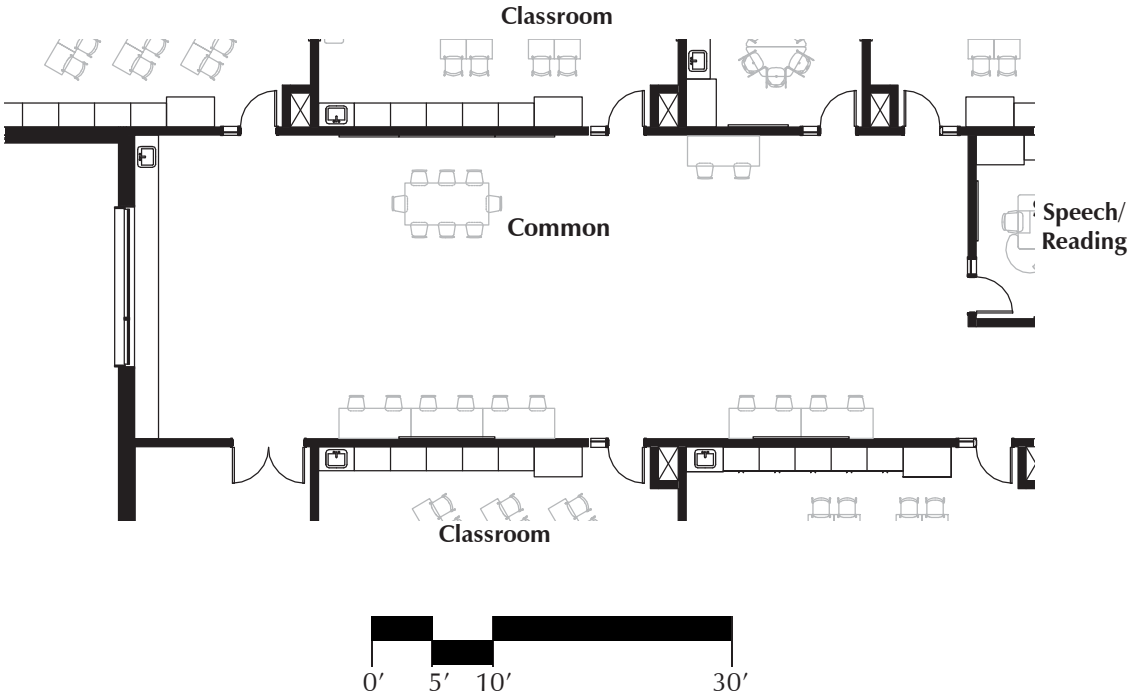
## 8. SPEECH

Review Comments:

Reviewed by:

Name, Title: Date:

# 9. COMMON




## GENERAL CRITERIA

Description:
Flexible use space dedicated to each classroom cluster, for use in combining multiple classes, pullout instruction, and project-based learning.

Area: 785-990 SF each
(6,315 SF of Common Space total)

Quantity: 7
Users:
1-2 Classrooms OR
(20-48) Students
(1-2) Teachers
Aides as required

Adjacencies:
- Direct adjacency to classrooms in the associated classroom wing

## MILLWORK / CASEWORK

- M4 - Lockable shelving with counter along wall
- M3A - Base cabinet unit w/ accessible sink
- M3 - Base cabinets at window wall (no wall cabinets)

## SPECIALTIES

Visual Display boards / accessories:
(1) Motorized projection screen
(1) Ceiling-mounted projector
(3) 8′-0″ Magnetic white boards
(2) 5′-0″ Tack boards

Window Treatments:
Woven translucent window shades

# 9. COMMON

## TECHNICAL CRITERIA

Finish Hardware:
N/A

Architectural Finishes:
- Floor: Linoleum
- Base: 4″ resilient vinyl
- Walls: Ceramic tile (5′ high); painted GWB above
- Ceiling: Specialty ceiling

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between general classrooms and adjacent spaces: 50-52

Plumbing:
- (1) Accessible sink with hot/cold water and integral drinking fountain at child height.

Mechanical:
- Air conditioning

Lighting:
- (24) Downlight LED fixtures with (2) combination occupancy/ daylight sensors
- ON/OFF controls and multi-scene controls

Electrical:
- (4) General duplex receptacles
- (1) Quad receptacle for projector
- (1) Duplex receptable for motorized projection screen

Data / Communication:
- (1) Projector connection
- (1) Hardwired data outlet (2 data ports) for projector
- (1) Hardwired data outlet (2 data ports) for wireless access point
- (1) Overhead speaker speech reinforcement system

Public Address / Clock:
- (1) Analog clock
- (2) Emergency Call Switches
- (1) Talk back speaker

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (1) 175cd speaker-strobe

# 9. COMMON

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- Paper towel dispenser and soap dispenser at sink area

Furniture:

- (7-8) Movable group tables or flip and nest tables
- (20-24) Student chairs

Equipment/Technology:

(1) Ceiling-mounted projector

Equipment included GC Contract:

- (1) Overhead speech reinforcement speaker

## OTHER INFORMATION

- Keep space open, any millwork to be along a wall

## NOTES:

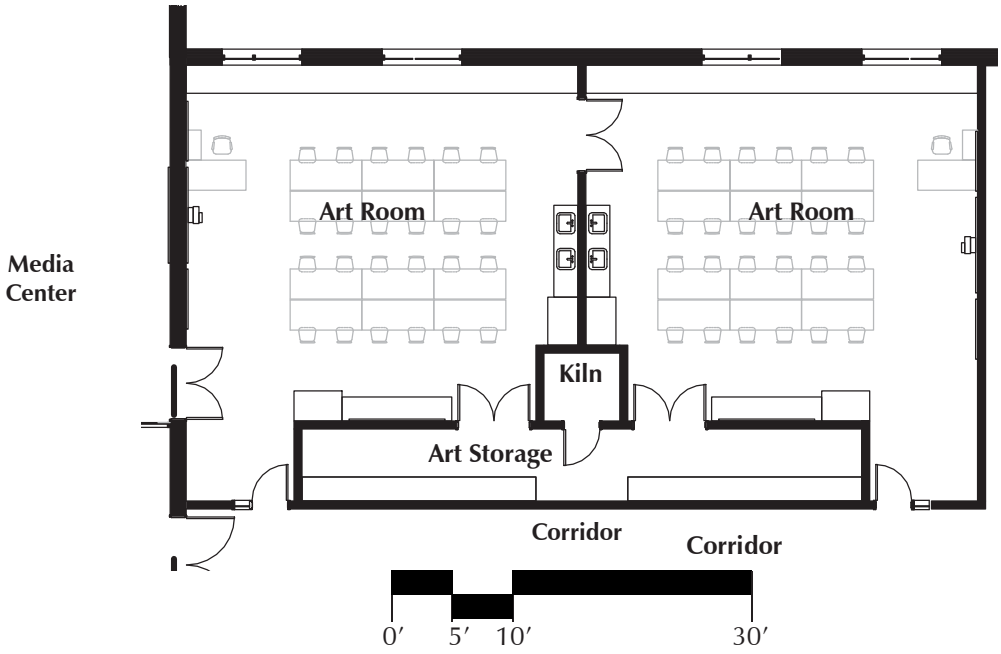
## 9. COMMON

Review Comments:

Reviewed by:

Name, Title: Date:

## 10. ART CLASSROOM




### GENERAL CRITERIA

Description:

An essential component of the STEAM program, all students (K-4) attend a weekly art class. The program does include air-dry clay as well as a variety of media throughout the year. The two art rooms are joined with a shared storage room and a kiln room.

Area: 1,000 SF
Quantity: 2
Users:
(1-2) Teacher
(25) Students per classroom
Aides as required

Adjacencies:
- Must be adjacent to Media Center
- Art Rooms are part of central/core spaces
- Art Rooms to be adjacent to each other
- Exit door

### MILLWORK / CASEWORK

- M1 - Teacher Wardrobe (lockable)
- M2 - Supply Cabinet (lockable)
- M3 - Base/wall cabinet unit w/sink
- M5 - Low, accessible base/wall cabinet unit w/ sink
- M4A - Under-window shelving (pullout drawers at ends)

### SPECIALTIES

Visual Display boards / accessories:
- (1) 8′-0″ Interactive Display Board
- (1) Short throw projector
- (1) Technology cart
- (2) 5′-0″ Magnetic whiteboards
- (1) 8′-0″ Tack board

Window Treatments:
- Woven fabric shades
- Sun control devices for west facing windows

# 10. ART CLASSROOM

## TECHNICAL CRITERIA

Finish Hardware:
Main Door
↳ Classroom lock set
↳ Side lite
Communicating door(s)
↳ Classroom Security lock set

Architectural Finishes:
- Floor: Linoleum
- Base: 4" resilient vinyl
- Walls: GWB; painted
- Ceiling: Specialty ceiling

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between self contained SPED and adjacent spaces: 50-52

Plumbing:
- (1) Deep sink with solids interceptor and spray hose
- (1) Accessible deep sink (student height) with hot/cold water, integral drinking fountain, and solids interceptor

Mechanical:
- Individual climate control
- Air conditioning

Lighting:
- (6) 8 ft. pendant mounted dimmable LED fixtures with (2) combination occupancy/ daylight sensors
- ON/OFF controls at the door(s)
- Maximize natural lighting

Electrical:
- (2) Counter duplex GFCI receptacles
- (2) Counter duplex receptacles
- (8) General duplex receptacles
- (2) Quad receptacles for teacher workstation
- (1) Quad receptacle for projector
- (1) Single receptacle for speech reinforcement system

Data / Communication:
- (1) Hardwired data outlet (2 data ports) for wireless access point
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset
- (1) Hardwired data outlet (2 data ports) for projector
- (1) Interactive short-throw projector connections
- (1) Overhead speaker speech reinforcement system
- (2) Hardwired voice/data outlet (1 voice/2 data ports) for teacher workstation
- (1) Connection for speech reinforcement system

Public Address / Clock:
- (1) Analog clock
- (2) Emergency Call Switches
- (1) PA ceiling speaker

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (1) 110cd speaker-strobe
- (1) 75 candela audiovisual device

# 10. ART CLASSROOM

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- Paper towel and soap dispensers at all sinks

Furniture:

- (1) Teacher desk and chair per classroom
- (6) 4 Station Drawing Tables: 60″ x 72″
- (25) Student chairs
- (1) Drying cabinet in Art Storage (for air-dry clay)

Equipment/Technology:

- (1) Interactive short-throw projector
- (1) Interactive display board
- (1) Technology cart

Mobile Technology:

- (1) Teacher laptop
- (1) Charging cabinet

Equipment included GC Contract:

- (1) Overhead speech reinforcement speaker

## OTHER INFORMATION

- Communicating double doors between art rooms
- Communicating door to media center

## NOTES:

- Area rug provided by owner

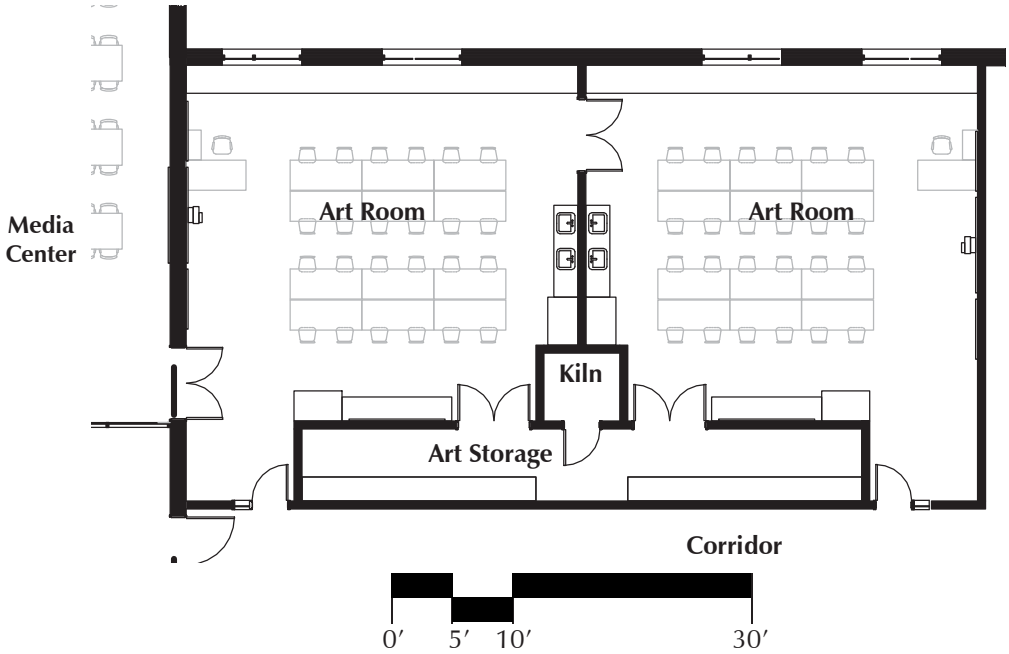
## 10. ART CLASSROOM

Review Comments:

Reviewed by:

Name, Title: Date:

## 11. ART STORAGE




### GENERAL CRITERIA

Description:
Flexible and secure storage for Art Room supplies and student work. The storage area will be shared between the two art classrooms and will include space for a kiln.

Area/Quantity: 1 @ 300 SF

Users:
(1) Teacher
(25) Students to have access

Adjacencies:
- Direct connection to Art classrooms
- Close proximity to Media Center

### MILLWORK / CASEWORK

M3 - Wall and base cabinets w/ extra deep counter. Open shelves or drawers in lower cabinets, adjustable shelves at upper cabinets. Non-porous/ solid surface countertops
(2) - Open shelving units with adjustable shelves

### SPECIALTIES

Visual Display boards / accessories:
(1) 6′-0″ Tack board

Window Treatments:
N/A

# 11. ART STORAGE

## TECHNICAL CRITERIA

Finish Hardware:
- Main door:
  - ↳ Storeroom Lockset
  - ↳ Door closer
  - ↳ Vision lite

Architectural Finishes:

Floor: Linoleum
Base: 4″ resilient vinyl
Walls: GWB; painted
Ceiling: ACT

Acoustical Requirements:

Sound Transmission Coefficient (STC) rating between general classrooms and adjacent spaces: 50-52

Plumbing:

N/A

Mechanical:
- Air conditioning

Lighting:
- (4) 2x4 recessed LED fixtures with (1) combination occupancy/daylight sensors
- ON/OFF controls at the door and multi-scene controls at the front of the classroom

Electrical:
- (4) General duplex receptacles

Data / Communication:

N/A

Public Address / Clock:

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- Ordinary-Hazard Sprinkler Coverage in Art Storage
- (1) Smoke detector

# 11. ART STORAGE

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

N/A

Furniture:

- (2) Mobile drying racks
- Maximize adjustable shelving racks
- Wood Storage Paper Organizer to fit 18″x24″ paper max.
- Paper Cutter (measures 20 3/4″W x 33″D)

Equipment/Technology:

- (1) Drying cabinet

Mobile Technology
N/A

Equipment included in GC contract:

- (1) Overhead speech reinforcement speaker

## OTHER INFORMATION

- See specifications for selected kiln model

## NOTES:

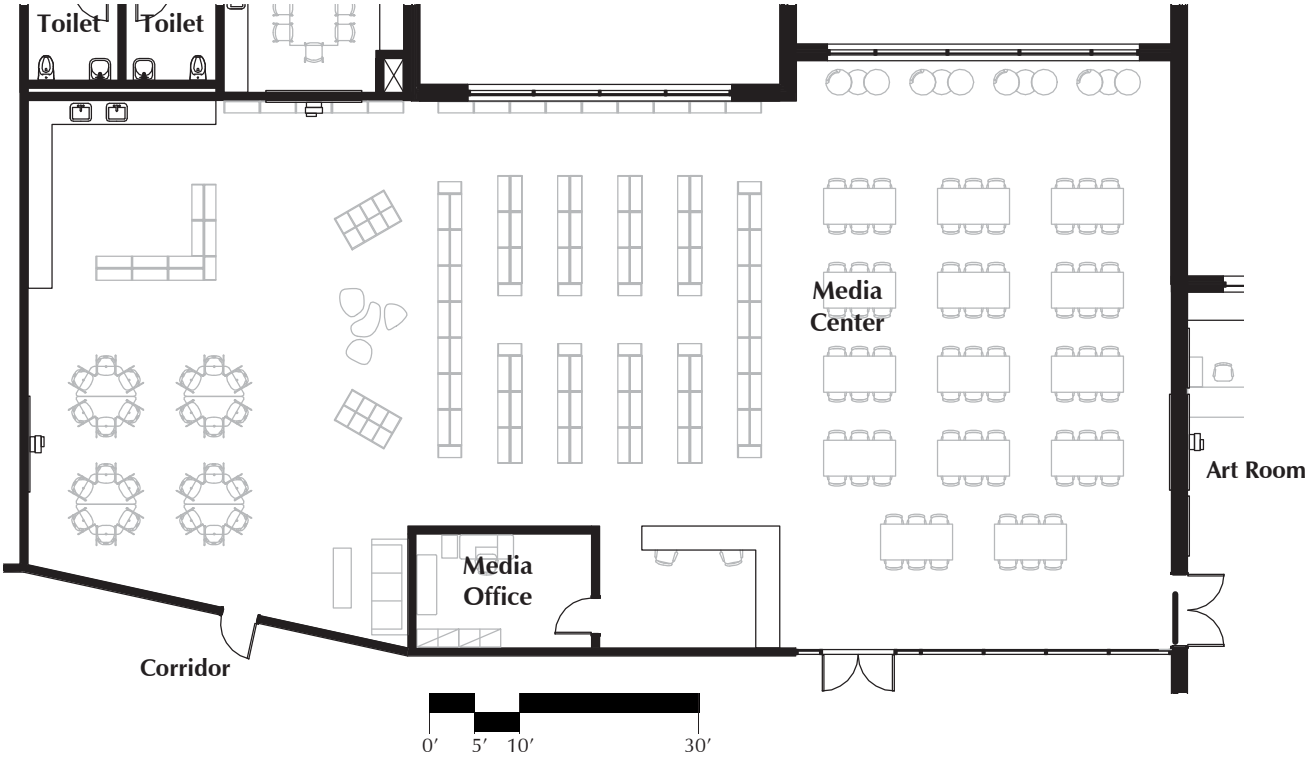
## 11. ART STORAGE

Review Comments:

Reviewed by:

Name, Title: Date:

## 12. MEDIA CENTER




### GENERAL CRITERIA

Description:
As part of the "hub" of the school, the Media Center is the primary space for the STEAM program and has an integral Maker Space that has a relationship with the Art Room. The Media Center will have print and digital collections and will support project-based learning experiences. The space will also accommodate large faculty meetings, community meetings, and gatherings for Extended School Care.

Area: 4,225 SF
Quantity: 1
Users:

(40 - 50/2 classes) Students at a time
(80) Staff for meetings
(1) Full-time Media Paraprofessional
(1) Media Specialist (rotating)
(20-24/1 class) Students in Maker Space

Adjacencies:

- Direct access to at least one Art Room
- Must be centrally located within school

### MILLWORK / CASEWORK

- M1 - Teacher Wardrobe
- M2 - Storage cabinet
- Circulation desk for 2 adults
- M3 - Base/wall cabinet unit w/sink
- M5 - Low base/wall cabinet unit w/ accessible sink
- M10 - Custom circulation desk

### SPECIALTIES

Visual Display boards / accessories:

- (1) Motorized projection screen
- (1) Ceiling-mounted projector
- (2) 8′-0″ Interactive Display Boards
- (2) Short throw projectors
- (2) Technology carts
- (1-2) 8′-0″ Magnetic white boards

Window Treatments:

- Woven fabric translucent shades
- Sun control devices for west facing windows

# 12. MEDIA CENTER

## TECHNICAL CRITERIA

Finish Hardware:
- Exit devices
- Door closers

Architectural Finishes:
- Floor: Carpet
- Base: 4″ resilient vinyl
- Walls: GWB, Painted
- Ceiling: ACT/Specialty
- Other standard library finishes

Acoustical Requirements:

Sound Transmission Coefficient (STC) rating at partitions between Media Center and adjacent spaces: 47-49

Plumbing:
- Accessible drinking fountain

Mechanical:
- Air Conditioned

Lighting:
- (30) pendant mount LED fixtures with (5) combination occupancy/daylight sensors
- ON/OFF multi-scene controls at the door

Electrical:
- (10) General duplex receptacles
- (2) Quad receptacles for projectors
- (2) Quad receptacles for teacher workstation
- (1) Duplex receptacle for copier/printer
- Connections for circulation desk equipment
- (8) General duplex receptacles for Maker Space area
- (1) Single outlet for speech reinforcement

Data / Communication:
- (1) Hardwired data outlet (2 data ports) for wireless access point
- (3) Wall phone outlet (1 data port) and (1) VoIP telephone handset
- (2) Hardwired data outlets (2 data ports each) for projector
- (2) Interactive short-throw projector connections
- Power for (25 Ipad) charging cart
- (1) Overhead speaker speech reinforcement system
- (3) Hardwired voice/data outlet (1 voice/2 data ports) for teacher workstation
- (1) Connection for speech reinforcement

Public Address / Clock:
- (2) Analog clocks
- (2) Emergency Call Switches
- (1) Talk back speaker
- (4) Paging speakers

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (4) 110cd speaker-strobe

# 12. MEDIA CENTER

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- Paper towel and soap dispensers at all sinks

Furniture:

- (100) – 36″wx42″h movable single sided shelving units (to be confirmed)
- (13) – 24″wx42″h single sided shelving units (to be confirmed)
- (2) Book bin units w/ 8 bins each
- (1) Desk in media office and desk chair
- (1) File cabinet
- (4) Group tables with (24) Chairs
- (14) Group tables (to seat 6 each) with 84 chairs
- (1) Story time couch
- (2) Movable craft carts for Maker Space

Equipment/Technology:

Equipment:

- (1) 3D printer
- (1) Charging cabinet
- (2) 8′-0″ Interactive Display Boards
- (2) Short throw projectors
- (2) Technology carts
- (1) Printer/copier
- (1) Librarian computer station or laptop
- (1) Digital card catalog computer station
- Book scanning system

Mobile Technology:

- (1) Librarian computer or laptop
- (24) Student tablets in charging cart (shared with art department)

Equipment in GC Contract:

- (1) Overhead speech reinforcement speaker/ local sound system

## OTHER INFORMATION

- There will be an estimated (4,000) books per grade level for a total of (20,000) books to be stored on mobile shelving units and open bins in the Media Center (desired).
- The 3′ and 2′ wide shelving units are currently 3 shelves high and could hold 7,060 books (calculated using an average adult book size). The bins could hold an additional 720 books (at adult size). Thus, the total books would be 7,780 books.

## NOTES:

- Area rugs provided by Owner
- Storage shelving/cabinets needed for craft/ activity materials

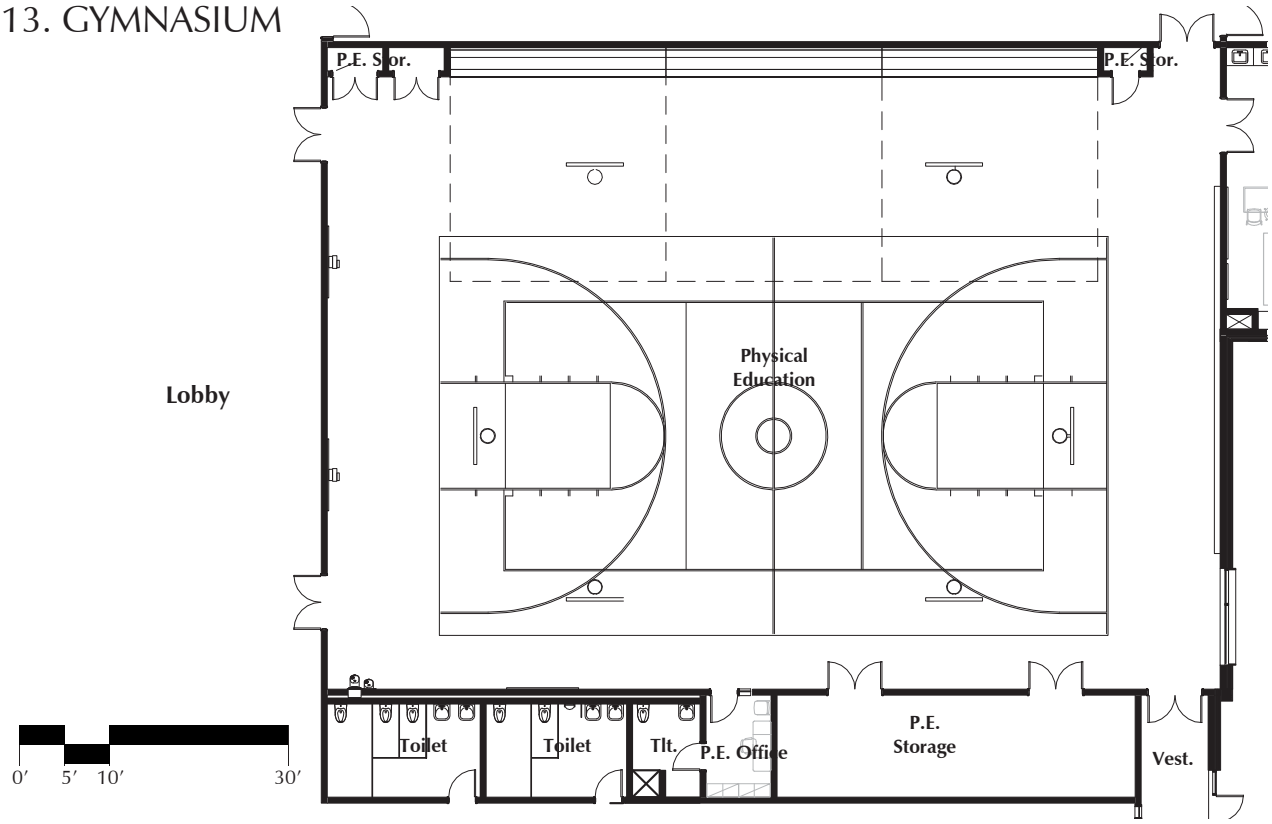
## 12. MEDIA CENTER

Review Comments:

Reviewed by:

Name, Title: Date:

## 13. GYMNASIUM




### GENERAL CRITERIA

Description:
Multipurpose space for Physical Education program, adaptive physical education, and community use. It will include a Gym Storeroom and Health Instructor's Office.

Area: 7,650 sf
Gym storerooms @ 500 SF included
(1) Gym office @ 150 SF included

Users:
(40-48) Students (60 max.) per class period
(900) Students for school assembly
(1-2) Instructors
Aides as required

Adjacencies:
- Exterior easily accessible
- One OT/PT room desired with direct connection
- Student toilet rooms & drinking fountain
- Nurse's suite

### MILLWORK / CASEWORK

- N/A

### SPECIALTIES

Visual Display boards / accessories:
- (2) 8′-0″ Interactive Display Boards
- (2) Short throw projectors
- (2) Technology carts
- (1) 8′-0″ Magnetic White Board
- (1) Motorized retractable projector screen
- (1) Interactive projector with wire guards
- (#) Hooks in main gym storeroom

Window Treatments:
N/A

# 13. GYMNASIUM

## TECHNICAL CRITERIA

Finish Hardware:
- Exit devices
- Door closers

Architectural Finishes:
Floor: Hardwood with resilient sub-floor
Base: Vented rubber
Walls: 4' h. abuse resistant acoustic wall panels, secure wall pads, high-impact GWB above
Ceiling: Exposed structure, painted

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating at partitions between Gymnasium and adjacent spaces: 55-57

Plumbing:
- Two accessible drinking fountains in the corridor (with bottle filler)
- Two accessible drinking fountains just inside the gym entrance (with bottle filler)

Mechanical:
- Air conditioning
- Adequate ventilation for full school assembly (approx. 790 Students and 130 faculty)

Lighting:
- (24) High-bay dimmable LED fixtures with (9) combination occupancy/daylight sensors
- ON/OFF multi-scene controls at the doors

Electrical:
- (15) General duplex receptacles
- (3) General duplex receptacles for office
- Power for scoreboard, motorized projection screen, projector lift, basketball hoops, shot clocks, divider curtain, and bleachers.
- (2) Floor outlets near scorer's table, proposed in front of bleachers

Data / Communication:
- (6) Hardwired data outlets (2 data ports) for wireless access points
- (2) Data outlets for scorer table at center of bleachers
- Connections for portable interactive smart board
- (2) Hardwired data outlet (2 data ports) for projectors
- (1) Assisted listening system
- (1) Wall phone outlet (1 data port) and (1) telephone handset (wall-mounted near door)
- Connections for interactive projector

Public Address / Clock:
- (2) Analog clocks with wire guards
- (8) Local sound speakers w/ (2) microphone jacks at opposite sides of gym
- (6) PA speakers
- Microphone jacks at opposite sides of gym
- Exterior speakers at outdoor play areas for emergencies
- (6) Emergency call switches

Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (2) fire alarm pull stations
- (18) 110cd speaker-strobe
- (4) beam detectors

# 13. GYMNASIUM

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- Flag
- Scoreboard and remote control panel

Furniture:

- Telescopic bleachers to seat 500
- Portable podium
- (1) Teacher desks for Gym Office (an additional desk would be ideal)
- (2) Desk chairs
- (1) File cabinet
- (#) Metal shelving units

Equipment/Technology:

Equipment included in GC Contract:

- (1) Overhead speech reinforcement speaker
- (6) Motorized basketball hoops
  - ↳ shot clocks attached to primary court hoops
  - ↳ hoops should be adjustable
- (1) Motorized divider curtain to divide the main court into (2) courts
- (1) Scoreboard
- (1) Ceiling-mounted motorized scissor lift for projector
- (1) Interactive projector with wire guards
- (1) Motorized retractable projector screen
- (2) 8′ Interactive Smart Boards
- Poles, net and mounting for volleyball net
- Chin up bar
- Hockey, soccer, basketball, tennis, baseball, gymnastics and dance equipment

Mobile Technology

- (1-2) Teacher laptops

## OTHER INFORMATION

- Court lines to support basketball, and volleyball.
- Include a rock wall.
- Standby power to be provided for Gymnasium

## NOTES:

- PE teacher has provided a detailed equipment list.

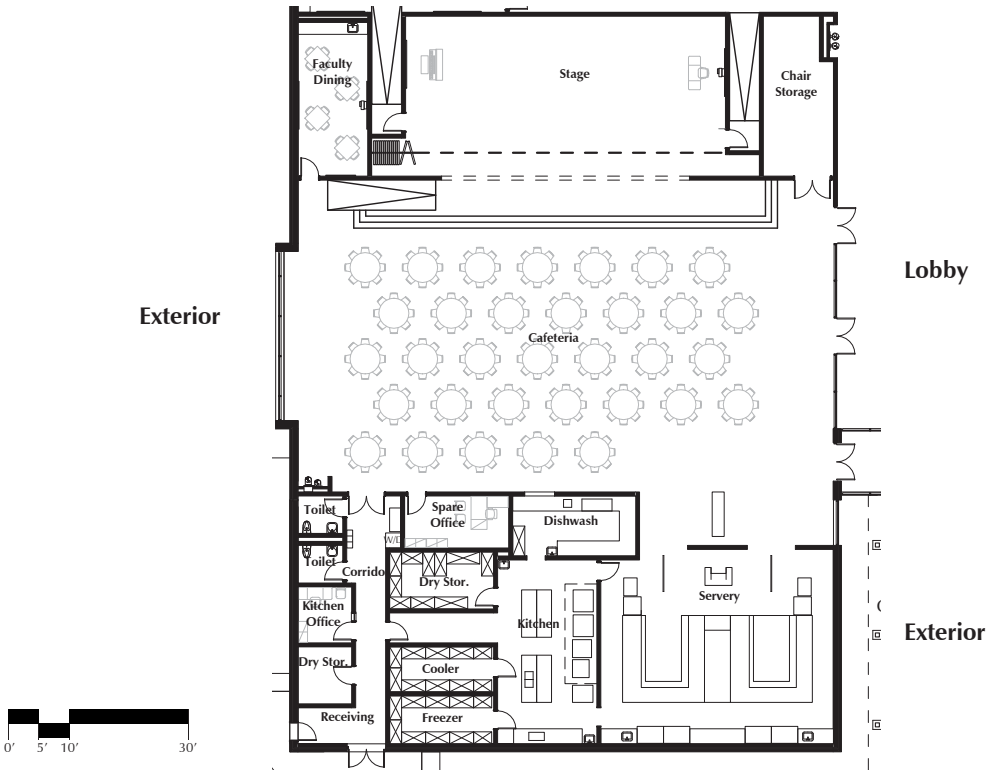
## 13. GYMNASIUM

Review Comments:

Reviewed by:

Name, Title: Date:

## 14. CAFETORIUM & TABLE STORAGE




## GENERAL CRITERIA

Description:
Multipurpose space used for student dining with multiple lunch servings in rotating intervals of 15 minutes to be large enough to accommodate (3) lunch servings each day. It will also be used for extended day and summer programs. The Cafetorium will include a stage, with adjacency to the music rooms, to be used for performances and assemblies.

Area: 5,463 SF
Quantity: 1
(1) Chair/Table Storage @ 463 SF included
Users:
Rotating (4-5 classroom) clusters/lunch interval for a total of (263) Students at a time for lunch
(625) Assembly in chairs

Adjacencies:
- Close to Gymnasium, main Lobby, and Administration Suite
- Direct adjacency to Stage and Faculty Dining
- Direct access to exterior/ recess area

## MILLWORK / CASEWORK

- Specialty paneling and Stage opening surround
- Stage stair risers/treads
- Custom enclosure for trash and recycle receptacles

## SPECIALTIES

Visual Display boards / accessories:
- (1) Motorized projection screen
- (1) Ceiling mounted projector
- (30) Coat hooks for extended day

Window Treatments:
- Room darkening window treatment/ Motorized window shades

# 14. CAFETORIUM & TABLE STORAGE

## TECHNICAL CRITERIA

Finish Hardware:
- Storeroom lockset at Table Storage doors
- Exit devices
- Door closers

Architectural Finishes:
- Floor: Linoleum
- Base: 4″ resilient vinyl
- Walls: Ceramic tile to 7′ high, painted GWB and acoustic panels above
- Ceiling: Specialty ACT

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between self contained SPED and adjacent spaces: 50-52

Plumbing:
- (1) Water fountain with bottle refill

Mechanical:
- Air conditioning

Lighting:
- (18) 5′ round pendant-mounted dimmable LED fixtures with (3) combination occupancy/daylight sensors & (3) 4′ linear pendant fixtures for chair storage
- ON/OFF controls at the door and multi-scene controls at projector screen

Electrical:
- (15) General duplex receptacles
- (1) Quad receptacle for projector
- Power for motorized projector screen
- Power for window shades

Data / Communication:
- (1) Hardwired data outlet (2 data ports) for projector
- (4) Hardwired data outlet (2 data ports) for wireless access point
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset
- (1) Overhead speaker speech reinforcement system
- (1) Interactive short-throw projector connection

Public Address / Clock:
- (2) Analog clocks
- (8) Local sound speakers
- (2) Emergency Call Switches
- (6) PA speakers
- Local sound system integrated w/ stage sound system
- (4) Paging speakers
- Assisted listening system

Fire Protection / Fire Alarm:
- (6) 110cd speaker-strobe
- (4) Audiovisual fire alarm devices with a candela rating of 110cd

# 14. CAFETORIUM & TABLE STORAGE

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

N/A

Furniture:

- Oval and round tables with attached seats to seat a minimum of 132 students
- (625) stackable chairs for assembly
- Accessible seating must be integrated.

Equipment/Technology:

N/A

Equipment to be included in GC Contract:

- (1) Motorized projector screen
- (1) Ceiling-mounted projector

## OTHER INFORMATION

- Standby power to be provided in Cafetorium
- Two lunch serving lines required

## NOTES:

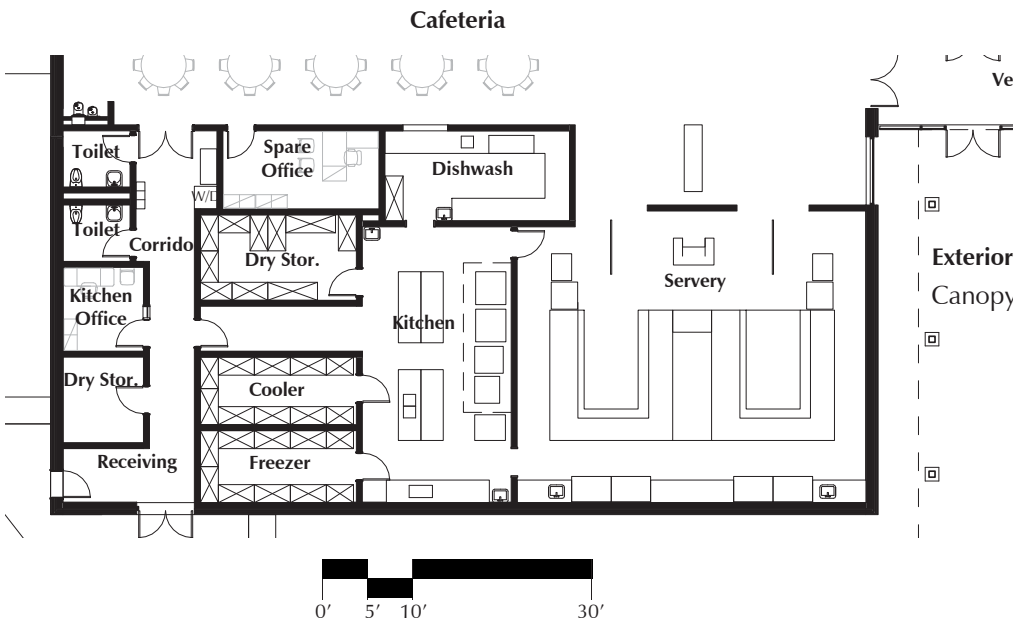
## 14. CAFETORIUM & TABLE STORAGE

Review Comments:

Reviewed by:

Name, Title: Date:

## 15. KITCHEN & STORAGE




### GENERAL CRITERIA

Description:
Full service kitchen that provides breakfast and lunch for students each day. The kitchen will be closed during the summer months.

Area/Quantity: 2,975 SF
Kitchen includes:

- (1) Servery
- (1) Kitchen
- (1) Office
- (2) Dry Storage
- (2) Toilets
- (1) Dishwashing room
- (1) Cooler
- (1) Freezer

Users:
(3-6) Staff

Adjacencies:

- Direct adjacency to Cafetorium
- Close proximity to Receiving area

### MILLWORK / CASEWORK

N/A

### SPECIALTIES

Visual Display boards / accessories:
N/A

Window Treatments:
N/A

# 15. KITCHEN & STORAGE

## TECHNICAL CRITERIA

Finish Hardware:
- Kitchen Door: Office lockset
- Storage Door: Storeroom lockset
- Exit devices
- Door closers

Architectural Finishes:
- Floor: Ceramic tile
- Base: Ceramic tile
- Walls: FRP w/ CT backsplash
- Ceiling: Vinyl/cleanable ACT

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between self contained SPED and adjacent spaces: 50-52

Plumbing:
- Hand wash and pot sinks
- (2) Accessible staff toilet rooms (M/W)
- Grease interceptor(s)
- Washer/dryer connections
- Floor sink in Kitchen Janitorial closet
- Floor drains, accessible for cleanout
  - ↳ (1) Floor drain outside of cooler door

Mechanical:
- Individual climate control
- Air conditioning

Lighting:
- (28) Downlight LED fixtures in Servery and (29) 2x2 recessed LED fixtures with (2) combination occupancy/daylight sensors
- ON/OFF controls at the door

Electrical:
- (1) Quad receptacle for POS/cashier
- Electrical connections for all kitchen equipment
- (10) General duplex outlets
- Power for freezer/cooler walk-in(s)

Data / Communication:
- (1) Hardwired data outlet for the point of sale station
- (1) Hardwired data outlet in Kitchen Office
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset in Kitchen office
- Buzzer in Kitchen for receiving door

Public Address / Clock:
- (1) Analog clock
- (4) PA speakers

Fire Protection / Fire Alarm:
- Ordinary-Hazard Sprinkler Coverage in Kitchen and Janitor closet
- Walk-in Cooler and Freezer to have concealed dry pendant sprinklers
- (4) Heat detectors
- (2) CO detectors
- (4) 75cd speaker-strobes

# 15. KITCHEN & STORAGE

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- (6) Lockers for staff

Furniture:

- (1) Desk and chair in Kitchen office
- (8-10 units) Open wire shelving

Equipment/Technology:

N/A

Equipment to be included in GC Contract:

- (1) Accessible point of sale station on casters
- (1) 50 gallon grease receptacle
- Equipment list to be provided

## OTHER INFORMATION

- Plan for dedicated dishwashing/dish drop area for future flexibility
- Standby power will be provided for Kitchen freezer/cooler walk-in(s)
- Kitchen/Servery to be self-contained by using an overhead coiling door for example

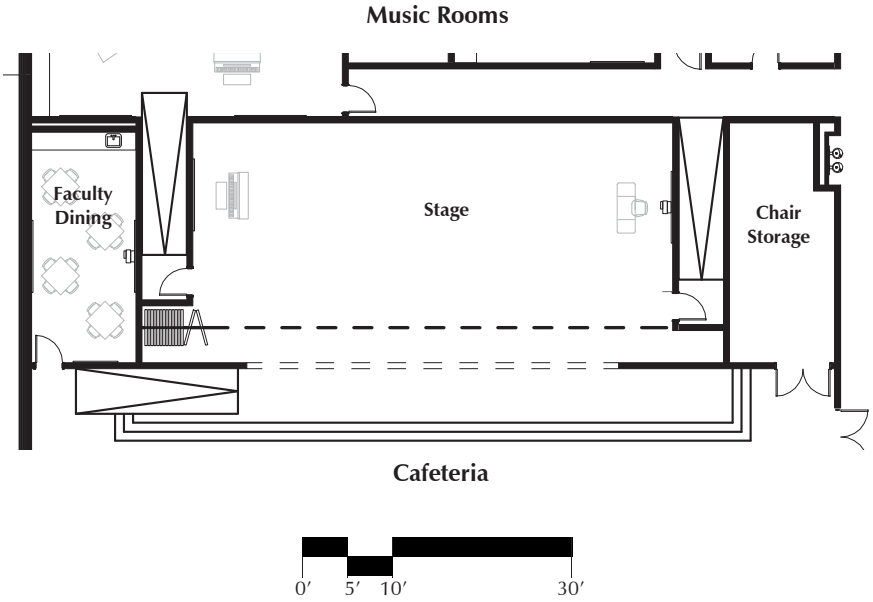
## 15. KITCHEN & STORAGE

Review Comments:

Reviewed by:

Name, Title: Date:

## 16. STAGE & STAGE EQUIPMENT




### GENERAL CRITERIA

Description:
Multi-use space for various performances and assemblies which doubles as an additional Music classroom/ rehearsal space.

Area/Quantity:
(1) Stage @ 1,500 SF

Users:
(1) Teacher
(80-130) Students for assembly/performance

Adjacencies:
- Directly adjacent to Cafetorium
- Direct access to Music Room

### MILLWORK / CASEWORK

N/A

### SPECIALTIES

Visual Display boards / accessories:
- (1) 8′-0″ Interactive Display Board
- (1) Short throw projector
- (1) Technology cart
- (1) 8′-0″ Magnetic white board

Window Treatments:
N/A

# 16. STAGE & STAGE EQUIPMENT

## TECHNICAL CRITERIA

Finish Hardware:
- Storeroom lockset for Stage Equipment
- Classroom lockset for doors between Stage and Music Room

Architectural Finishes:
- Floor: Resilient hardwood
- Base: 4″ vented rubber
- Walls: GWB; painted w/ 5′ H acoustic panels
- Ceiling: ACT with gypsum board soffits

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating at partitions between Stage and adjacent spaces: 55-57

Plumbing:
N/A

Mechanical:
- Air conditioning

Lighting:
- (21) Downlight dimmable LED fixtures with (2) combination occupancy/daylight sensors
- (12) monopoint spot/flood lights
- ON/OFF and multi-scene controls at the door(s)

Electrical:
- (6) Floor box outlets
- (1) quad receptacle for teacher desk
- (8) general duplex receptacles
- (1) quad receptacle for projector
- Power for operable partition
- (1) single outlet for speech reinforcement amplifier
- Power for motorized lighting track(s)
- Power for motorized projection screen
- (1) Quad receptacle for projector

Data / Communication:
- (1) Hardwired voice/data outlet (1 voice/2 data ports) for teacher workstation
- (1) hardwired data outlet (2 data ports) for wireless access point
- (1) wall phone outlet (1 data port) and (1) VoIP telephone handset
- (1) Overhead speaker speech reinforcement system
- (1) Hardwired data outlet (2 data ports) for projector
- (1) Interactive short-throw projector connection
- (1) Connection for speech reinforcement system

Public Address / Clock:
- (1) Analog clock
- (2) Emergency Call Switches
- (1) Talk back speaker
- (1) Connection to cafeteria sound system
- (2) Call assurance buttons

Fire Protection / Fire Alarm:
- (2) Ceiling-mounted smoke hatches
- (2) Fire hose connections
- (1) 75cd speaker-strobe
- (2) Heat detectors

# 16. STAGE & STAGE EQUIPMENT

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- N/A

Furniture:

- (1) Conductor chair
- (1) Podium
- (100) Student chairs
- (1) Digital upright piano

Equipment/Technology:

- N/A

Equipment included in GC contract:

- (1) Overhead speech reinforcement speaker
- Motorized lighting track(s)
- Microphones/sound system accessories
- Motorized projection screen

## OTHER INFORMATION

- Confirm number of users for performances

## NOTES:

- See music room furniture list for number of choral risers (to be shared with stage area)

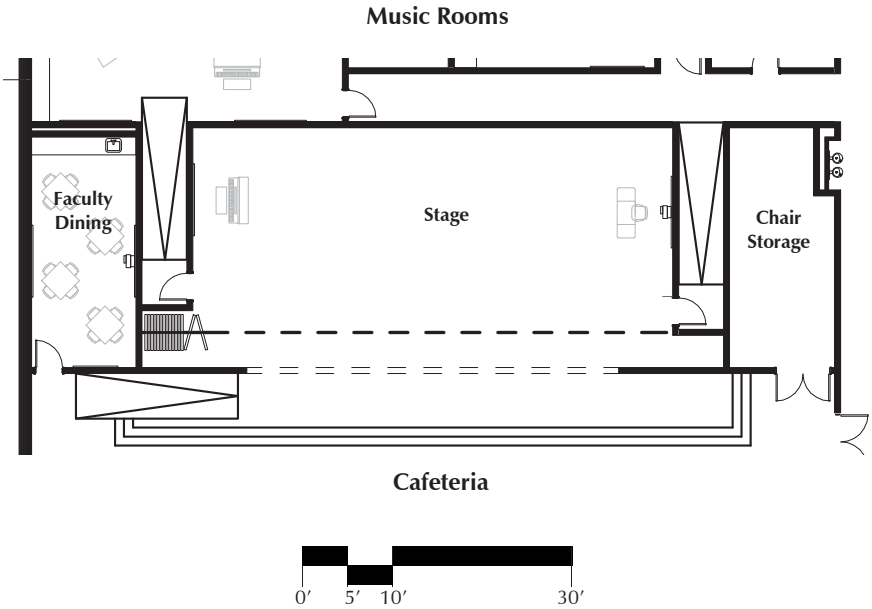
## 16. STAGE & STAGE EQUIPMENT

Review Comments:

Reviewed by:

Name, Title: Date:

## 17. FACULTY DINING




### GENERAL CRITERIA

Description:
Multi-purpose room used for Faculty Dining at lunch-time and for meetings.

Area: 298 SF
Quantity: 1

Users:
(12-15) Faculty/Staff

Adjacencies:
- Directly adjacent to Cafetorium
- Adjacent to main Lobby for meeting room capabilities

### MILLWORK / CASEWORK

- M3A - Base and wall cabinets with sink

### SPECIALTIES

Visual Display boards / accessories:
- (1) 8′-0″ Interactive Display Board
- (1) Short throw projector
- (1) Technology cart
- (1) 8′-0″ Magnetic white board
- (1) 5′-0″ Tack board

Window Treatments:
N/A

# 17. FACULTY DINING

## TECHNICAL CRITERIA

Finish Hardware:
- Door with vision panel or side lite
- Exit devices
- Door closers

Architectural Finishes:
- Floor: Linoleum
- Base: 4″ Resilient vinyl
- Walls: GWB; painted
- Ceiling: ACT

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between Faculty Dining and adjacent spaces: 50-52

Plumbing:
- (1) Accessible sink

Mechanical:
- Air conditioning

Lighting:
- (6) Recessed can LED fixtures with (1) combination occupancy/daylight sensor
- ON/OFF controls at the door

Electrical:
- (6) General duplex receptacles
- (2) GFCI receptacles at counter sink area
- (1) Floor box receptacle beneath tables
- (2) Duplex receptacles for refrigerator and microwave

Data / Communication:
- (1) Hardwired data outlet (2 data ports) for projector
- (1) Hardwired data outlet (2 data ports) for wireless access point
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset
- (1) Overhead speaker speech reinforcement system

Public Address / Clock:
- (1) Analog clock
- (1) Emergency Call Switch
- (1) Talk back speaker

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- 75 Candela audiovisual device

# 17. FACULTY DINING

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- N/A

Furniture:

- (4) Round OR square group tables with (4) chairs each

Equipment/Technology:

- (1) 8′-0″ Interactive Display Board
- (1) Short throw projector
- Microwave

Equipment included in GC contract:

- (1) Overhead speech reinforcement speaker
- Full height refrigerator

## OTHER INFORMATION

## NOTES:

- Confirm if space is needed for a vending machine.

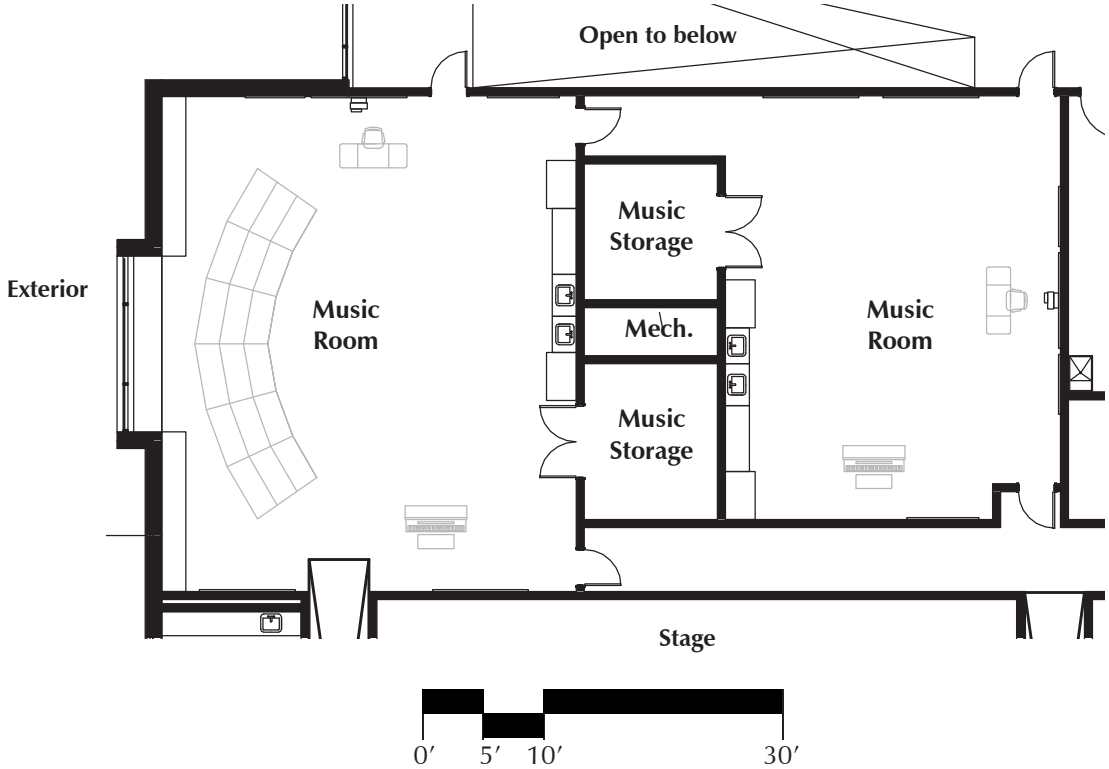
## 17. FACULTY DINING

Review Comments:

Reviewed by:

Name, Title: Date:

## 18. MUSIC CLASSROOM




### GENERAL CRITERIA

Description:
All students in the school attend general music, and all fourth grade students participate in Chorus. Curriculum includes small instruments, singing, dancing, etc.

Area/Quantity: 2,775 SF
(1) Music Room @ 1,500 SF
(1) Music Room @ 1,000 SF
(1) Music Storage @ 150 SF
(1) Music Storage @ 125 SF

Users:
(1-2) Teachers
(20-24) Students
(80) Students for Chorus in larger Music Room (90 students max.)
Aides as required

Adjacencies:
Stage in cafeteria

### MILLWORK / CASEWORK

- M1 - Teacher Wardrobe
- M2 - Storage Unit
- M3 - Base/wall cabinet unit w/sink
- M5 - Low base/wall cabinet unit w/sink
- M4 - Open shelving under windows

### SPECIALTIES

Visual Display boards/Accessories:
- (1) 8′-0″ Interactive display board
- (1) Short throw projector
- (2) 8′ Magnetic white boards w/ staff lines
- (2) 5′ Magnetic white boards
- (1) 6′ Tack board

Window Treatments:
- Woven fabric translucent shades

# 18. MUSIC CLASSROOM

## TECHNICAL CRITERIA

Finish Hardware:
- Main door:
  - ↳ Classroom lockset
  - ↳ Door closer
  - ↳ Side lites in doors

Architectural Finishes:
- Floor: Linoleum
- Base: 4″ resilient vinyl
- Walls: GWB Painted
- Ceiling: Suspended acoustical panels

Acoustical Requirements:

Sound Transmission Coefficient (STC) rating between Music and adjacent spaces: 50-52

STC (55-57) Between Music room and storage
STC (63-65) between Music room and other rooms

Plumbing:
- (1) Accessible sink with hot/cold water and integral drinking fountain at child height.
- (1) Deep sink with mixing valves for cleaning instruments and mouthpieces

Mechanical:
- Air conditioning
- Individual climate control

Lighting:
- (3) 20 ft. pendant mounted dimmable Dali controlled LED fixtures with (2) combination occupancy/daylight sensors
- ON/OFF controls at the door and multi-scene controls at the front of the classroom

Electrical:
- (6) General duplex receptacles
- (1) GFCI receptacle at counter sink area; (2) duplex receptacles at counters
- (1) Quad receptacle for projector
- (1) Quad receptacle for teacher workstation
- (1) Single outlet for speech reinforcement amplifier
- (2) Floor outlets for Digital Keyboard

Data / Communications:
- (1) Hardwired data outlet (2 data ports) for wireless access point
- (2) Hardwired voice/data outlet (1 voice/2 data ports) for teacher work station
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset
- (1) Hardwired data outlet (2 data ports) for projector
- (1) Overhead speaker speech reinforcement system
- (1) Interactive short-throw projector connections
- (1) Connection for speech reinforcement system

Public Address / Clock:
- (1) Analog clock
- (2) Emergency Call Switches
- (1) Talk back speaker

Fire Protection / Fire Alarm:
- Ordinary-Hazard Sprinkler Coverage in music storage rooms
- (1) 75 candela audiovisual device

# 18. MUSIC CLASSROOM

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

N/A

Equipment/Technology:

N/A

Equipment included in GC contract:

- (1) Overhead speech reinforcement speaker

Furniture:

- (6 sections) Risers for rehearsals
- (2) Portable digital pianos
- Open shelving for music storage

## OTHER INFORMATION

## NOTES:

Area rugs (with musical markings) provided by Owner

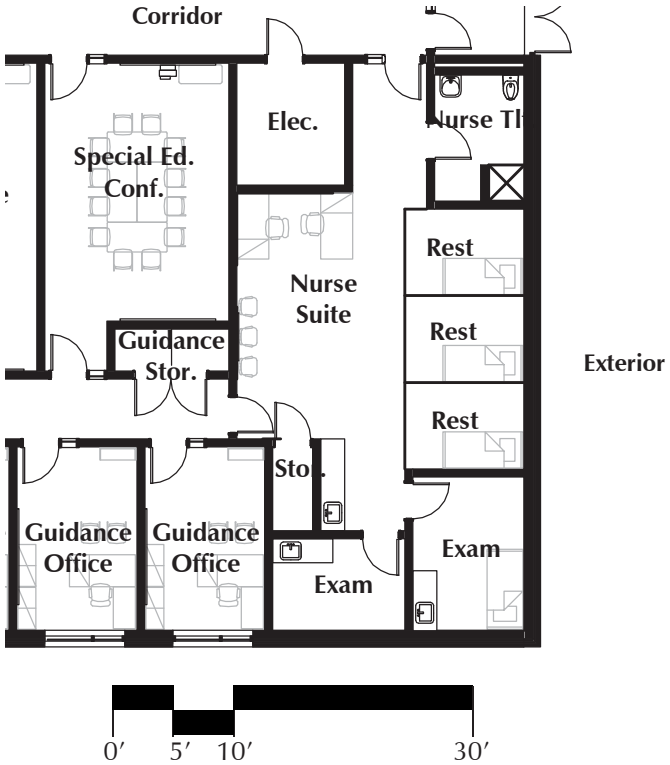
## 18. MUSIC CLASSROOM

Review Comments:

Reviewed by:

Name, Title: Date:

## 19. MEDICAL SUITE




### GENERAL CRITERIA

Description:
Centrally located Nurse suite to serve students and staff physical health. Duties include dispensation of daily medicine and administering to injuries and illness. Suite includes enclosed office for Nurse with visibility to waiting area, 2 Exam rooms, a toilet room, and (3) Rest areas. One exam room will double as a lactation room.

Area/Quantity: 906 SF
(1) Office/Waiting @ 410 SF
(1) Toilet @ 75 SF
(1) Exam @ 120 SF
(1) Exam/Lactation Room @ 85 SF
(1) Resting @ 216 SF
↳ (3) separate areas at 72 SF each

Users: (1-2) Nurses
(8) Students maximum

Adjacencies:
- Administration Suite
- Gym
- Close proximity to exterior doors

### MILLWORK / CASEWORK

- M1 - Wardrobe unit
- M2 - Lockable storage cabinet
- M3 - Base and upper cabinets with accessible sink
- M3A - Base and upper cabinets with non-accessible sink

### SPECIALTIES

Visual Display boards / accessories:
(1) 4′ Tack board or pamphlet display

Window Treatments:
- N/A

Miscellaneous:
- Ceiling-mounted cubicle curtain track at rest areas

# 19. MEDICAL SUITE

## TECHNICAL CRITERIA

Finish Hardware:
Main Door: Office lockset
Office/Exam Doors: Office lockset
Toilet Door: Office lockset with vacancy indicator

Architectural Finishes:
- Floor: Linoleum
- Base: 4″ Resilient vinyl
- Walls: GWB; painted
- Ceiling: ACT

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between general classrooms and adjacent spaces: 50-52

Plumbing
- (1) Accessible hand wash sink with mixing valve outside of Nurse's office
- (1) Non-accessible sink with mixing valve in Exam Room
- (1) Non-accessible sink with mixing valve in Exam Room/Lactation Room
- (1) Accessible sink in toilet
- (1) Shower in toilet room (to confirm in DD)

Mechanical:
- Air conditioning

Lighting:
- (12) 2x4 recessed LED fixtures with (2) combination occupancy/daylight sensors
- (3) Wall-mounted LED bed lights with ON/OFF controls
- (1) recessed can LED light and (1) 8′ vanity LED fixture for toilet room
- (1) 4′ linear LED light in storage room
- ON/OFF controls at door

Electrical:
- (10) General duplex receptacles
- (2) GFCI receptacles at counter sink areas
- (1) GFCI receptacle at bathroom area
- (2) Quad receptacles for Nurse's office
- (3) Duplex receptacles for each Exam room
- (1) Receptacle for refrigerator

Data / Communication
- (2) Hardwired voice/data outlet (1 voice/2 data ports) per office
- (1) Hardwired data outlet (2 data ports) for wireless access points
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset per office

Public Address / Clock:
- (2) Analog clocks
- (1) Emergency Call Switch
- (4) Talk back speakers
- (2) Call assurance buttons

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (1) 75 candela audiovisual device
- (3) 15 candela audiovisual devices

# 19. MEDICAL SUITE

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

N/A

Equipment/Technology:

- (1) Lockable full-size refrigerator for medications
- (1) Nurse laptop

Furniture:

- (3-4) Waiting room chairs
- (2) Nurse's desks and (2) chairs in office
- (2) Exam Room beds
- (3) Rest beds
- (2) Exam Room chairs
- (1) Wheeled table for mobile computer station

## OTHER INFORMATION:

- Include supply closet with shelving

## NOTES:

- Needs acoustical separation

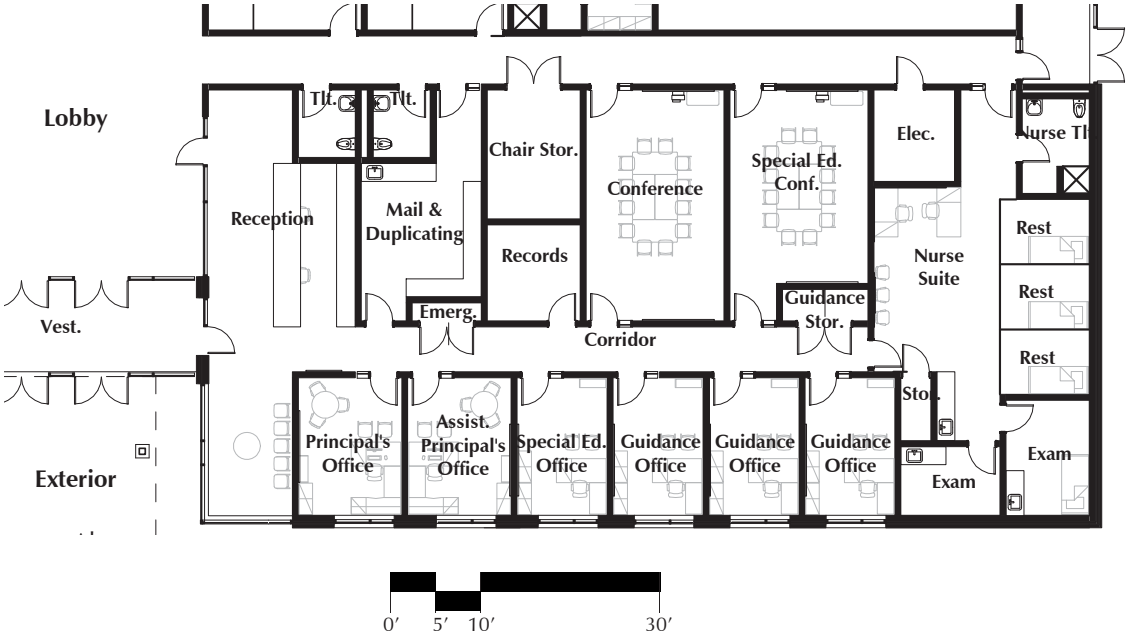
## 19. MEDICAL SUITE

Review Comments:

Reviewed by:

Name, Title: Date:

## 20. ADMINISTRATION SUITE




## GENERAL CRITERIA

Description:
The Administration Suite functions to support the centralized administration for the school. It is the control point for public access to the building. School-wide communications are centered here.

Total Area: 1,700 SF
(not including SF for Guidance and SPED suite)

Areas/Quantities:
- (1) General Office/Waiting/Toilet @ 590 SF
- (1) Teachers' Mail and Time Room @ 250 SF
- (1) Records Room @ 110 SF
- (1) Principal's Office @ 175 SF
- (1) Assistant Principal's Office @ 175 SF
- (1) Conference Room @ 400 SF

Users: (5) Staff: Principal, Assistant Principal, Psychologist, two receptionists

## MILLWORK / CASEWORK

- M10 - Custom reception desk with (2) work stations
- M3A - Base and upper cabinets with sink
- M9 - Mail cubby units for (130) staff

## SPECIALTIES

Visual Display boards / accessories:
- (1) Flat screen wall mounted monitor for digital signage in waiting area
- (1) 4′-0″ Tack board in general office
- (3) 8′-0″ Magnetic Markerboards
- (2) 8′-0″ Interactive Display Boards
- (2) Short throw projectors
- (2) Technology carts

Window Treatments:
- Woven fabric translucent shades

Adjacencies:
- Main Entrance/Lobby
- Exterior drop off area

# 20. ADMINISTRATION SUITE

## TECHNICAL CRITERIA

Finish Hardware:
- Office lockset for offices
- Door from Vestibule: Video Entrance Station

Architectural Finishes:
- Floor: Carpet
- Base: 4″ Resilient vinyl
- Walls: GWB; painted
- Ceiling: ACT

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between general classrooms and adjacent spaces: 50-52

Plumbing:
- (1) Non-accessible sink with mixing valve for staff use at break counter
- (2) Accessible staff toilet rooms (single occupant M/W)

Mechanical:
- Individual climate control
- Air conditioning

Lighting:
- (3) 8 ft. pendant mounted dimmable LED fixtures with (2) combination occupancy/ daylight sensors
- (17) recessed can LED fixtures for reception and corridor
- (4) 2x4 recessed LED fixtures for offices
- (9) 4′ linear LED fixtures
- (2) 8′ vanity LED fixtures for toilet rooms

Electrical:
- (20) General duplex receptacles
- (6) Quad receptacles for workstations
- (1) Duplex receptacle for copier/printer
- (2) GFCI receptacle at counter sink area
- (1) Duplex receptacle for refrigerator
- (3) Quad receptacles for projectors
- (1) Power for flat panel digital display in Waiting area

Data / Communication:
- (1) Hardwired data outlet (2 data ports) for wireless access point
- (6) Hardwired voice/data outlets (1 voice/2 data ports) for work stations
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset at each office; (2) at reception desk.
- Data connection at digital display in waiting area
- Video entrance system control at reception desk
- (2) Hardwired data outlet (2 data ports ea.) for projectors
- (1) Overhead speaker speech reinforcement system
- Access control system

Public Address / Clock:
- (4) Analog clocks
- (1) Emergency Call Switch per office; (2) at reception desk
- (5) PA Ceiling speakers
- Microphone jacks for PA system interface
- (3) Local sound systems (Conf. Rooms)

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- Ordinary-Hazard Sprinkler Coverage in Mail/ Duplicating areas and Records room
- (1) 75 candela audiovisual device
- (4) 15 candela visual devices

## 20. ADMINISTRATION SUITE

### FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- Soap and paper towel dispenser at sink
- Safe drop payment box in the mailroom
- Secure vault in records room

Furniture:

- (1) Desk and chair at Principal's office
- (1) Desk and chair at Asst. Principal's office
- (1) Table with 4 chairs at Asst. Principal's office
- (1) Desk and chair at SPED office
- (5) Chairs in waiting room
- (1) 30" dia. coffee table in waiting area
- (1) 12'x5' Conference table
- (12) Conference room chairs
- (2) Chairs at reception desk
- (#) Shelving units
- (#) Lateral file units

Equipment/Technology:

- (2) Monitors for the front desk
- (1) Copier/Printer
- (2) 8'-0" Interactive Display Boards (Conference Rooms)
- (2) Short throw projectors
- (2) Technology carts
- (1) Flat screen wall mounted monitor for digital signage in waiting area
- Microwave
- Under-counter refrigerator

Equipment included in GC contract:

- (1) Overhead speech reinforcement speaker

### OTHER INFORMATION

Adjacencies desired:

- A coffee counter is to be included near the mailroom
- Mailroom to be close to general office

### NOTES:

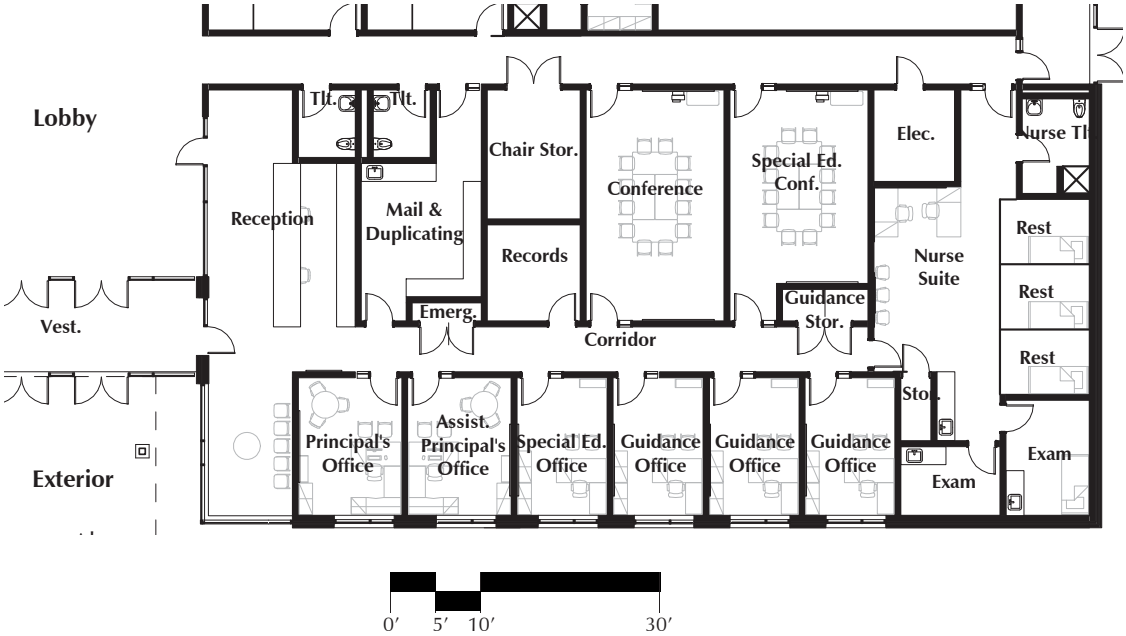
## 20. ADMINISTRATION SUITE

Review Comments:

Reviewed by:

Name, Title: Date:

## 21. SPED SITE COORDINATOR SUITE




### GENERAL CRITERIA

Description:
The SPED Coordinator Suite functions to provide a home base and meeting space for the Special Education Site Coordinator.

Total Area: 500 SF

Areas/Quantities:
- (1) SPED Chair Office @ 150 SF
- (1) SPED Conference Room @ 350 SF

Users: (1) Staff

### MILLWORK / CASEWORK

- N/A

### SPECIALTIES

Visual Display boards / accessories:
- (1) 8′-0″ Interactive Display Board
- (1) Short throw projector
- (1) Technology cart
- (2) 8′-0″ Magnetic Markerboards

Window Treatments:
- Woven fabric translucent shades

Adjacencies:
- Administration Suite

# 21. SPED SITE COORDINATOR SUITE

## TECHNICAL CRITERIA

Finish Hardware:
- Office lockset for office

Architectural Finishes:
- Floor: Carpet
- Base: 4″ Resilient vinyl
- Walls: GWB; painted
- Ceiling: ACT

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between general classrooms and adjacent spaces: 50-52

Plumbing:
- N/A

Mechanical:
- Air conditioning
- Individual climate control

Lighting:
- (2) 8 ft. pendant mounted dimmable LED fixtures with (2) combination occupancy/ daylight sensors
- (2) 2x4 recessed LED fixtures for office

Electrical:
- (10) General duplex receptacles
- (2) Quad receptacles for workstation

Data / Communication:
- (1) Hardwired data outlet (2 data ports) for office
- (1) Hardwired data outlet (2 data ports) for conference room
- (1) Hardwired data outlet (2 data ports) for wireless access points
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset per office
- (1) Hardwired data outlet (2 data ports) for projector
- (1) Overhead speaker speech reinforcement system

Public Address / Clock:
- (1) Analog clock
- (1) Emergency Call Switch at office

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage

# 21. SPED SITE COORDINATOR SUITE

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- N/A

Equipment/Technology:

- (1) 8′-0″ Interactive Display Board (Conference Room)
- (1) Short throw projector

Furniture:

- (1) Office desk and (1) Office chair at SPED Office
- (1) 12′x5′ Conference table
- (12) Conference room chairs
- (2) File cabinets
- (1) Shelving unit

## OTHER INFORMATION

- The SPED Chair Suite will be located immediately adjacent to the administration suite and supports the Special Education programs for the school.

## NOTES:

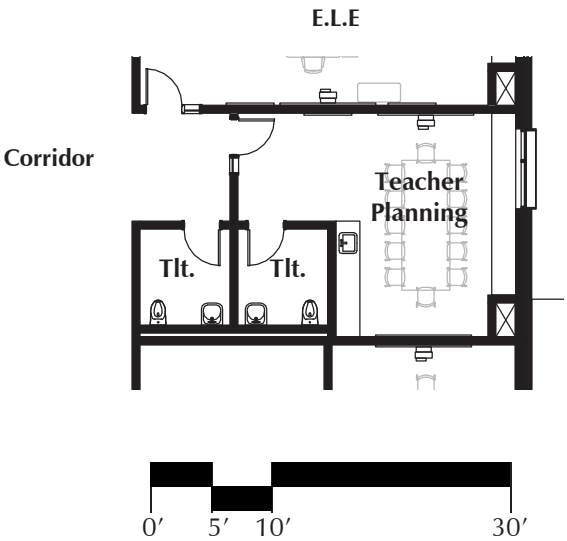
## 21. SPED SITE COORDINATOR SUITE

Review Comments:

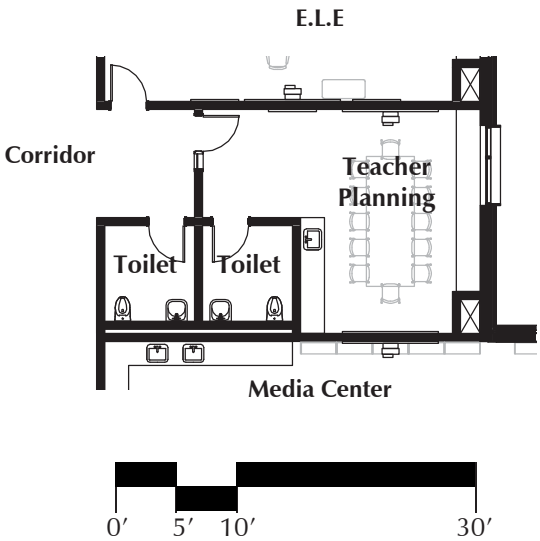
Reviewed by:

Name, Title: Date:

## 22. TEACHER PLANNING




Main Floor




Ground Floor

### GENERAL CRITERIA

Description:
Area used by teachers to meet with colleagues, plan curriculum, and print and prepare teaching materials. The space can accommodate an active work area or a quiet break space.

Area: 345 SF
Quantity: 4

Users:
(12-15) Staff

Adjacencies:
- Near "knuckles" of the building
- (2) on each floor (1 at each "L" wing)

### MILLWORK / CASEWORK

M3A - Base and upper cabinets with sink

### SPECIALTIES

Visual Display boards / accessories:
- (1) 8′-0″ Interactive Display Board
- (1) Short throw projector
- (1) Technology cart
- (1) 8′-0″ Magnetic white board
- (1) 4′-0″ Tack board

Window Treatments:
Woven translucent window shade

# 22. TEACHER PLANNING

## TECHNICAL CRITERIA

Finish Hardware:
- Exit device
- Door closer
- Side lite in door

Architectural Finishes:
- Floor: Linoleum
- Base: 4″ Resilient vinyl
- Walls: GWB; painted
- Ceiling: ACT

Acoustical Requirements:

Sound Transmission Coefficient (STC) rating between offices and adjacent spaces: 50-52

Plumbing:
- (1) Accessible sink

Mechanical:
- Air conditioning

Lighting:
- (1) 12ft. Pendant mounted dimmable LED fixture with (2) combination occupancy/ daylight sensors
- ON/OFF controls at the door

Electrical:
- (8) General duplex receptacles
- (1) GFCI receptacle at counter sink area
- (2) Duplex receptacles at counters
- (1) Duplex receptacle for refrigerator
- (1) Duplex receptacle for copier/printer
- (1) Quad receptacle for projector
- (1) Quad receptacle for computer workstations

Data / Communication:
- (1) Hardwired data outlet (2 data ports) for wireless access point
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset
- (1) Hardwired data outlet (2 data ports) for copier/printer
- (1) Hardwired data outlet (2 data ports) for projector
- (1) Overhead speaker speech reinforcement system
- (1) Hardwired data outlet (2 data ports) for workstations
- (1) Interactive short-throw projector connection

Public Address / Clock:
- (1) Analog clock
- (2) Emergency Call Switches
- (1) Talk back speaker

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (1) 75cd speaker-strobe
- (1) 15 candela audiovisual device

# 22. TEACHER PLANNING

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- Soap and paper towel dispenser at sink

Equipment/Technology:

- (1) Copier/Printer

Furniture:

- (1) 12'x4' Conference table
- (12) Conference room chairs
- OR (6) mobile tables that can be arranged to create a conference table

## OTHER INFORMATION

## NOTES:

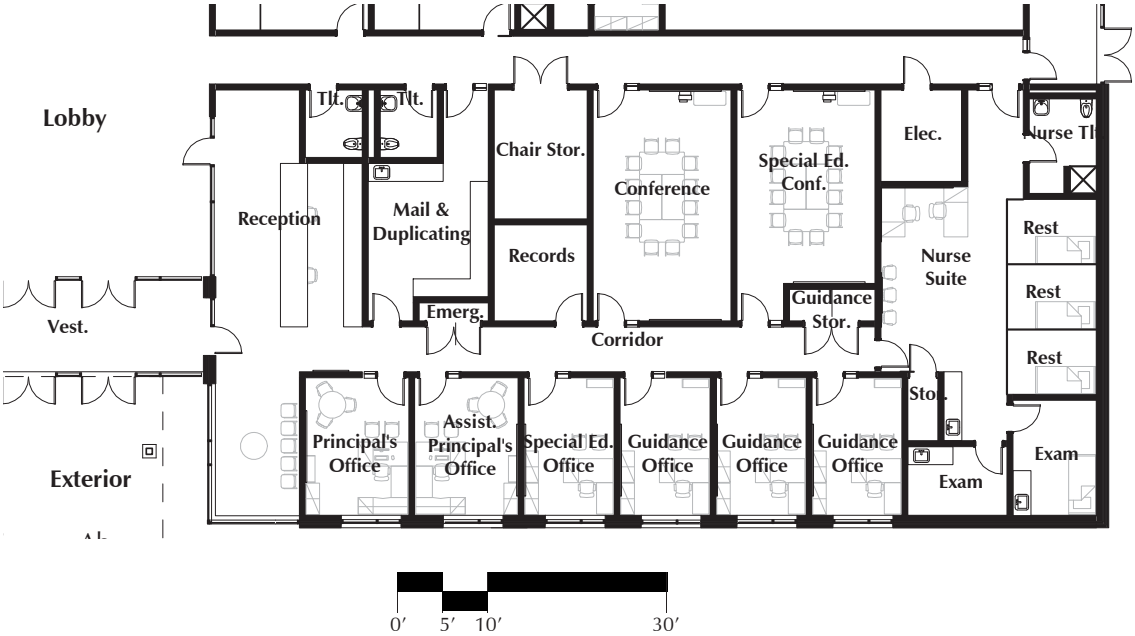
## 22. TEACHER PLANNING

Review Comments:

Reviewed by:

Name, Title: Date:

# 23. GUIDANCE




## GENERAL CRITERIA

Description:
The Guidance Suite functions to provide offices for the school psychologists, meetings with students, and an area to store materials. These offices are less visible to the main circulation areas for privacy.

Total Area: 485 SF

Areas/Quantities:
- (3) Guidance Offices @ 150 SF
- (1) Guidance Storeroom @ 35 SF

Users: (2-3) Psychologists

## MILLWORK / CASEWORK

- N/A

## SPECIALTIES

Visual Display boards / accessories:
- (3) 8′-0″ Magnetic Markerboards

Window Treatments:
- Woven fabric translucent shades

Adjacencies:
- Administration suite

## 23. GUIDANCE

### TECHNICAL CRITERIA

Finish Hardware:
- Office lockset for offices

Architectural Finishes:
- Floor: Carpet
- Base: 4″ Resilient vinyl
- Walls: GWB; painted
- Ceiling: ACT

Acoustical Requirements:
- Sound Transmission Coefficient (STC) rating between general classrooms and adjacent spaces: 50-52

Plumbing:
- N/A

Mechanical:
- Individual climate control
- Air conditioning

Lighting:
- (6) 2x4 recessed LED fixtures for offices
- (1) 4′ linear LED fixture for storeroom

Electrical:
- (12) General duplex receptacles
- (6) Quad receptacles for workstations

Data / Communication:
- (1) Hardwired data outlet (2 data ports) per office
- (1) Hardwired data outlet (2 data ports) for wireless access points
- (1) Wall phone outlet (1 data port) and (1) VoIP telephone handset per office
- (1) Overhead speaker speech reinforcement system

Public Address / Clock:
- (1) Analog clock per office
- (1) Emergency Call Switch per office

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage

## 23. GUIDANCE

### FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:
- N/A

Equipment/Technology:
- N/A

Furniture:
- (3) Office desks
- (3) Desk chairs

### OTHER INFORMATION

### NOTES:

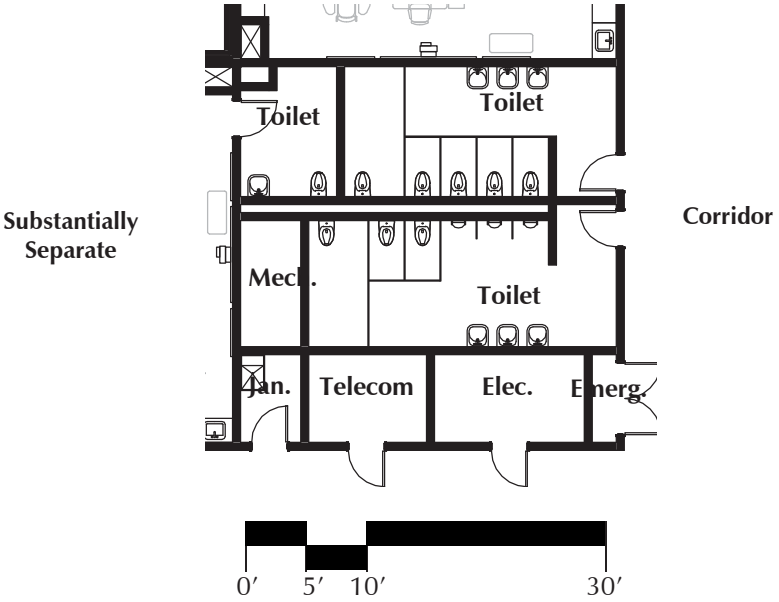
## 23. GUIDANCE

Review Comments:

Reviewed by:

Name, Title: Date:

# 24. STUDENT TOILET ROOMS




## GENERAL CRITERIA

Description:
Student toilet rooms to be distributed throughout the school.

Quantity: 8 total (4 Boys & 4 Girls toilet rooms)

Area/Quantities:
(4) Toilet rooms @ 240-270 SF
(4) Toilet rooms @ 155-238 SF

Users:
1-4 Students
Monitors as required

Adjacencies:
- (1) Boys and (1) Girls, located at intersection of grade clusters on each floor

## MILLWORK / CASEWORK

N/A

## SPECIALTIES

Visual Display boards / accessories:
N/A

Window Treatments:
N/A

# 24. STUDENT TOILET ROOMS

## TECHNICAL CRITERIA

Finish Hardware:
- Door Closers

Architectural Finishes:
- Floor/Base: Ceramic Tile
- Walls: Ceramic tile (full height)
- Ceiling: ACT

Acoustical Requirements:
N/A

Plumbing:
- Accessible sinks with mixing valves
- Low-flush toilets with DC powered (battery) flushometers
- Low-flush urinals with DC powered (battery) flushometers
- Floor Drains
- Hose bib

Mechanical:
- Exhaust ventilation as required
- Air conditioning

Lighting:
(8) 2'x2' LED fixtures
(2) Occupancy/Motion sensors

Electrical:
- (2) GFCI duplex receptacles
- Power for electrical hand dryers

Data / Communication:
N/A

Public Address / Clock:
- (1) PA Speaker

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (1) 15cd strobe

# 24. STUDENT TOILET ROOMS

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- Soap dispensers at sinks
- Toilet paper dispensers
- Paper towel dispensers
- Built-in or free-standing waste receptacles

Fixtures included in GC contract:

- Grab bars as required for accessibility
- Toilet partitions

Furniture:

N/A

Equipment/Technology:

- Low decibel high velocity hand dryer in each student toilet room

## OTHER INFORMATION

- Confirm accessible drinking fountain just outside of toilet rooms

## NOTES:

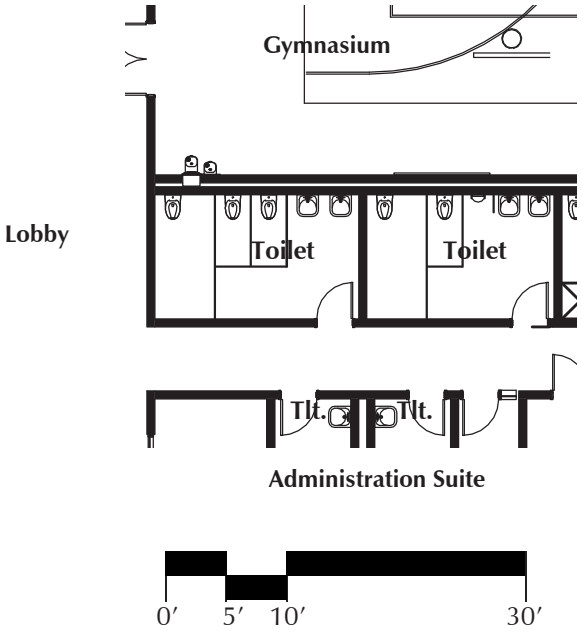
## 24. STUDENT TOILET ROOMS

Review Comments:

Reviewed by:

Name, Title: Date:

## 25. PUBLIC TOILET ROOMS




### GENERAL CRITERIA

Description:
Accessible toilet rooms for the public, located off of the main Lobby.

Area: 170 SF
Quantity: (2)

Users:
1-4 Students or Adults
Monitors as required

Adjacencies:
- (2) One Womens and one Mens @ main lobby

### MILLWORK / CASEWORK

N/A

### SPECIALTIES

Visual Display boards / accessories:
N/A

Window Treatments:
N/A

# 25. PUBLIC TOILET ROOMS

## TECHNICAL CRITERIA

Finish Hardware:
Door Closers

Architectural Finishes:
- Floor/Base: Ceramic tile
- Walls: Ceramic tile (full height)
- Ceiling: ACT

Acoustical Requirements:
N/A

Plumbing:
- Accessible sinks with mixing valves
- Low-flush toilets with DC powered (battery) flushometers
- Low-flush urinals with DC powered (battery) flushometers
- Floor Drains
- Hose bib

Mechanical:
- Exhaust ventilation as required
- Air conditioning

Lighting:
(8) 2'x2' LED fixtures
(2) Occupancy/Motion sensors

Electrical:
- (2) GFCI duplex receptacles
- Power for electrical hand dryers

Data / Communication:
N/A

Public Address / Clock:
- (1) PA Speaker

Fire Protection / Fire Alarm:
- Light-Hazard Sprinkler Coverage
- (1) 75cd strobe

# 25. PUBLIC TOILET ROOMS

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:

- Soap dispensers at sinks
- Toilet paper dispensers
- Paper towel dispensers
- Built-in or free-standing waste receptacles

Fixtures included in GC contract:

- Grab bars as required for accessibility
- Toilet partitions

Equipment/Technology:

Equipment included in GC Contract:

- Low decibel high velocity hand dryer in each public toilet room

## OTHER INFORMATION

## NOTES:

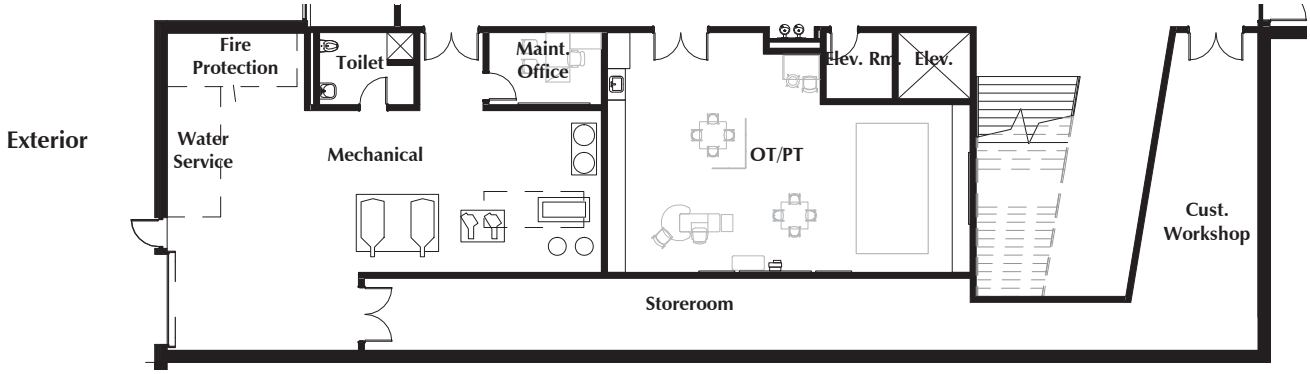
## 25. PUBLIC TOILET ROOMS

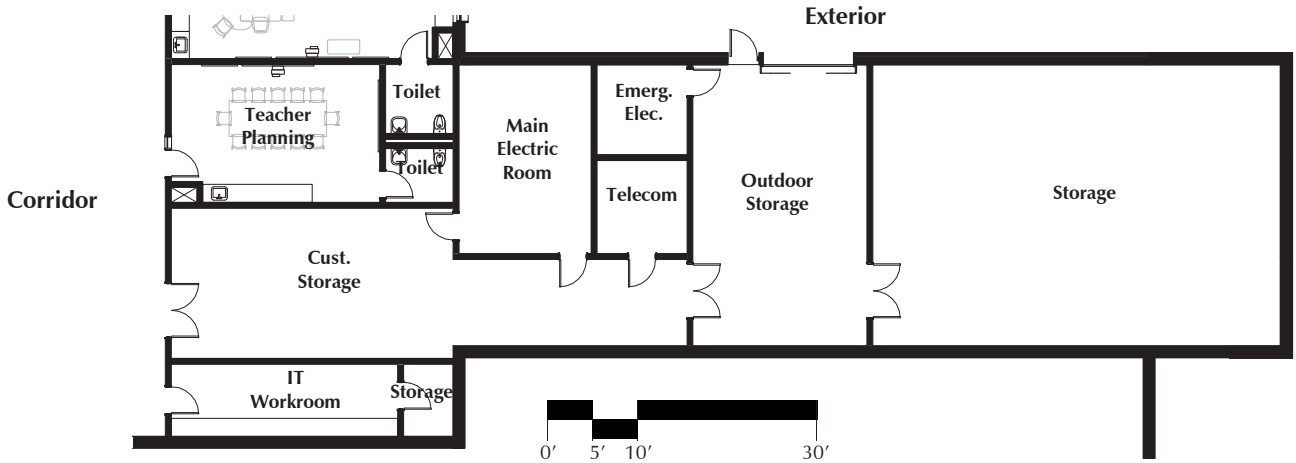
Review Comments:

Reviewed by:

Name, Title: Date:

## 26. CUSTODIAL & MECHANICAL




## GENERAL CRITERIA

Description:

Building facilities maintenance area includes Custodian's spaces, a telecom room, receiving area and storage adjacent to mechanical and electrical spaces.

Area: 2,390 SF (Custodial & Maintenance)

- Custodian's Office @ 100 SF
- Custodian's Toilet Room w/ Shower @ 82 SF
- Custodian's Workshop @ 425 SF
- Custodian's Storage @ 775 SF
- Receiving and General Supply @ 363 SF
- Storeroom @ 527 SF
- Network/Telecom Room @ 200 SF
- Mechanical Room as required
- Electric Rooms as required

Users:

(1-2) Custodians

Adjacencies:

- Exterior, Mechanical room, Receiving area

## MILLWORK / CASEWORK

N/A

## SPECIALTIES

Visual Display boards / accessories:
(1) 8′-0″ Magnetic white board

Window Treatments:
N/A

Miscellaneous:
Overhead door to mechanical room

# 26. CUSTODIAL & MECHANICAL

## TECHNICAL CRITERIA

Finish Hardware:
- Door closers
- Exit devices
- Storeroom lockset at storage door
- Exterior hardware at exterior doors
- Office lockset at office
- Overhead doors

Architectural Finishes:
- Floor: Sealed concrete
- Base: 4″ Resilient vinyl
- Walls: Painted GWB
- Ceiling: Exposed structure, painted

Acoustical Requirements:

Sound Transmission Coefficient (STC) rating at partitions for Custodian's Office and Telecom Room: TBD

Plumbing:
- (1) Accessible, unisex staff toilet room
- (1) Shower in toilet room
- Floor drains in Mechanical room
- Water wall hydrant for cleaning

Mechanical:

Exhaust ventilation as required

Lighting:
- (24) 1x4 Utility LED fixtures
- ON/OFF controls at the door

Electrical:
- (20) General duplex receptacles
- (1) Quad receptacle for workstation
- Exterior power receptacle near exterior door

Data / Communication:
- (1) Hardwired voice/data outlet (1 voice/2 data ports) for workstations
- (2) Hardwired data ports at office
- Connections for access control at maintenance entrance

Public Address / Clock:
- (2) Analog clocks
- (1) PA ceiling speaker

Fire Protection / Fire Alarm:
- Audiovisual devices as appropriate (TBD)

# 26. CUSTODIAL & MECHANICAL

## FIXTURES, FURNITURE & EQUIPMENT (FF&E NOT IN CONTRACT)

Fixtures:
- N/A

Furniture:
- (2) Office desks
- (3) Desk chairs
- (1) 42″ Filing cabinet
- (1) Workbench (in custodian workshop)
- Adjustable shelving units as required

Equipment/Technology:
- Computer equipment for systems control & alarm system in office
- Access control system at exterior doors

## OTHER INFORMATION

## NOTES:

## 26. CUSTODIAL & MECHANICAL

Review Comments:

Reviewed by:

Name, Title: Date:

# 4.1.2 SCHEMATIC DESIGN BINDER

M. Proposed Construction Methodology

PMA Consultants
EST. 1971
35 Braintree Hill Office Park, Suite 300 ▪ Braintree, MA 02184
Tel: 781.794.1404 ▪ Fax: 781.794.1405

Shrewsbury Beal Elementary School Project

Schematic Design Submittal

# Narrative of Construction Delivery Methodology

MGL Ch. 149, Design-Bid-Build vs. MGL Ch. 149A, Construction Management at Risk

At a Building Committee meeting on 2/13/18, the Owner's Project Manager (OPM), PMA Consultants, presented a comparison of the traditional Design-Bid-Build (MGL Ch. 149) and the Construction Management at Risk, CM@Risk, (MGL Ch. 149A) project delivery methods. The two methods were summarized as Follows:

Traditional Design-Bid-Build Project Delivery Method.

- "Traditional approach" for Public Construction Project
- Project team takes design to 100% construction documents with no contractor / third party involvement
- Town can pre-qualify general contractors and subs
- Once plans are completed, bids are solicited from filed trade-contractors and general contractors
- Low "responsive and responsible" bidder is awarded the project
- Contract value is based on a "lump sum" amount

Alternative CM@Risk Project Delivery Method

- CM hired during the design process (usually during late SD or early DD)
- CM provides design phase, pre-construction and construction services
- CM becomes the builder of the project (the "contractor")
- CM participates in trade prequalification process
- Owner participates in sub-contractor selections
- Option for early release bid packages or "fast-track" schedules
- Contract value is based on "Guaranteed Maximum Price" (GMP)
- Open books accounting

Also at the 2/13/18 Building Committee meeting, the OPM reviewed the advantages and disadvantages of each method with the review followed by questions by members of the Committee and answers from the OPM.

## Decision to Proceed with CM-at-Risk (MGL Ch. 149A) project delivery method.

At the May 8, 2018 Beal School Building Committee meeting, the committee voted 7-2 to proceed with the CM-at-Risk project delivery method. Expectations of high quality, more certainty with schedule, and the ability to select a contractor based upon qualifications and price were noted as compelling factors justifying the use of CM-at-Risk.

Two other significant influences leading to the decision to use CM-at-Risk were the Town's successful experience with the use of the CM at Risk project delivery method on the Sherwood Middle School project and the Shrewsbury Public Library Expansion and Renovation project. The new Sherwood Middle School opened ahead of schedule (in January 2013 rather than in September 2013) and the Library project completed on schedule in August of 2016. Both projects were constructed safely and with high quality, the final total project costs were was less than budgeted, and there were no claims or disputes at the end of the projects – levels of satisfaction that had not been achieved on prior Town of Shrewsbury school construction projects delivered through the traditional Ch. 149 design-bid-build process.

The following list of advantages of the CM-at-Risk method were considered:

- The CM-at-Risk Contractors bring a professional approach to project delivery.
- The CM-at-Risk contractor is selected based on qualifications and fee; with design-bid-build a pre-qualified General Contractor (GC) is accepted based upon the lowest bid.
- General Conditions are negotiated rather than bid which can result in more experienced and a larger number of on-site staff providing better inspection and improved quality.
- Savings in allowances, GMP contingency, and reimbursable general requirements are returned to Owner rather than retained by the contractor.
- CM-at-Risk contractor may bring to the table a higher quality collection of non-filed sub-bidders than a GC would.
- Potential schedule savings; accomplished through expert scheduling and early release packages, if warranted.
- The CM-at-Risk firms generally conduct business differently than GC firms, increasing the likelihood of a collaborative rather than adversarial relationship with the owner.
- Chapter 149A has attracted higher quality firms to public construction, many CM firms do not bid public work under Ch. 149.

N. Reimbursement Rate

## Anticipated Reimbursement Rate with Incentive Points

| Category | Reimbursement Points |
|---|---|
| | |
| Reimbursement Rate before Incentives | 50.16% |
| | |
| (0-2) Maintenance | 1.70 |
| (0-1) CM @ Risk | 1.00 |
| (0-6) Newly Formed Regional School District | 0 |
| (0-5) Major Reconstruction or Reno/Reuse | 0 |
| (0-1) Overlay Zoning District – c. 40R or c. 40S | 0 |
| (0-0.50) Overlay Zoning 100 Units or 50% units for 1, 2, 3 family units | 0 |
| (0-2) Energy Efficiency – "Green Schools" | 2.00 |
| (5) Model Schools | 0 |
| | |
| Total Incentive Points | 4.70 |
| | |
| **Anticipated MSBA Reimbursement Rate with Incentives** | **54.86%** |

# 4.1.2 SCHEMATIC DESIGN BINDER

## O. Total Project Budget

1. Total Project Budget
2. Narrative of Estimate Reconciliation

# Total Project Budget

**Town of Shrewsbury**
**Beal Elementary School**

**DRAFT**

**9/6/2018**

| | Total Project Budget: All costs associated with the project are subject to 963 CMR 2.16(5) | Estimated Budget | Scope Items Excluded from the Estimated Basis of Maximum Facilities Grant or Otherwise Ineligible | Estimated Basis of Maximum Total Facilities Grant[1] | Estimated Maximum Total Facilities Grant[1] |
|---|---|---|---|---|---|
| 1 | Feasibility Study Agreement | | | | |
| 2 | *OPM Feasibility Study* | $250,000 | $0 | $250,000 | |
| 3 | *A&E Feasibility Study* | $750,000 | $0 | $750,000 | |
| 4 | *Environmental & Site* | $50,000 | $0 | $50,000 | |
| 5 | *Other* | $150,000 | $0 | $150,000 | |
| 6 | **Feasibility Study Agreement Subtotal** | **$1,200,000** | **$0** | **$1,200,000** | **$658,320** |
| 7 | Administration | | | | |
| 8 | **Legal Fees** | $25,000 | $25,000 | $0 | **$0** |
| 9 | **Owner's Project Manager** | | | | |
| 10 | *Design Development* | $0 | $0 | $0 | |
| 11 | *Construction Contract Documents* | $0 | $0 | $0 | |
| 12 | *Bidding* | $2,373,917 | $0 | $2,373,917 | |
| 13 | *Construction Contract Administration* | $0 | $0 | $0 | |
| 14 | *Closeout* | $0 | $0 | $0 | |
| 15 | *Extra Services (Value is an Allowance)* | $150,000 | $0 | $150,000 | |
| 16 | *Reimbursable & Other Services (Includes $110k for testing + $90k for any addn'l building testing- windows roof, etc)* | $200,000 | $0 | $200,000 | |
| 17 | *Cost Estimates (Allowance)* | $65,000 | $0 | $65,000 | |
| 18 | *Advertising* | $5,000 | $0 | $5,000 | |
| 19 | *Permitting* | $0 | $0 | $0 | |
| 20 | *Owner's Insurance* | $0 | $0 | $0 | |
| 21 | *Other Administrative Costs (Allow., could include on-site FF&E/move mgt., struct peer review...)* | $150,000 | $150,000 | $0 | |
| 22 | **Administration Subtotal** | **$2,968,917** | **$175,000** | **$2,793,917** | **$1,532,743** |
| 23 | **Architecture and Engineering** | | | | |
| 24 | **Basic Services** | | | | |
| 25 | *Design Development* | $1,593,750 | $0 | $1,593,750 | |
| 26 | *Construction Contract Documents* | $3,028,125 | $0 | $3,028,125 | |
| 27 | *Bidding* | $159,375 | $0 | $159,375 | |
| 28 | *Construction Contract Administration* | $1,530,000 | $0 | $1,530,000 | |
| 29 | *Closeout* | $63,750 | $0 | $63,750 | |
| 30 | *Other Basic Services* | $0 | $0 | $0 | |
| 31 | **Basic Services Subtotal** | **$6,375,000** | **$0** | **$6,375,000** | |
| 32 | Reimbursable Services (PQ plugged in +$250K since PSR) | | | | |
| 33 | *Construction Testing (Allowance for special testing)* | $100,000 | $0 | $100,000 | |
| 34 | *Printing (over minimum)* | $15,000 | $0 | $15,000 | |
| 35 | *Other Reimbursable Costs (add'l design if Lake St per MassDOT, special GF review, LEED filing fees and special work packages)* | $150,000 | $0 | $150,000 | |
| 36 | *Hazardous Materials (This is a $100K allow. for subconsultant to observe and report on abatement before demo plus $100K allow. for contam. soils consulting)* | $200,000 | $0 | $200,000 | |
| 37 | *Geotech & Geo-Env. (LPA Estim)* | $50,000 | $0 | $50,000 | |
| 38 | *Site Survey (LPA Estim)* | $30,000 | $0 | $30,000 | |
| 39 | *Wetlands* | $0 | $0 | $0 | |
| 40 | *Traffic Studies* | $25,000 | $0 | $25,000 | |
| 41 | **Architectural/Engineering Subtotal** | **$6,945,000** | **$0** | **$6,945,000** | **$3,810,027** |
| 42 | **CM & Risk Preconstruction Services** | | | | |
| 43 | Pre-Construction Services (prelim. Value, $0/elsewhere in PSR) | $250,000 | **$0** | $250,000 | **$137,150** |
| 44 | Site Acquisition | | | | |
| 45 | Land / Building Purchase | $915,000 | $915,000 | $0 | |
| 46 | Appraisal Fees | $0 | $0 | $0 | |
| 47 | Recording fees | $0 | $0 | $0 | |
| 48 | **Site Acquisition Subtotal** | **$915,000** | **$915,000** | **$0** | **$0** |
| 49 | Construction Costs | | | | |
| 50 | SUBSTRUCTURE | | | | |
| 51 | Foundations | $3,302,132 | $0 | | |
| 52 | Basement Construction | $0 | $0 | | |
| 53 | SHELL | | | | |
| 54 | SuperStructure | $4,534,040 | $0 | | |
| 55 | Exterior Closure | $0 | $0 | | |
| 56 | Exterior Walls | $5,566,817 | $0 | | |
| 57 | Exterior Windows | $1,400,740 | $0 | | |
| 58 | Exterior Doors | $117,068 | $0 | | |
| 59 | Roofing | $2,192,546 | $0 | | |
| 60 | INTERIORS | | | | |
| 61 | Interior Construction | $4,648,072 | $0 | | |
| 62 | Staircases | $243,940 | $0 | | |
| 63 | Interior Finishes | $3,799,556 | $0 | | |
| 64 | SERVICES | | | | |
| 65 | Conveying Systems | $115,037 | $0 | | |
| 66 | Plumbing | $2,307,592 | $0 | | |
| 67 | HVAC | $5,632,726 | $0 | | |
| 68 | Fire Protection | $623,040 | $0 | | |
| 69 | Electrical | $6,225,100 | $0 | | |
| 70 | EQUIPMENT & FURNISHINGS | | | | |
| 71 | Equipment | $1,006,238 | $0 | | |
| 72 | Furnishings | $1,667,761 | $0 | | |
| 73 | SPECIAL CONSTRUCTION & DEMOLITION | | | | |
| 74 | Special Construction | $0 | $0 | | |
| 75 | Existing Building Demolition | $725,000 | $725,000 | | |
| 76 | In-Bldg. Hazardous Material Abatement | $1,250,000 | $1,250,000 | | |
| 77 | Asbestos Cont'g Floor Mat'l Abatement | $0 | $0 | | |
| 78 | Other Hazardous Material Abatement | $0 | $0 | | |

## Total Project Budget

**Town of Shrewsbury**
**Beal Elementary School**

**DRAFT**

**9/6/2018**

| | Total Project Budget: All costs associated with the project are subject to 963 CMR 2.16(5) | Estimated Budget | Scope Items Excluded from the Estimated Basis of Maximum Facilities Grant or Otherwise Ineligible | Estimated Basis of Maximum Total Facilities Grant[1] | Estimated Maximum Total Facilities Grant[1] |
|---|---|---|---|---|---|
| 79 | BUILDING SITEWORK | | | | |
| 80 | Site Preparation | $2,543,513 | $0 | | |
| 81 | Site Improvements | $4,656,664 | $0 | | |
| 82 | Site Civil / Mechanical Utilities | $1,702,407 | $0 | | |
| 83 | Site Electrical Utilities | $600,237 | $0 | | |
| 84 | Other Site Construction | $0 | $0 | | |
| 85 | Scope Excluded Site Cost | | $6,032,229 | | |
| 86 | **Construction Trades Subtotal** | $54,860,226 | $8,007,229 | | |
| 87 | Contingencies (Design and Pricing) | $5,486,023 | $800,723 | | |
| 88 | D/B/B Sub-Contractor Bonds | | $0 | | |
| 89 | D/B/B Insurance | | $0 | | |
| 90 | D/B/B General Conditions | $5,475,362 | $799,167 | | |
| 91 | D/B/B Overhead & Profit | | $0 | | |
| 92 | GMP Insurance | $1,564,394 | $228,334 | | |
| 93 | GMP Fee | $1,807,606 | $263,833 | | |
| 94 | GMP Contingency | $1,810,387 | $264,238 | | |
| 95 | Escalation to Mid-Point of Construction | $3,107,832 | $453,610 | | |
| 96 | Overall Excluded Construction Cost | | $16,141,895 | | |
| 97 | **Construction Budget** | **$74,111,829** | **$26,959,029** | **$47,152,800** | **$25,868,026** |
| 98 | **Alternates** | | | | |
| 99 | Ineligible Work Included in the Base Project | $0 | $0 | $0 | |
| 100 | Alternates Included in the Total Project Budget (Lake Street is in Constr. Budget) | $0 | $0 | $0 | |
| 101 | Alternates Excluded from the Total Project Budget | $0 | | $0 | |
| 102 | **Subtotal to be Included in Total Project Budget** | **$0** | **$0** | **$0** | **$0** |
| 103 | Miscellaneous Project Costs | | | | |
| 104 | *Utility Company Fees* | $30,000 | $30,000 | $0 | |
| 105 | *Testing Services* | $0 | $0 | $0 | |
| 106 | *Swing Space / Modulars* | $0 | $0 | $0 | |
| 107 | *Other Project Costs (Mailing & Moving)* | $150,000 | $150,000 | $0 | |
| 108 | **Misc. Project Costs Subtotal** | **$180,000** | **$180,000** | **$0** | **$0** |
| 109 | *Furnishings and Equipment* | | | | |
| 110 | *Furniture, Fixtures and Equipment (790 students @ $1,200/student)* | $948,000 | $0 | $948,000 | |
| 111 | *Technology (790 students @ $1,200/student)* | $948,000 | $0 | $948,000 | |
| 112 | **FF&E Subtotal** | **$1,896,000** | **$0** | **$1,896,000** | **$1,040,146** |
| 113 | | | | | |
| 114 | Soft Costs that exceed 20% of Construction Cost | | $0 | | |
| 115 | **Project Budget** | **$88,466,746** | **$28,229,029** | **$60,237,717** | **$33,046,412** |

| | | |
|---|---|---|
| 116 | **Board Authorization** | |
| 117 | Design Enrollment | 790 |
| 118 | Total Building Gross Floor Area (GSF) | 141,600 |
| 119 | Total Project Budget (excluding Contingencies) | $88,466,746 |
| 120 | Scope Items Excluded or Otherwise Ineligible | $28,229,029 |
| 121 | Third Party Funding (Ineligible) | $0 |
| 122 | Estimated Basis of Maximum Total Facilities Grant[1] | $60,237,717 |
| 123 | Reimbursement Rate | 54.86% |
| 124 | Est. Max. Total Facilities Grant (before recovery)[1] | $33,046,412 |
| 125 | Cost Recovery[2] | $0 |
| 126 | Estimated Maximum Total Facilities Grant[1] | $33,046,412 |

| | | |
|---|---|---|
| 127 | Construction Contingency[3] | $3,705,591 |
| 128 | Ineligible Construction Contingency[3] | $2,964,473 |
| 129 | "Potentially Eligible" Construction Contingency[3] | $741,118 |
| 130 | Owner's Contingency[3] | $659,495.85 |
| 131 | Ineligible Owner's Contingency[3] | $441,862 |
| 132 | "Potentially Eligible" Owner's Contingency[3] | $217,634 |
| 133 | Total Potentially Eligible Contingency[3] | $958,752 |
| 134 | Reimbursement Rate | 54.86% |
| 135 | Potential Additional Contingency Grant Funds[3] | $525,971 |
| 136 | Maximum Total Facilities Grant | $33,572,383 |
| 137 | Total Project Budget | $92,831,833 |
| | **Potential District Share:** | **$59,259,450** |

| | |
|---|---|
| 50.16 | Reimbursement Rate Before Incentive Points |
| 4.70 | Total Incentive Points |
| 54.86% | MSBA Reimbursement Rate |

NOTES

This template was prepared by the MSBA as a tool to assist Districts and consultants in understanding MSBA policies and practices regarding potential impact on the MSBA's calculation of a potential Basis of Total Facilities Grant and potential Total Maximum Facilities Grant. This template does not contain a final, exhaustive list of all evaluations which the MSBA may use in determining whether items are eligible for reimbursement by the MSBA. The MSBA will perform an independent analysis based on a review of information and estimates provided by the District for the proposed school project that may or may not agree with the estimates generated by the District using this template.

1. Does not include any potentially eligible contingency funds and is subject to review and audit by the MSBA.

2. The proposed demolition of the _____ School is expected to result in the MSBA recovering a portion of state funds previously paid to the District for the ____ project at the existing facilities completed in ___. The MSBA will perform an independent analysis based on a review of information and estimates provided by the District for the proposed school project that may or may not agree with the estimated cost recovery generated by the District and its consultants using this template.

3. Pursuant to Section 3.20 of the Project Funding Agreement and the applicable policies and guidelines of the Authority, any project costs associated with the reallocation or transfer of funds from either the Owner's contingency or the Construction contingency to other budget line items shall be subject to review by the Authority to determine whether any such costs are eligible for reimbursement by the Authority. All costs are subject to review and

0.20165501

0.79834499

**36.16% Forecasted MSBA Grant as % of TPB**

**DRAFT**

**Conceptual Total Project Cost for Modeling MSBA Grant Calculations**

**Based on Reconciled Construction Cost Estimate dated 8/28/13, Subject to Adjustment and Coordination w/ MSBA**

PMA Consultants
Est. 1971
35 Braintree Hill Office Park, Suite 300 ▪ Braintree, MA 02184
Tel: 781.794.1404 ▪ Fax: 781.794.1405

Shrewsbury Beal Elementary School Project

Schematic Design Submittal

## Narrative of Estimate Reconciliation

Schematic Design estimates were prepared for both the architect and the Owner's Project Manager (OPM). The architect's estimator was A. M. Fogarty & Associates, Inc. of Hingham and the OPM's estimator was PM&C, LLC of Hingham. On August 3, 2018, Schematic Design documents were provided to estimators and on 8/24/18 each estimating firm delivered their initial (unreconciled) construction cost estimates.

On 8/27/18, at the architect's offices in Worcester, the two estimators met with the architect and OPM to review and compare all elements of the two estimates. The scope and pricing of all elements of the estimates were reviewed and particular emphasis was placed on the elements with the greatest differences in quantities and/or prices. Each estimator made adjustments to his estimates to assure consistent placement estimated costs. Both estimators made selective adjustments to scope and pricing in response to clarifications of the design provided by the architect and subconsultants. Through this review, a mutual understanding of scope and pricing developed and all parties were confident that each construction cost estimate captured the entire scope of work.

A summary of estimates is provided as follows:

| | **Unreconciled Estimates** | | **Reconciled Estimates** | |
|---|---|---|---|---|
| | **A. M. Fogarty** | **PM&C** | **A. M. Fogarty** | **PM&C** |
| New Building | $43,402,421 | $42,337,490 | $43,382,406 | $42,403,469 |
| Sitework | $9,531,904 | $8,519,974 | $9,502,820 | $9,320,506 |
| Demo | $750,000 | $600,000 | $725,000 | $600,000 |
| Hazardous Mat'ls Abatement | $1,640,000 | $700,000 | $1,250,000 | $1,250,000 |
| **Total Direct Cost** | **$55,324,325** | **$52,157,464** | **$54,860,226** | **$53,573,975** |
| Design Contingency | $5,532,432 | $5,440,024 | $5,486,023 | $5,609,195 |
| CM/GMP Contingency | $1,825,703 | $1,196,805 | $1,810,387 | $1,851,034 |
| Escalation | $3,760,948 | $2,242,771 | $3,107,832 | $2,517,977 |
| General Conditions | $4,500,000 | $3,360,000 | $3,750,000 | $4,000,000 |
| General Reqts | $1,773,585 | $2,575,883 | $1,725,362 | $2,026,565 |
| Per. & Payment Bond | $618,094 | $508,994 | $601,289 | $528,798 |
| Gen'l Liability Ins. | $990,024 | $80,368 | $963,105 | $814,071 |
| CM Fee | $2,043,941 | $1,537,783 | $1,807,606 | $1,773,040 |
| **Sub Total** | **$76,369,052** | **$69,100,092** | **$74,111,830** | **$72,694,655** |
| Lake Street Realignment | *incl'd above* | $1,479,940 | *incl'd above* | *incl'd above* |
| Field Irrigation | *incl'd above* | $38,023 | *incl'd above* | *incl'd above* |
| Firewall | *incl'd above* | $138,545 | *incl'd above* | *incl'd above* |
| **Total** | **$76,369,052** | **$70,756,600** | **$74,111,830** | **$72,694,655** |

# 4.1.2 SCHEMATIC DESIGN BINDER

P. Designer Cost Estimate

A.M. Fogarty
& Assoc., Inc.
175 Derby St., Suite 5, Hingham, MA 02043
TEL: (781) 749-7272 • FAX: (781) 740-2652
ptim@amfogarty.com
"Construction Cost Consultants"

# Schematic Cost Estimate
# Beal Elementary School
# Shrewsbury, MA

**28-Aug-18**

| | | | | |
|---|---|---|---|---|
| NEW BUILDING | | | | $43,382,406 |
| SITEWORK | | | | $9,502,820 |
| BUILDING DEMOLITION | 100,000 | GSF | $7.25 | $725,000 |
| HAZARDOUS WASTE REMOVAL | | | | $1,250,000 |
| | | | | --- |
| TOTAL DIRECT COST ( escalated to mid point of construction ) | | | | $54,860,226 |
| Chptr 149 a CM at Risk: | | | | |
| DESIGN CONTINGENCY | | 10% | | $5,486,023 |
| CM CONTINGENCY | | 3% | | $1,810,387 |
| ESCALATION ( bid winter 2019 ) | | 5% | | $3,107,832 |
| GENERAL CONDITIONS | 25 | MOS | $150,000 | $3,750,000 |
| GENERAL REQUIREMNTS | | 2.5% | | $1,725,362 |
| BUILDING PERMIT | | waived | | |
| P&P BOND | | 0.85% | | $601,289 |
| GENERAL LIABILITY INSURANCE | | 1.35% | | $963,105 |
| FEE | | 2.50% | | $1,807,606 |
| | | | | --- |
| TOTAL CONSTRUCTION COST | | | | $74,111,829 |
| COST PER S.F. | | | | $523.39 |

**ALTERNATES:**

| | |
|---|---|
| LAKE STREET ALIGNMENT | ($1,238,757) |
| IRRIGATION WELL AND SYSTEM | ($118,322) |

| | | | |
|---|---|---|---|
| PROJECT: | Beal Elementary School | NO. OF SQ. FT.: | 141,600 |
| LOCATION: | Shrewsbury, MA | COST PER SQ. FT.: | $373.48 |
| CLIENT: | Lamoureux-Pagano Architects | *GSF Noted on A1.1 | |
| DATE: | 28-Aug-18 | | |

No.: 18004

## SUMMARY

| | TOTAL | PERCENT OF PROJECT | COST PER SF |
|---|---|---|---|
| A. SUBSTRUCTURE | | | |
| A10 - FOUNDATIONS | | | |
| A1010 STANDARD FOUNDATIONS | 2,350,230 | 4% | 16.60 |
| A1020 SPECIAL FOUNDATIONS | 0 | 0% | 0.00 |
| A1030 SLAB ON GRADE | 951,902 | 2% | 6.72 |
| A20 - BASEMENT CONSTRUCTION | | | |
| A2010 BASEMENT EXCAVATION | 0 | 0% | 0.00 |
| A2020 BASEMENT WALLS | 0 | 0% | 0.00 |
| B. SHELL | | | |
| B10 - SUPERSTRUCTURE | | | |
| B1010 FLOOR CONSTRUCTION | 1,862,953 | 4% | 13.16 |
| B1020 ROOF CONSTRUCTION | 2,671,087 | 5% | 18.86 |
| B20 - EXTERIOR ENCLOSURE | | | |
| B2010 EXTERIOR WALLS | 5,566,817 | 11% | 39.31 |
| B2020 EXTERIOR WINDOWS | 1,400,740 | 3% | 9.89 |
| B2030 EXTERIOR DOORS | 117,068 | 0% | 0.83 |
| B30 - ROOFING | | | |
| B3010 ROOF COVERINGS | 2,154,946 | 4% | 15.22 |
| B3020 ROOF OPENINGS | 37,600 | 0% | 0.27 |
| C. INTERIORS | | | |
| C10 - INTERIOR CONSTRUCTION | | | |
| C1010 PARTITIONS | 2,867,146 | 5% | 20.25 |
| C1020 INTERIOR DOORS | 806,839 | 2% | 5.70 |
| C1030 FITTINGS | 974,087 | 2% | 6.88 |
| C20 - STAIRS | | | |
| C2010 STAIR CONSTRUCTION | 157,500 | 0% | 1.11 |
| C2020 STAIR FINISHES | 86,440 | 0% | 0.61 |
| C30 - INTERIOR FINISHES | | | |
| C3010 WALL FINISHES | 1,281,090 | 2% | 9.05 |
| C3020 FLOOR FINISHES | 1,471,319 | 3% | 10.39 |
| C3030 CEILING FINISHES | 1,047,147 | 2% | 7.40 |
| D. SERVICES | | | |
| D10 - CONVEYING | | | |
| D1010 ELEVATORS & LIFTS | 115,037 | 0% | 0.81 |
| D20 - PLUMBING | | | |
| D2010 PLUMBING | 2,307,592 | 4% | 16.30 |

| | TOTAL | PERCENT OF PROJECT | COST PER SF |
|---|---|---|---|
| D30 - HVAC | | | |
| D3010 HVAC | 5,632,726 | 11% | 39.78 |
| D40 - FIRE PROTECTION | | | |
| D4010 SPRINKLERS | 623,040 | 1% | 4.40 |
| D4020 STANDPIPES | 0 | 0% | 0.00 |
| D4030 FIRE PROTECTION SPECIALTIES | 0 | 0% | 0.00 |
| D4090 OTHER FIRE PROTECTION SYSTEMS | 0 | 0% | 0.00 |
| D50 - ELECTRICAL | | | |
| D5010 ELECTRICAL SERVICE & DISTRIBUTION | 2,139,160 | 4% | 15.11 |
| D5020 LIGHTING & BRANCH WIRING | 1,649,640 | 3% | 11.65 |
| D5030 COMMUNICATION & SECURITY | 1,865,700 | 4% | 13.18 |
| D5090 OTHER ELECTRICAL SYSTEMS | 570,600 | 1% | 4.03 |
| E. EQUIPMENT & FURNISHINGS | | | |
| E10 - EQUIPMENT | | | |
| E1010 COMMERCIAL EQUIPMENT | 545,000 | 1% | 3.85 |
| E1020 INSTITUTIONAL EQUIPMENT | 0 | 0% | 0.00 |
| E1030 VEHICULAR EQUIPMENT | 0 | 0% | 0.00 |
| E1090 OTHER EQUIPMENT | 461,238 | 1% | 3.26 |
| E20 - FURNISHINGS | | | |
| E 2010 FIXED FURNISHINGS | 1,667,761 | 3% | 11.78 |
| E2020 MOVABLE FURNISHINGS | 0 | 0% | 0.00 |
| F. SPECIAL CONSTRUCTION & DEMOLITION | | | |
| F10 - SPECIAL CONSTRUCTION | | | |
| F1010 SPECIAL STRUCTURES | 0 | 0% | 0.00 |
| F20 - SELECTIVE BUILDING DEMOLITION | | | |
| F2010 BUILDING ELEMENTS DEMOLITION | 0 | 0% | 0.00 |
| F2020 HAZARDOUS COMPONENTS ABATEMENT | 0 | 0% | 0.00 |
| G. BUILDING SITEWORK | | | |
| G10 - SITE PREPARATION | | | |
| G1010 SITE CLEARING | 735,606 | 1% | 5.19 |
| G1020 SITE DEMOLITION & RELOCATIONS | 0 | 0% | 0.00 |
| G1030 SITE EARTHWORK | 1,807,907 | 3% | 12.77 |
| G1040 HAZARDOUS WASTE REMEDIATION | 0 | 0% | 0.00 |
| G20 - SITE IMPROVEMENTS | | | |
| G2010 ROADWAYS | 1,445,883 | 3% | 10.21 |
| G2020 PARKING LOTS | 0 | 0% | 0.00 |
| G2030 PEDESTRIAN PAVING | 567,232 | 1% | 4.01 |
| G2040 SITE DEVELOPMENT | 1,441,363 | 3% | 10.18 |
| G2050 LANDSCAPING | 1,202,186 | 2% | 8.49 |

Beal Elementary School

| | TOTAL | PERCENT OF PROJECT | COST PER SF |
|---|---|---|---|
| G30 - SITE MECHANICAL UTILITIES | | | |
| G3010 WATER SUPPLY | 464,163 | 1% | 3.28 |
| G3020 SANITARY SEWER | 104,503 | 0% | 0.74 |
| G3030 STORM SEWER | 1,071,381 | 2% | 7.57 |
| G3040 HEATING DISTRIBUTION | 0 | 0% | 0.00 |
| G3050 COOLING DISTRIBUTION | 0 | 0% | 0.00 |
| G3060 FUEL DISTRIBUTION | 62,360 | 0% | 0.44 |
| G3090 OTHER SITE MECHANICAL UTILITIES | 0 | 0% | 0.00 |
| G40 - SITE ELECTRICAL UTILITIES | | | |
| G4010 ELECTRICAL DISTRIBUTION | 286,338 | 1% | 2.02 |
| G4020 SITE LIGHTING | 313,899 | 1% | 2.22 |
| G4030 SITE COMMUNICATIONS & SECURITY | 0 | 0% | 0.00 |
| G4090 OTHER SITE ELECTRICAL UTILITIES | 0 | 0% | 0.00 |
| G90 - OTHER SITE CONSTRUCTION | | | |
| G9090 OTHER SITE SYSTEMS | 0 | 0% | 0.00 |
| | --- | --- | --- |
| TOTAL DIRECT COST | 52,885,226 | 100% | 373.48 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|

A. SUBSTRUCTURE

A10 - FOUNDATIONS

A1010 STANDARD FOUNDATIONS

033000 CAST IN PLACE CONCRETE

| | | | | |
|---|---|---|---|---|
| Int Column Footing -18"D ( 118 ea): | | | | |
| 4000 psi, NW, (incl. placement) | 242 | CY | 205.00 | 49,610 |
| Formwork | 4,345 | SFCA | 9.25 | 40,191 |
| Rebar | 24,200 | LBS | 1.20 | 29,040 |
| **unit cost $491.08* | | | | |
| | | | | |
| Perim Wall Column Footing & pilasters | | N/A | | |
| | | | | |
| Retaining Wall Footing - 1'6"d x 12'w x 537 LF: | | | | |
| 4,000 psi, NW, (incl. placement) | 358 | CY | 205.00 | 73,390 |
| Formwork | 2,258 | SFCA | 8.00 | 18,064 |
| Rebar | 17,900 | LBS | 1.20 | 21,480 |
| **unit cost $315.46* | | | | |
| | | | | |
| Retaining Wall Footing - 1'6"d x 6'w x 46 LF: | | | | |
| 4,000 psi, NW, (incl. placement) | 15 | CY | 205.00 | 3,075 |
| Formwork | 78 | SFCA | 8.00 | 624 |
| Stepped Formwork | 75 | SFCA | 15.00 | 1,125 |
| Rebar | 1,500 | LBS | 1.20 | 1,800 |
| **unit cost $441.60* | | | | |
| | | | | |
| Perim Wall Footing 3 - 3'6" w 'x 1' (2,027 LF ): | | | | |
| 4000 psi, NW, (incl. placement) | 227 | CY | 205.00 | 46,535 |
| Formwork | 3,910 | SFCA | 8.00 | 31,280 |
| Stepped Formwork | 144 | SFCA | 15.00 | 2,160 |
| Rebar | 17,025 | LBS | 1.20 | 20,430 |
| **unit cost $442.31* | | | | |
| | | | | |
| Int Retaining Wall (20" Thick x 15'H x 408 lf): | | | | |
| 4,000 psi, NW, (incl. placement) | 378 | CY | 210.00 | 79,380 |
| Formwork | 12,240 | SFCA | 20.00 | 244,800 |
| Reinforcing steel | 56,700 | LBS | 1.20 | 68,040 |
| **unit cost $1,037.62* | | | | |
| | | | | |
| Ext Retaining Wall (22-16" Thick x 18'H x 140 lf): | | | | |
| 4,000 psi, NW, (incl. placement) | 134.5 | CY | 210.00 | 28,245 |
| Formwork | 5,040 | SFCA | 22.00 | 110,880 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Brick shelf | 140 | LF | 17.50 | 2,450 |
| Reinforcing steel | 20,175 | LBS | 1.20 | 24,210 |
| **unit cost $1,232.60* | | | | |
| Ext Stepped Retaining Wall ( 18" -20" Thick x 10'H Ave x 47 lf): | | | | |
| 4,000 psi, NW, (incl. placement) | 24 | CY | 210.00 | 5,040 |
| Stepped Formwork | 940 | SFCA | 22.00 | 20,680 |
| Brick shelf | 47 | LF | 17.50 | 823 |
| Reinforcing steel | 3,600 | LBS | 1.20 | 4,320 |
| **unit cost $1,285.94* | | | | |
| (1/S4.1) Foundation Perim. Wall 18" - 20" x 4' -8' deep (2,030 lf): | | | | |
| 4000 psi, NW, (incl. placement) | 490 | CY | 205.00 | 100,450 |
| Formwork | 15,488 | SFCA | 18.50 | 286,528 |
| Stepped Formwork | 1,504 | SFCA | 20.00 | 30,080 |
| Brick Shelf | 2,030 | LF | 14.50 | 29,435 |
| Reinforcing steel (4.5 / psf ) | 73,500 | LBS | 1.20 | 88,200 |
| **unit cost $1,091.21* | | | | |
| Int Column pier & pilaster - ( 17 ea): | | | | |
| 4000 psi, NW, (incl. placement) | 28 | CY | 195.00 | 5,363 |
| Formwork | 1,376 | SFCA | 9.25 | 12,728 |
| Rebar | 4,125 | LBS | 1.20 | 4,950 |
| **unit cost $837.84* | | | | |
| Gym Foundation Perim. Wall 20" x 4' deep (43 lf): | | | | |
| 4000 psi, NW, (incl. placement) | 11 | CY | 205.00 | 2,255 |
| Formwork | 344 | SFCA | 18.50 | 6,364 |
| Brick Shelf | 43 | LF | 14.50 | 624 |
| Reinforcing steel (4.5 / psf ) | 1,650 | LBS | 1.20 | 1,980 |
| **unit cost $1,020.23* | | | | |
| Stage Int. Wall Footing - (2' x 1' x234 lf): | | | | |
| 4000 psi, NW, (incl. placement) | 17.5 | CY | 205.00 | 3,588 |
| Formwork | 468 | SFCA | 8.00 | 3,744 |
| Reinforcing steel | 1,313 | LBS | 1.20 | 1,575 |
| **unit cost $508.94* | | | | |
| Stage Int. Found. Wall( 1' x 2' x 234 lf): | | | | |
| 4000 psi, NW, (incl. placement) | 17.5 | CY | 195.00 | 3,413 |
| Formwork | 936 | SFCA | 13.00 | 12,168 |
| Reinforcing steel | 2,625 | LBS | 1.20 | 3,150 |
| **unit cost $1,070.31* | | | | |
| Tie Beam @ Brace Frame - (2' x 1' x 362 lf): | | | | |
| 4000 psi, NW, (incl. placement) | 27 | CY | 205.00 | 5,535 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Formwork | 524 | SFCA | 13.00 | 6,812 |
| Rebar | 3,375 | LBS | 1.20 | 4,050 |
| **unit cost $607.30* | | | | |
| Fire Sep Int. Wall Footing - (3' x 1' x 83 lf): | | | | |
| 4000 psi, NW, (incl. placement) | 9.5 | CY | 205.00 | 1,948 |
| Formwork | 166 | SFCA | 10.00 | 1,660 |
| Reinforcing steel | 713 | LBS | 1.20 | 855 |
| **unit cost $469.74* | | | | |
| Fire Sep Int. Foundation Wall | NIC | | | |
| 18"D Canopy Column Footing - ( 20 ea): | | | | |
| 4000 psi, NW, (incl. placement) | 29 | CY | 195.00 | 5,655 |
| Formwork | 600 | SFCA | 9.25 | 5,550 |
| Rebar | 1,450 | LBS | 1.20 | 1,740 |
| **unit cost $446.38* | | | | |
| Canopy Column Pier - ( 2' x 2' x 6'H w/ 3'exp. 20 ea): | | | | |
| 4000 psi, NW, (incl. placement) | 18 | CY | 195.00 | 3,510 |
| Formwork | 960 | SFCA | 9.25 | 8,880 |
| Rebar | 900 | LBS | 1.20 | 1,080 |
| **unit cost $748.33* | | | | |
| Concrete Allowances: | | | | |
| Setting Anchor Bolts and Grout | 118 | EA | 320.00 | 37,760 |
| Interior equipment pads - allow | 1 | LS | 5,000.00 | 5,000 |
| 12" Elevator mat | 6 | CY | 650.00 | 3,900 |
| Elev sump pit | 1 | EA | 900.00 | 900 |
| 12" Elevator pit wall | 6 | CY | 1,100.00 | 6,600 |
| Loading Dock Foundation | | | | |
| Wall Footing: | 9 | CY | 385.00 | 3,465 |
| Foundation Wall | 24 | CY | 985.00 | 23,640 |
| Loading Dock Stair Structure | 1 | LS | 7,500.00 | 7,500 |
| * Retaining Wall carried w/ site estimate | | | | |
| <u>072100 INSULATION</u> | | | | |
| ( 4/A6.1)Int Ret Wall 10- 15'H x 455 LF: | | | | |
| 2" Rigid found. insul - full ht ret. wall | 6,590 | SF | 3.20 | 21,088 |
| Drainage comp w/ geotextile fabric | 6,590 | SF | 2.60 | 17,134 |
| ( 4/A6.2)Ext Retaining Wall 18'H x 140 LF: | | | | |
| 2" Rigid found. insul - full ht ret. wall | 2,520 | SF | 3.20 | 8,064 |
| Drainage comp w/ geotextile fabric | 2,520 | SF | 2.60 | 6,552 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Typ Frost Wall: | | | | |
| 2" Rigid found. Insul | 8,496 | SF | 3.20 | 27,187 |
| 071000 DAMPPROOF., WATERPROOF. & CAULKING* | | | | |
| ( 4/A6.1)Int Ret Wall 10-15'H x 408 LF: | | | | |
| Foundation waterproofing membrane | 6,590 | SF | 7.90 | 52,061 |
| ( 4/A6.2)Ext Retaining Wall 18'H x 140 LF: | | | | |
| Foundation waterproofing membrane | | nic | | |
| Foundation dampproofing | | not shown | | |
| Elev. pit waterproofing | 1 | LOC | 4,300.00 | 4,300 |
| 310000 EARTHWORK | | | | |
| Foundation Earthwork: | | | | |
| Building Cut | 2,562 | CY | 12.00 | 30,744 |
| Slab fill | 12,457 | CY | 28.00 | 348,796 |
| Foundation excavation | 6,500 | CY | 12.00 | 78,000 |
| Retaing Wall Backfill | 1,800 | CY | 22.00 | 39,600 |
| Backfill Existing | 4,700 | CY | 12.00 | 56,400 |
| excess spoil reuse in sitework portion | | | | |
| | | | | --- |
| | | | | 2,350,230 |
| A1030 SLAB ON GRADE | | | | |
| 310000 EARTHWORK | | | | |
| 12" Gravel base - SOG | 3,359 | CY | 36.00 | 120,924 |
| Excavate plumbing trenches | 90,688 | SF | 0.50 | 45,344 |
| GF Under slab drainage | | NIC | | |
| Perm Foundation Drain - lowest level | 1,985 | LF | 32.50 | 64,513 |
| Perm Foundation Drain - upper level | | NIC | | |
| Moisture mitigation | | W/ C 3020 | | |
| 033000 CAST IN PLACE CONCRETE | | | | |
| 5" Slab on Grade - Typ: | | | | |
| 3,500 psi, NW, (incl. placement) | 1,411 | CY | 220.00 | 310,420 |
| 6x6 W2.9 X W2.9 | 90,688 | SF | 1.68 | 152,356 |
| Control Joint | 6,045 | LF | 2.60 | 15,717 |
| Trowel Finish | 90,688 | SF | 2.20 | 199,514 |

*unit cost $7.48

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Ext. 6" Loading Dock & Ramp Slab : | | | | |
| 4000 psi, NW, (incl. placement) | 18 | CY | 245.00 | 4,410 |
| 6x6 W2.9 X W2.9 | 928 | SF | 2.00 | 1,856 |
| Trowel Finish | 928 | SF | 3.00 | 2,784 |
| *unit cost $9.75 | | | | |
| Premium @ stage ramp ( 3 loc) | 350 | SF | 25.00 | 8,750 |
| 071000 DAMPPROOF., WATERPROOF. & CAULKING* | | | | |
| GF Under slab waterproofing sys | | nic | | |
| 072100 INSULATION | | | | |
| 2" Rigid Slab Insul. - 2'W @ BLDG perim | 6,100 | SF | 3.30 | 20,130 |
| 072616 BELOW GRADE VAPOR RETARDER | | | | |
| Under slab vapor barrier - 2'W @ BLDG perim | 6,100 | SF | 0.85 | 5,185 |
| | | | | --- |
| | | | | 951,902 |
| TOTAL A10 FOUNDATIONS | | | | 3,302,132 |
| B. SHELL | | | | |
| B10 - SUPERSTRUCTURE | | | | |
| B1010 FLOOR CONSTRUCTION | | | | |
| 051200 STRUCTURAL STEEL | | | | |
| Steel Allowance (50,912 GSF): | | | | |
| TYP Floor Frame ( 14 lbs / SF) | 351.1690 | TONS | 3,700.00 | 1,299,325 |
| HSS Beam | Included Above | | | |
| Wide Flange Beam | Included Above | | | |
| HSS Column | Included Above | | | |
| HSS Brace Frame | Included Above | | | |
| FND wall deck support angle | Included Above | | | |
| Relieving angle | Included Above | | | |
| Shear stud ( 10/100sf) | 5,017 | EA | 5.35 | 26,841 |
| TOTAL STEEL WEIGHT | | TONS | | |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| 033000 CAST IN PLACE CONCRETE | | | | |
| TYP 5 1/2" NW Deck fill | 50,167 | SF | 7.55 | 378,761 |
| 053100 STEEL DECKING | | | | |
| 3" x 18 Ga. Comp Deck- Typ | 50,167 | SF | 3.15 | 158,026 |
| 054000 COLD FORMED FRAMING FRAMING | | | | |
| Stage - light gauge raised flr framing | | N/A | | |
| 078120 FIREPROOFING | | | | |
| Spray fireproofing | | N/A | | |
| | | | | --- |
| | | | | 1,862,953 |
| B1020 ROOF CONSTRUCTION | | | | |
| 051200 STRUCTURAL STEEL | | | | |
| Steel Allowance (91,411 GSF): | | | | |
| TYP Roof Frame ( 13 # / 72,441 SF) | 470.8665 | TONS | 3,700.00 | 1,742,206 |
| Gym Roof Frame (LH Joist 13 lbs / 7,580SF) | 49.27 | TONS | 3,700.00 | 182,299 |
| Café Roof Frame (DLH Joist 13 lbs / 7,465 SF) | 48.5225 | TONS | 3,700.00 | 179,533 |
| Stage Roof Frame (LH Joist 13 lbs / 3,925 SF) | 25.5125 | TONS | 3,700.00 | 94,396 |
| Truss | | Included Above | | |
| HSS Beam | | Included Above | | |
| Wide Flange Beam | | Included Above | | |
| HSS Column | | Included Above | | |
| HSS Brace Frame | | Included Above | | |
| Relieving angle | | Included Above | | |
| Roof edge angle | | Included Above | | |
| Galv. RTU dunnage | | Included Above | | |
| Moment connection | | Included Above | | |
| Solar panel support | | Included Above | | |
| Shear stud ( 10/100sf) | 480 | EA | 5.50 | 2,640 |
| Premium -AESS | | N/A | | |
| Allow: | | | | |
| TS Roof screen ( 10 lbs/sf @ 945 SF) | 4.75 | TONS | 4,200.00 | 19,950 |
| Main Entry High Canopy ( 1,460 SF): | | | | |
| Low slope flat roof frame( 10#/SF) | 7.3 | TONS | 4,250.00 | 31,025 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| 9' Color Galv stl col ( 10 EA) | 1.4 | TONS | 4,250.00 | 5,950 |
| Main Entry Low Canopy (1,716 SF): | | | | |
| Low slope flat roof frame( 10#/SF) | 8.58 | TONS | 4,200.00 | 36,036 |
| 7' Color Galv stl col ( 10 EA) | 1.3 | TONS | 4,200.00 | 5,460 |
| South Entry Cant Canopy (1,436 SF): | | | | |
| Flat roof frame ( 10#/SF) | 7.18 | TONS | 4,200.00 | 30,156 |
| 033000 CAST IN PLACE CONCRETE | | | | |
| 6" NW deck fill @ mech equip -Allow: | | | | |
| Roof Top mech equip | 4,850 | SF | 7.00 | 33,950 |
| 8" x 12"H conc curb @ doghouse roof top unit | | N/A | | |
| Misc Equip curbs | 1 | LS | 7,500.00 | 7,500 |
| 053100 STEEL DECKING | | | | |
| Roof Deck: | | | | |
| 1 1/2" x 18Ga comp deck -mech equip | 4,500 | SF | 3.10 | 13,950 |
| 3" x 20/20 Ga acoustical - gym | 7,580 | SF | 7.30 | 55,334 |
| 3" x 20/20 Ga acoustical-café & stage | | N/A | | |
| 1 1/2" x 20 Ga Sloped | 4,700 | SF | 2.70 | 12,690 |
| 1 1/2" x 20 Ga Typ. Flat | 74,281 | SF | 2.70 | 200,559 |
| 1 1/2" x 20 Ga Main entry canopies low sloped | 3,176 | SF | 2.70 | 8,575 |
| 1 1/2" x 20 Ga South entry flat canopies | 1,436 | SF | 2.70 | 3,877 |
| 078120 FIREPROOFING | | | | |
| Spray fireproofing -elev shaft cap | 1 | LS | 5,000.00 | 5,000 |
| | | | | --- |
| | | | | 2,671,087 |
| TOTAL B10 SUPERSTRUCTURE | | | | 4,534,040 |

B20 - EXTERIOR ENCLOSURE

B2010 EXTERIOR WALLS

**GSF Exterior**

040001 MASONRY*

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Masonry Veneer Building: | | | | |
| Brick veneer | 30,057 | SF | 33.50 | 1,006,910 |
| Premium -Brick veneer patterned | 750 | SF | 10.00 | 7,500 |
| Typ 4" precast wall base 3'4"H | 6,570 | SF | 72.00 | 473,040 |
| 4" Precast wall base exp fnd | 2,000 | SF | 72.00 | 144,000 |
| Precast window sill & lintels | | N/A | | |
| Masonry veneer cap / mtl panels sill | | N/A | | |
| Canopy col enclosure | | N/A | | |
| SS Masonry flashing | 3,000 | LF | 12.00 | 36,000 |
| Staging | | inc. w/ unit | | |
| CMU Backup | | N/A | | |
| 054000 COLD FORMED METAL FRAMING | | | | |
| Exterior wall Backup: | | | | |
| 8" x 16 Ga. stud @ typ wall | 49,951 | SF | 10.75 | 536,973 |
| (struct)12" x 16 Ga. stud @ Gym full ht 25' | 868 | SF | 14.75 | 12,803 |
| 8" x 16 Ga. stud @ fin wall | 200 | SF | 10.75 | 2,150 |
| 6" x 16 Ga. stud @ Roof edge wall 12"H | 2,555 | SF | 9.20 | 23,506 |
| 6" x 16 Ga. stud @ Kit parapet wall 5' H | 865 | SF | 9.20 | 7,958 |
| 1/2" Dens glass sheathing typ wall | 54,638 | SF | 3.30 | 180,305 |
| 1/2" Dens glass sheathing -back side @ roof | 3,420 | SF | 3.30 | 11,286 |
| 4" lgmf@ | | | | |
| 4' soffit @ lower edge | 128 | SF | 8.75 | 1,120 |
| 8' soffit @ upper edge | 256 | SF | 8.75 | 2,240 |
| 18" soffit @ upper rake | 93 | SF | 8.75 | 814 |
| Fascia / Rake frame 2'H | 510 | SF | 8.75 | 4,463 |
| 1/2" Dens glass sheathing | 987 | SF | 4.00 | 3,948 |
| 4" lgmf Canopy Framing @ : | | | | |
| Ceiling frame | 4,723 | SF | 7.50 | 35,423 |
| Fascia frame - 12"H | 622 | SF | 7.50 | 4,665 |
| 1/2" Dens glass sheathing | 5,345 | SF | 4.00 | 21,380 |
| 4" lgmf Art Room Framing @ : | | | | |
| Ceiling frame | 409 | SF | 7.50 | 3,068 |
| Fascia frame - 12"H | 72 | SF | 7.50 | 540 |
| 1/2" Dens glass sheathing | 481 | SF | 4.00 | 1,924 |
| 050001 MISCELLANEOUS & ORNAMENTAL IRON* | | | | |
| Galv, loose lintel | 1,221 | LF | 36.00 | 43,956 |
| Reliving angle | | W /Structural | | |
| OH door frame @: | | | | |
| Mech / elec rm (10'x9' ) | 1 | EA | 750.00 | 750 |
| Storage rm (10'x9' ) | 1 | EA | 750.00 | 750 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| 071000 DAMPPROOF., WATERPROOF. & CAULKING* | | | | |
| Control and expansion joints | 1 | LS | 30,000.00 | 30,000 |
| Adhered air & vapor barrier : | | | | |
| Typ ext wall | 54,638 | SF | 7.50 | 409,785 |
| Sloped roof fascia & soffit cladding | 987 | SF | 7.50 | 7,403 |
| Canopy roof fascia & soffit cladding | 5,345 | SF | 7.50 | 40,088 |
| Art roof fascia & soffit cladding | 481 | SF | 7.50 | 3,608 |
| 072100 INSULATION | | | | |
| Exterior Wall: | | | | |
| Cavity drainage mat @ brick veneer | 30,057 | SF | 3.35 | 100,691 |
| Typ 3" Foil faced rigid Insulation | 54,638 | SF | 3.35 | 183,037 |
| Typ 6" batt (R-19) | 54,638 | SF | 0.85 | 46,442 |
| 074000 WALL PANELS & TRIM | | | | |
| Exterior Wall Panel System: | | | | |
| High Performance Rainscreen sys w/ mtl furring | 19,318 | SF | 79.99 | 1,545,247 |
| Typ Gravel stop-extended prefab metal fascia | W / Roof Flashing | | | |
| *Insulated Panels also included as part of the window system | | | | |
| *Fiber Cement Wall Panels ( per spec ) | | N/A | | |
| Metal composite sys w/ mtl furring @ Sloped Roof : | | | | |
| 4' soffit @ lower edge | 128 | SF | 65.00 | 8,320 |
| 8' soffit @ upper edge | 256 | SF | 65.00 | 16,640 |
| 18" soffit @ upper rake | 93 | SF | 65.00 | 6,045 |
| Fascia / Rake 2'H | 510 | SF | 65.00 | 33,150 |
| Metal composite sys w/ mtl furring @ Canopy Roof : | | | | |
| Ceiling frame | 4,723 | SF | 65.00 | 306,995 |
| Fascia - 12"H | 622 | SF | 65.00 | 40,430 |
| Metal composite sys w/ mtl furring @ Art Room : | | | | |
| Ceiling frame | 409 | SF | 65.00 | 26,585 |
| Fascia - 12"H | 72 | SF | 65.00 | 4,680 |
| 070002 ROOFING AND FLASHING* | | | | |
| Café Roof Parapet Screen Wall 5'H : | | | | |
| 5'H Membrane sys ( 6 SF/LF) | 1,038 | SF | 8.00 | 8,304 |
| Roof Equipment Screen Wall : | | | | |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| 8'H Metal wall panel | 872 | SF | 50.00 | 43,600 |
| * Horiz cap w/ roofing | | | | |
| *Roof Screen- TS Frame w/Super Structure | | | | |
| 092116 GYPSUM WALLBOARD ASSEMBLIES | | | | |
| 1 lyr 5/8" gyp. at ext. 8" x 16 Ga. Stud | 50,819 | SF | 2.50 | 127,048 |
| 2 1/2" stud w/1 lyr 5/8" gyp. @ CW spandrel | 450 | SF | 5.00 | 2,250 |
| 101200 SIGNAGE | | | | |
| 14" Pin bldg mtd signage | 20 | EA | 450.00 | 9,000 |
| | | | | --- |
| | | | | 5,566,817 |
| B2020 EXTERIOR WINDOWS | | | | |
| 061000 ROUGH CARPENTRY | | | | |
| P.T. - perim blocking 2x8 | 5,381 | LF | 6.50 | 34,977 |
| 071000 DAMPPROOF., WATERPROOF. & CAULKING* | | | | |
| Flex flashing - perim | 5,381 | LF | 8.00 | 43,048 |
| Exterior sealants - perim. | 5,381 | LF | 7.50 | 40,358 |
| 080001 METAL WINDOWS* | | | | |
| 12" Alum Curtain Wall: | | | | |
| Main Entry ( 1 loc) | 590 | SF | 118.00 | 69,620 |
| Entry / stairhall & commons (10 loc) | 1,865 | SF | 118.00 | 220,070 |
| Gym ( 1 loc) | 207 | SF | 118.00 | 24,426 |
| Café & main entrance ( 3 loc) | 308 | SF | 118.00 | 36,344 |
| Media ctr ( 1 loc) | 470 | SF | 118.00 | 55,460 |
| Café bay ( 2 loc) | 402 | SF | 118.00 | 47,436 |
| Café clerestory sloped top ( 1 loc) | 174 | SF | 118.00 | 20,532 |
| Alum Storefront Window System : | | | | |
| Typ. windows | 7,487 | SF | 95.00 | 711,265 |
| Alum window perim panning | 4,210 | LF | 10.00 | 42,100 |
| *Includes perimeter int/ext sealants, glass, glazing , spandrel and alum break metal | | | | |
| Security Glazing Film - ALLOW: | | NIC | | |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Exterior Wall Mock-up | 1 | LS | 40,000.00 | 40,000 |
| 109000 MISCELLANEOUS SPECIALTIES | | | | |
| Horizontal Sun Shade 2' 8" Projection: | | | | |
| S.elev ( 2 loc) | 43 | LF | 235.00 | 10,105 |
| Vert. Sun Shade | | N/A | | |
| Misc Alum louvers -allow | 1 | LS | 5,000.00 | 5,000 |
| | | | | --- |
| | | | | 1,400,740 |
| B2030 EXTERIOR DOORS | | | | |
| 061000 ROUGH CARPENTRY | | | | |
| P.T. - perim blocking HM open | 100 | LF | 8.00 | 800 |
| 071000 DAMPPROOF., WATERPROOF. & CAULKING* | | | | |
| Perim. Ext HM & OH opening: | | | | |
| Flex flashing - perim | 156 | LF | 8.00 | 1,248 |
| Exterior sealants - perim. | 156 | LF | 7.50 | 1,170 |
| 080001 METAL WINDOWS* | | | | |
| 7' Alum. Doors (Incl. Hardware): | | | | |
| Entry - sgl | 1 | EA | 4,750.00 | 4,750 |
| Entry - dbl | 5 | PR | 8,650.00 | 43,250 |
| Stair hall- dbl | 3 | PR | 8,650.00 | 25,950 |
| 081113 HOLLOW METALWORK | | | | |
| Ext HM Doors Frame, Glass & Glazing: | | | | |
| 7'- sgl | 1 | EA | 265.00 | 265 |
| 7'- sgl w/ transom | 2 | EA | 875.00 | 1,750 |
| 7'- dbl w/ transom | 1 | EA | 1,150.00 | 1,150 |
| Ext 7' Insulated HM Door, Glass & Glazing: | | | | |
| Mech / elec rm - sgl | 1 | EA | 585.00 | 585 |
| Storage - sgl | 1 | EA | 585.00 | 585 |
| Kitchen - sgl | 1 | EA | 585.00 | 585 |
| Kitchen - dbl | 1 | EA | 1,170.00 | 1,170 |
| 083323 SPECIAL DOORS | | | | |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Ext Motor Operated Insulated OH Door: | | | | |
| Mech / elec rm (10'x9' ) | 1 | EA | 6,200.00 | 6,200 |
| Storage rm (10'x9' ) | 1 | EA | 6,200.00 | 6,200 |
| 087100 DOOR HARDWARE | | | | |
| Auto opener -allow | 2 | LOC | 7,600.00 | 15,200 |
| Ext HM Door HDW SET: | | | | |
| Mech / elec rm - sgl | 1 | EA | 800.00 | 800 |
| Storage - sgl | 1 | EA | 550.00 | 550 |
| Kitchen - sgl | 1 | EA | 1,500.00 | 1,500 |
| Kitchen - dbl | 1 | EA | 2,750.00 | 2,750 |
| *Hardware also included with 080001 | | | | |
| 090007 PAINTING* | | | | |
| Paint HM door & Frame - sgl | 1 | EA | 110.00 | 110 |
| Paint HM door & Frame - sgl w/ transom | 2 | EA | 150.00 | 300 |
| Paint HM door & Frame - dbl w/ transom | 1 | EA | 200.00 | 200 |
| | | | | --- |
| | | | | 117,068 |
| TOTAL B20 - EXTERIOR ENCLOSURE | | | | 7,084,625 |
| B30 - ROOFING | | | | |
| B3010 ROOF COVERINGS | | | | |
| 061000 ROUGH CARPENTRY | | | | |
| Flat Roof Blocking & Ply@: | | | | |
| Flat roof fire sep expansion joint | 100 | LF | 65.00 | 6,500 |
| Base flashing fire sep expansion joint | 135 | LF | 32.00 | 4,320 |
| Base flashing | 575 | LF | 14.00 | 8,050 |
| Gravel stop-extended prefab metal fascia | 2,858 | LF | 14.00 | 40,012 |
| Equip blocking | 1 | LS | 10,000.00 | 10,000 |
| Sloped Roof Blocking @: | | | | |
| Flat /sloped transition | 64 | LF | 15.00 | 960 |
| Rake trim | 187 | LF | 15.00 | 2,805 |
| High end fascia trim | 34 | LF | 15.00 | 510 |
| Low end fascia trim | 34 | LF | 15.00 | 510 |
| Canopy Roof Blocking @: | | | | |
| Base flashing | 218 | LF | 14.00 | 3,052 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Typ Gravel stop-extended prefab metal fascia | 622 | LF | 14.00 | 8,708 |
| 070002 ROOFING AND FLASHING* | | | | |
| BLDG Flat Roof System: | | | | |
| 1/4" Roof prtection bd | 86,711 | SF | 1.33 | 115,326 |
| Roof vapor barrier | 86,711 | SF | 0.88 | 76,306 |
| 8" Rigid insul | 86,711 | SF | 7.80 | 676,346 |
| 1/2" Cover bd | 86,711 | SF | 1.78 | 154,346 |
| Fully adhered .90 mil. EPDM | 86,711 | SF | 6.80 | 589,635 |
| BLDG Flat Roof Flashing: | | | | |
| Walkway pads -allow | 2,000 | SF | 6.50 | 13,000 |
| Membrane flashing | 86,711 | SF | 0.50 | 43,356 |
| Flat roof fire sep expansion joint | 100 | LF | 48.00 | 4,800 |
| Base flashing fire sep expansion joint | 135 | LF | 32.00 | 4,320 |
| Base flashing | 575 | LF | 32.00 | 18,400 |
| Gravel stop-extended prefab metal fascia | 2,858 | LF | 18.00 | 51,444 |
| Screen wall cap | 109 | LF | 32.00 | 3,488 |
| Roof top equip unit curb | 17 | LF | 25.00 | 425 |
| Flash DBL roof drain | 35 | EA | 120.00 | 4,200 |
| BLDG Sloped Roof System: | | | | |
| 1/4" Roof prtection bd | 4,700 | SF | 1.33 | 6,251 |
| Roof vapor barrier | 4,700 | SF | 0.88 | 4,136 |
| Nailable 8" Rigid Insul | 4,700 | SF | 9.20 | 43,240 |
| Standing seam roofing | 4,700 | SF | 26.00 | 122,200 |
| BLDG Sloped Roof Flashing: | | | | |
| Flat /sloped transition | 64 | LF | 35.00 | 2,240 |
| Rake trim | 187 | LF | 35.00 | 6,545 |
| High end fascia trim | 34 | LF | 35.00 | 1,190 |
| Low end fascia trim | 34 | LF | 35.00 | 1,190 |
| Canopy Flat Roof System: | | | | |
| 1/4" Roof prtection bd | 4,612 | SF | 1.33 | 6,134 |
| Roof vapor barrier | 4,612 | SF | 0.88 | 4,059 |
| Rigid insul | 4,612 | SF | 8.00 | 36,896 |
| 1/2" Cover bd | 4,612 | SF | 1.78 | 8,209 |
| Fully adhered .90 mil. EPDM | 4,612 | SF | 6.80 | 31,362 |
| Canopy Flat Roof Flashing: | | | | |
| Membrane flashing | 4,612 | SF | 0.50 | 2,306 |
| Base flashing | 218 | LF | 32.00 | 6,976 |
| Typ Gravel stop-extended prefab metal fascia | 622 | LF | 18.00 | 11,196 |
| Canopy Gutter and Downspout | 1 | LS | 20,000.00 | 20,000 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| | | | | --- |
| | | | | 2,154,946 |

B3020 ROOF OPENINGS

070002 ROOFING AND FLASHING*

| | | | | |
|---|---|---|---|---|
| Pre Fab Roof Top Dog House | | N/A | | |
| Roof hatch | 2 | EA | 4,200.00 | 8,400 |
| Auto smoke vent | 2 | EA | 14,000.00 | 28,000 |
| Elevator vent | 1 | EA | 1,200.00 | 1,200 |
| | | | | --- |
| | | | | 37,600 |

| | |
|---|---|
| TOTAL B30 ROOFING | 2,192,546 |

C. INTERIORS

C10 - INTERIOR CONSTRUCTION

C1010 PARTITIONS

040001 MASONRY*

| | | | | |
|---|---|---|---|---|
| CMU Partition- Allow: | | | | |
| 8" CMU Elev shaft - 29' | 857 | SF | 29.00 | 24,853 |
| 8" CMU- sgl wyth fire seperation: | | | | |
| 1st Flr fire sep. | 1,792 | SF | 27.50 | 49,280 |
| 2nd Flr fire sep. | 3,466 | SF | 27.50 | 95,315 |
| Int. Masonry Veneer: | | | | |
| Main entry vestibule | 300 | SF | 40.00 | 12,000 |

061000 ROUGH CARPENTRY

| | | | | |
|---|---|---|---|---|
| Interior blocking | 141,600 | GSF | 0.35 | 49,560 |
| Misc. rough carpentry | 141,600 | GSF | 0.50 | 70,800 |

072100 INSULATION

| | | | | |
|---|---|---|---|---|
| Firestopping | 141,600 | GSF | 0.65 | 92,040 |

071000 DAMPPROOF., WATERPROOF. & CAULKING*

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Joint sealants | 141,600 | GSF | 0.85 | 120,360 |
| 079513 EXPANSION JOINT COVER ASSEMBLIES | | | | |
| Floor Expasion Joint | 82 | LF | 220.00 | 18,040 |
| Roof Expansion joint | 233 | LF | 220.00 | 51,260 |
| Wall Joint | 1 | LS | 10,000.00 | 10,000 |
| Floor Plate Cover | 24 | LF | 75.00 | 1,800 |
| 081113 HOLLOW METALWORK | | | | |
| Interior H.M Windows : | | | | |
| Int Window - allow | 500 | SF | 42.00 | 21,000 |
| *sidelight carried w/ doors | | | | |
| 083323 SPECIAL DOORS | | | | |
| Access panels | 1 | LS | 30,000.00 | 30,000 |
| 080001 METAL WINDOWS* | | | | |
| 9' 6"H Aluminum Storefront Frame, Glass & Glazing: | | | | |
| GF Vest (1 loc) | 168 | SF | 90.00 | 15,120 |
| MF Vest (2 loc) | 331 | SF | 90.00 | 29,790 |
| MF Main office (2 loc) | 189 | SF | 90.00 | 17,010 |
| GF Media Center (1 loc) | 257 | SF | 90.00 | 23,130 |
| MF Media Center (1 loc) | 300 | SF | 90.00 | 27,000 |
| MF Café (2 loc) | 286 | SF | 90.00 | 25,740 |
| Office/ vestibule security window -Allow: | | N/A | | |
| 080002 GLASS AND GLAZING* | | | | |
| Interior H.M Windows : | | | | |
| Int Window - allow | 500 | SF | 44.00 | 22,000 |
| 090007 PAINTING* | | | | |
| Paint window/sidelight & transom | 500 | SF | 5.00 | 2,500 |
| 092116 GYPSUM WALLBOARD | | | | |
| Furr w/gyp @ elev shaft | 750 | SF | 10.00 | 7,500 |
| Gym - 15'h (nic fire sep) | 2,580 | SF | 15.50 | 39,990 |
| Gym storage- 25'h | 758 | SF | 15.50 | 11,749 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Music, stage & café (15-20') | 6,954 | SF | 12.50 | 86,925 |
| Stage front 20'h | 619 | SF | 15.50 | 9,595 |
| Mech/elec rm & shaft 20'h | 672 | SF | 15.50 | 10,416 |
| 6" Typ wall - S6A 20'h | 2,084 | SF | 13.50 | 28,134 |
| TYP -15' Drywall Partitions: | | | | |
| 1 side class mech chase | 8,932 | SF | 11.00 | 98,252 |
| 1 side plumb chase | 6,977 | SF | 11.00 | 76,747 |
| Chase @ fnd wall | 2,590 | SF | 9.00 | 23,310 |
| 4" Typ wall - S4A | 2,595 | SF | 11.25 | 29,194 |
| 6" Typ wall - S6A | 2,595 | SF | 12.50 | 32,438 |
| Class separation | 32,281 | SF | 12.50 | 403,513 |
| Office separation | 4,743 | SF | 12.50 | 59,288 |
| Class corridor | 37,748 | SF | 12.50 | 471,850 |
| Office corridor | 5,728 | SF | 12.50 | 71,600 |
| Kitchen | 5,539 | SF | 12.50 | 69,238 |
| Mech/elec rm & shaft | 12,029 | SF | 15.50 | 186,450 |
| Stair hall | 4,591 | SF | 15.50 | 71,161 |
| 1 Side vestibule masonry chase | 324 | SF | 10.50 | 3,402 |
| Impact resis gyp @ gym | 1 | LS | 20,000.00 | 20,000 |
| Misc. GWB assemblies | 141,600 | GSF | 1.50 | 212,400 |
| Load, Distribute and Misc. | 141,600 | GSF | 0.25 | 35,400 |
| *Partitions include sound attenuation, tape & joint compound finish | | | | |
| | | | | --- |
| | | | | 2,867,146 |

C1020 INTERIOR DOORS

081113 HOLLOW METALWORK

| | | | | |
|---|---|---|---|---|
| Int. HM Frame 7'H: | | | | |
| Single Door | 223 | EA | 285.00 | 63,555 |
| Double Door | 41 | EA | 305.00 | 12,505 |
| Sidelight - 2' x 7' ( 86 ea ) | 1,204 | SF | 44.00 | 52,976 |

081416 WOOD AND PLASTIC DOORS

| | | | | |
|---|---|---|---|---|
| Oak SC Wood Door - Prefinished 7'H: | | | | |
| Admin - sgl | 22 | EA | 685.00 | 15,070 |
| Bathroom - sgl | 37 | EA | 525.00 | 19,425 |
| Classroom - dbl | 1 | EA | 1,370.00 | 1,370 |
| Classroom - sgl | 67 | EA | 685.00 | 45,895 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Classroom interconnection - dbl | 1 | EA | 620.00 | 620 |
| Classroom interconnection - sgl | 43 | EA | 1,240.00 | 53,320 |
| Corr. - dbl | 6 | EA | 1,450.00 | 8,700 |
| Gym - dbl | 4 | EA | 1,450.00 | 5,800 |
| Jan - sgl | 3 | EA | 525.00 | 1,575 |
| Kitchen - sgl | 6 | EA | 600.00 | 3,600 |
| Media center - sgl | 1 | EA | 685.00 | 685 |
| MEP - dbl | 8 | EA | 1,100.00 | 8,800 |
| MEP - sgl | 19 | EA | 550.00 | 10,450 |
| Music - sgl | 5 | EA | 750.00 | 3,750 |
| Ramp - sgl | 2 | EA | 685.00 | 1,370 |
| Stair - dbl | 6 | EA | 1,500.00 | 9,000 |
| Stair - sgl | 1 | EA | 750.00 | 750 |
| Storage - dbl | 15 | EA | 1,040.00 | 15,600 |
| Storage - sgl | 14 | EA | 520.00 | 7,280 |
| Teacher planning - sgl | 3 | EA | 685.00 | 2,055 |
| 080002 GLASS AND GLAZING* | | | | |
| Glass & Glazing @ Interior Wood Door: | | | | |
| *inc. w/ door cost | | | | |
| 1/4" Temp Glazing: | | | | |
| Sidelight - 2' x 7' ( 86 ea ) | 1,204 | SF | 41.50 | 49,966 |
| 087100 DOOR HARDWARE | | | | |
| Admin - sgl | 22 | EA | 850.00 | 18,700 |
| Bathroom - sgl | 37 | EA | 850.00 | 31,450 |
| Classroom - dbl | 1 | EA | 1,400.00 | 1,400 |
| Classroom - sgl | 67 | EA | 975.00 | 65,325 |
| Classroom interconnection - dbl | 1 | EA | 750.00 | 750 |
| Classroom interconnection - sgl | 43 | EA | 525.00 | 22,575 |
| Corr. - dbl | 6 | EA | 4,000.00 | 24,000 |
| Gym - dbl | 4 | EA | 4,000.00 | 16,000 |
| Jan - sgl | 3 | EA | 750.00 | 2,250 |
| Kitchen - sgl | 6 | EA | 1,200.00 | 7,200 |
| Media center - sgl | 1 | EA | 1,500.00 | 1,500 |
| MEP - dbl | 8 | EA | 1,600.00 | 12,800 |
| MEP - sgl | 19 | EA | 800.00 | 15,200 |
| Music - sgl | 5 | EA | 1,500.00 | 7,500 |
| Ramp - sgl | 2 | EA | 1,500.00 | 3,000 |
| Stair - dbl | 6 | EA | 4,000.00 | 24,000 |
| Stair - sgl | 1 | EA | 2,500.00 | 2,500 |
| Storage - dbl | 15 | EA | 675.00 | 10,125 |
| Storage - sgl | 14 | EA | 450.00 | 6,300 |
| Teacher planning - sgl | 3 | EA | 850.00 | 2,550 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| 080001 METAL WINDOWS* | | | | |
| 7' Aluminum ( Frame, Door, Glass, Glazing and Hdw): | | | | |
| GF Vest - dbl | 1 | EA | 8,100.00 | 8,100 |
| MF Vest - dbl | 3 | EA | 8,100.00 | 24,300 |
| Main office - sgl | 2 | EA | 4,100.00 | 8,200 |
| Media Center - dbl | 2 | EA | 7,250.00 | 14,500 |
| Café - dbl | 3 | EA | 7,250.00 | 21,750 |
| 083323 SPECIAL DOORS | | | | |
| Kitchen / servery elec op Stainless Steel OH Grille: | | | | |
| Servery ( 8' x 9') | 2 | EA | 6,500.00 | 13,000 |
| Dish drop ( 5' x ) | 1 | EA | 4,500.00 | 4,500 |
| 090007 PAINTING* | | | | |
| Single Door | 223 | EA | 125.00 | 27,875 |
| Double Door | 41 | EA | 140.00 | 5,740 |
| Sidelight - 2' x 7' ( 86 ea ) | 1,204 | SF | 8.00 | 9,632 |
| | | | | --- |
| | | | | 806,839 |
| C1030 FITTINGS | | | | |
| 050001 MISCELLANEOUS & ORNAMENTAL IRON* | | | | |
| Floor Opening: | | | | |
| Decorative Guard railing | 153 | LF | 500.00 | 76,500 |
| Café Platform: | | | | |
| Guard rail | 25 | LF | 265.00 | 6,625 |
| Wall rail | 80 | LF | 165.00 | 13,200 |
| Misc equip. supports | 1 | LS | 15,000.00 | 15,000 |
| Hatch Access Ladder | 1 | EA | 4,200.00 | 4,200 |
| OT/PT equip support | 1 | RM | 2,500.00 | 2,500 |
| Gym equip supports | 1 | LS | 10,000.00 | 10,000 |
| Misc. metals | 141,600 | GSF | 0.50 | 70,800 |

*Interior Rails are also included w/ C2010
*Exterior Rails are also included w/ G20

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| 062000 FINISH CARPENTRY | | | | |
| Utility & closet shelving | 1 | LS | 10,000.00 | 10,000 |
| Window sill - 8"ss | 1,259 | LF | 42.00 | 52,878 |
| CW sill - 8"ss | 123 | LF | 42.00 | 5,166 |
| Display Case: | | | | |
| Art corridor 2D ( 5' x 4' ) | 2 | EA | 2,500.00 | 5,000 |
| Art corridor 3D 5'W | 2 | EA | 5,000.00 | 10,000 |
| Media ctr - allow | 1 | LS | 10,000.00 | 10,000 |
| Alum Column Enclosure: | | | | |
| 10' H Servery - 2' dia | 24 | VLF | 250.00 | 6,000 |
| 10' H Café - 2' dia | 72 | VLF | 250.00 | 18,000 |
| 10' H -2' dia | 60 | VLF | 250.00 | 15,000 |
| 15' H - 2' dia | 75 | VLF | 250.00 | 18,750 |
| Wood Wall Panel & Trim : | | W/C3010 | | |
| Custom Casework: | | | | |
| Main Office: | | | | |
| Reception desk - front | 17 | LF | 850.00 | 14,450 |
| Reception desk - side | 6 | LF | 500.00 | 3,000 |
| Mail & Duplicating: | w/ furnishing | | | |
| Library / Media Center (1 EA): | | | | |
| Circulation desk - front | 20 | LF | 1,000.00 | 20,000 |
| Book shelving sys | | NIC | | |
| Cafe : | | | | |
| Trash/ recycle ctr | 1 | EA | 3,500.00 | 3,500 |
| *Balance of casework is included w/ E2010 | | | | |
| 080002 GLASS AND GLAZING* | | | | |
| Mirror - Allow: | | | | |
| OT / PT room ( 2 rm) | 100 | SF | 65.00 | 6,500 |
| Toilet & locker rooms | | W / 102113 | | |
| 102113 COMPARTMENTS & CUBICLES | | | | |
| Solid Plastic Toilet Partitions: | | | | |
| Std. partition | 31 | EA | 1,220.00 | 37,820 |
| HC partition | 10 | EA | 1,430.00 | 14,300 |
| Urinal screen | 7 | EA | 310.00 | 2,170 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| 102813 TOILET ACCESSORIES | | | | |
| Toilet tissue dispenser | 62 | EA | 48.00 | 2,976 |
| Soap dispenser | 25 | EA | 45.00 | 1,125 |
| Paper towel dispenser | 32 | EA | 135.00 | 4,320 |
| Waste receptacle | 32 | EA | 150.00 | 4,800 |
| Elec hand dryer | | NIC | | |
| Tilt mirror @ wall hung lav | 25 | EA | 220.00 | 5,500 |
| Toilet grab bars | 62 | EA | 85.00 | 5,270 |
| San. prod. disposal | 20 | EA | 60.00 | 1,200 |
| Coat hook | 62 | EA | 25.00 | 1,550 |
| Public Fixed diaper changing sta | 4 | EA | 550.00 | 2,200 |
| Pre-K & toddler Fixed diaper changing sta | 4 | EA | 550.00 | 2,200 |
| Large changing sta | 1 | EA | 3,500.00 | 3,500 |
| Janitor shelf | 3 | EA | 200.00 | 600 |
| 101100 MARKERBOARDS & TACKBOARDS | | | | |
| Flag w/ holder -allow | 68 | EA | 125.00 | 8,500 |
| White Board: | | | | |
| Mag white board - 4' | 9 | EA | 325.00 | 2,925 |
| Mag white board - 5' | 114 | EA | 400.00 | 45,600 |
| Mag white board - 8' | 73 | EA | 650.00 | 47,450 |
| Interactive display - 8' | 82 | EA | 2,800.00 | 229,600 |
| Tack Board: | | | | |
| Tack board - 4' | 2 | EA | 250.00 | 500 |
| Tack board - 5' | 77 | EA | 290.00 | 22,330 |
| Tack board - 6' | 40 | EA | 330.00 | 13,200 |
| 109000 MISCELLANEOUS SPECIALTIES | | | | |
| Metal Locker: | | | | |
| Kitchen staff 12" | 3 | EA | 260.00 | 780 |
| Locker base - allow | 4 | LF | 65.00 | 260 |
| Health office cubicle track w/ curtain | 6 | EA | 1,325.00 | 7,950 |
| Fire extinguisher and cab | 10 | EA | 475.00 | 4,750 |
| AED cabinets | 2 | EA | 750.00 | 1,500 |
| W2 Secure wall panels: | | | | |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| OT/PT rm (2 ea) | 750 | SF | 39.00 | 29,250 |
| Misc Wall & corner guards - allow | 1 | LS | 7,500.00 | 7,500 |
| 101400 IDENTIFYING DEVICES | | | | |
| Allow: | | | | |
| Building directory | 1 | EA | 5,000.00 | 5,000 |
| Dedication plaque | 1 | EA | 3,800.00 | 3,800 |
| Room ID sign | 264 | EA | 150.00 | 39,600 |
| Misc Int. ADA signage | 141,600 | GSF | 0.12 | 16,992 |
| | | | | --- |
| | | | | 974,087 |
| TOTAL C10 - INTERIOR CONSTRUCTION | | | | 4,648,072 |
| C20 - STAIRS | | | | |
| C2010 STAIR CONSTRUCTION | | | | |
| 050001 MISCELLANEOUS & ORNAMENTAL IRON* | | | | |
| Metal Pan Main Stair Hall ( 1 FLT): | 1 | FLTS | 45,000.00 | 45,000 |
| Metal Pan Egress Stair Hall ( 1 FLT): | 3 | FLTS | 25,000.00 | 75,000 |
| Roof Stair | 1 | FLTS | 25,000.00 | 25,000 |
| Lobby guardrail | | w/ fittings | | |
| 033000 CAST IN PLACE CONCRETE | | | | |
| Conc stair pan fill ( 5 FLT) : | | | | |
| Metal pan stair treads and risers | 5 | FLTS | 2,500.00 | 12,500 |
| | | | | --- |
| | | | | 157,500 |
| C2020 STAIR FINISHES | | | | |
| 090005 RESILIENT FLOORING* | | | | |
| Rubber treads and risers : | | | | |
| Egress Stair | 3 | FLTS | 13,500.00 | 40,500 |
| Main stair | 1 | FLTS | 2,000.00 | 2,000 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Monumental Stair Premium Finish | 1 | LS | 25,000.00 | 25,000 |
| 095000 WOOD & ATHLETIC FLOOR | | | | |
| 3/4" Solid Maple -Stage ( 2 FLT) : | | | | |
| Tread | 165 | LFT | 36.00 | 5,940 |
| 090007 PAINTING* | | | | |
| Paint Metal Pan Stair & Rail: | | | | |
| Stair Hall | 3 | FLTS | 2,500.00 | 7,500 |
| Monumental Lobby Stair | 1 | FLTS | 4,000.00 | 4,000 |
| Roof access stair | 1 | FLTS | 1,500.00 | 1,500 |
| | | | | --- |
| | | | | 86,440 |
| TOTAL C20 - STAIRS | | | | 243,940 |
| C30 - INTERIOR FINISHES | | | | |
| C3010 WALL FINISHES | | | | |
| 062000 FINISH CARPENTRY | | | | |
| Wood Wall Panel & Trim- Allow : | | | | |
| Stage Front and Surround | 1 | LS | 25,000.00 | 25,000 |
| Media Center | 1 | LS | 25,000.00 | 25,000 |
| Café | 1 | LS | 25,000.00 | 25,000 |
| 097700 FIBERGLASS REINF. PLASTIC WALL PANELS | | | | |
| FRP Wall Panel: | | | | |
| Janitor closet | 300 | SF | 14.50 | 4,350 |
| 098400 ACOUSTICAL ROOM COMPONENTS | | | | |
| Tectum Wall Panel- Allow: | | | | |
| Gymnasium 6'H | 2,016 | SF | 19.00 | 38,304 |
| Fabric Wrapped Acoustical Panels - Allow: | | | | |
| Band Rm ( 1 ea) | 500 | SF | 36.00 | 18,000 |
| Media center | 750 | SF | 36.00 | 27,000 |
| Stage | 350 | SF | 36.00 | 12,600 |
| Lobby/Commons | 1,000 | SF | 36.00 | 36,000 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Café | 750 | SF | 36.00 | 27,000 |
| 090002 TILE* | | | | |
| W4 Porcelain Wall Tile 7'H : | | | | |
| Bathroom - 8' | 10,832 | SF | 22.00 | 238,304 |
| Kitchen/Servery - allow | 4,500 | SF | 22.00 | 99,000 |
| Commons and Corridor - 5' | 16,122 | SF | 23.50 | 378,867 |
| Stair Hall - 5' | 2,500 | SF | 23.05 | 57,625 |
| 090007 PAINTING* | | | | |
| Interior painting- walls | 141,600 | GSF | 1.90 | 269,040 |
| vinyl wall covering | | NIC | | |
| | | | | --- |
| | | | | 1,281,090 |
| C3020 FLOOR FINISHES | | | | |
| 033000 CAST IN PLACE CONCRETE | | | | |
| Sealed Concrete: | | | | |
| Mech & elec rm | 5,676 | SF | 1.30 | 7,379 |
| 090002 TILE* | | | | |
| Bathrooms | 4,053 | SF | 23.50 | 95,246 |
| Quarry Tile | 2,800 | SF | 18.00 | 50,400 |
| Quarry Tile base | 734 | LF | 12.75 | 9,359 |
| Marble Threshold | 1 | LS | 1,500.00 | 1,500 |
| 096623 TERRAZZO TILE | | | | |
| Lobby - ground floor | 5,600 | SF | 28.00 | 156,800 |
| 098500 RESINOUS FLOORING | | | | |
| Epoxy Flooring W/ Int Wall Base: | | | | |
| Bathrooms | 4,053 | SF | 14.75 | 59,782 |
| 090005 RESILIENT FLOORING* | | | | |
| Moisture mitigation - tbd | 95,448 | SF | 1.00 | 95,448 |
| Linoleum Sheet: | | | | |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Common and Corridor | 21,582 | SF | 8.20 | 176,972 |
| Classrooms | 65,854 | SF | 8.20 | 540,003 |
| OT/PT | 1,886 | SF | 8.20 | 15,465 |
| Rubber tile : | | | | |
| Stair Hall | 2,412 | SF | 13.20 | 31,838 |
| Ramp | 345 | SF | 13.20 | 4,554 |
| *Balance of rubber stair finish is included w/ C2020 | | | | |
| 4" Vinyl base (incl corridor & stair halls) | 14,638 | LF | 0.75 | 10,979 |
| 095000 WOOD & ATHLETIC FLOOR | | | | |
| Main Gym: | | | | |
| Hardwood Flr assembly | 7,078 | SF | 23.50 | 166,333 |
| Vented wall base | 142 | LF | 8.30 | 1,179 |
| *floor sytem includes 1" leveling compound & vapor retarder | | | | |
| Café Stage Platform: | | | | |
| Hardwood Flr assembly | 192 | SF | 16.50 | 3,168 |
| Vented wall base | 110 | LF | 8.00 | 880 |
| Nosing | 76 | LF | 25.00 | 1,900 |
| 096800 CARPET | | | | |
| Media center w/small group rms | 4,300 | SF | 5.00 | 21,500 |
| Admin suite | 2,101 | SF | 5.00 | 10,505 |
| 124813 MATS | | | | |
| Walk off mat - vestibule (4 loc) | 614 | SF | 16.50 | 10,131 |
| Exterior entrance grate | | NIC | | |
| | | | | --- |
| | | | | 1,471,319 |
| C3030 CEILING FINISHES | | | | |
| 092116 GYPSUM WALLBOARD | | | | |
| Misc gyp soffits | 141,600 | GSF | 0.75 | 106,200 |
| Gyp Ceiling System : | | | | |
| Typ Gyp clg | 20,000 | SF | 10.75 | 215,000 |
| 2 Hr. gyp ceiling - emerg elec rm | 250 | SF | 13.50 | 3,375 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| 090003 ACOUSTICAL TILE* | | | | |
| Auditorium: | | | | |
| act - 2X 2 | 112,269 | SF | 5.25 | 589,412 |
| Allow For Specialty Ceilings | 1 | LS | 100,000.00 | 100,000 |
| 090007 PAINTING* | | | | |
| Paint gyp ceiling & soffits | 1 | LS | 15,000.00 | 15,000 |
| Paint exposed structure- 100%: | | | | |
| Main gym - acoustic deck | 7,580 | SF | 2.00 | 15,160 |
| Stage | 1,500 | SF | 2.00 | 3,000 |
| | | | | --- |
| | | | | 1,047,147 |
| TOTAL C30 - INTERIOR FINISHES | | | | 3,799,557 |
| D. SERVICES | | | | |
| D10 - CONVEYING | | | | |
| D1010 ELEVATORS & LIFTS | | | | |
| 140001 ELEVATORS & LIFTS* | | | | |
| Passenger elevator ( 1 door) | 2 | STOP | 54,500.00 | 109,000 |
| 050001 MISCELLANEOUS & ORNAMENTAL IRON* | | | | |
| Elev. framing | 1 | EA | 3,000.00 | 3,000 |
| Elev. pit ladder | 1 | EA | 1,537.00 | 1,537 |
| Elev. sump grate | 1 | EA | 1,500.00 | 1,500 |
| | | | | --- |
| | | | | 115,037 |
| TOTAL D10 - CONVEYING | | | | 115,037 |
| D20 - PLUMBING | | | | |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| D2010 PLUMBING | | | | |
| 220001 PLUMBING* | | | | |
| Plumbing Fixtures: | | | | |
| P-1 water closet | 31 | EA | 1,850.00 | 57,350 |
| P-2 water closet | 13 | EA | 1,850.00 | 24,050 |
| P-3 water closet | 18 | EA | 1,400.00 | 25,200 |
| P-4 urinal | 6 | EA | 1,650.00 | 9,900 |
| P-5 urinal | 4 | EA | 1,650.00 | 6,600 |
| P-6 lavatory | 11 | EA | 1,375.00 | 15,125 |
| P-7 lavatory | 14 | EA | 1,375.00 | 19,250 |
| P-8 countertop sink, classroom, no bubbler | 24 | EA | 1,550.00 | 37,200 |
| P-9 countertop sink, planning rooms | 74 | EA | 1,550.00 | 114,700 |
| P-10 art room sink | 16 | EA | 2,100.00 | 33,600 |
| P-11 art room sink | 3 | EA | 2,100.00 | 6,300 |
| P-13 countertop sink, classroom, bubbler | 4 | EA | 1,800.00 | 7,200 |
| P-14 lavatory | 2 | EA | 1,375.00 | 2,750 |
| FPSC wall hydrant | 5 | EA | 450.00 | 2,250 |
| HB hose bibb | 12 | EA | 350.00 | 4,200 |
| Gas Fired Hot Water Supply: | | | | |
| BLR-1 | 1 | EA | 29,500.00 | 29,500 |
| Acid neutralization | 1 | LS | 601.00 | 601 |
| Hot Water Storage Tank: | | | | |
| HST-1 | 1 | EA | 4,400.00 | 4,400 |
| HST-2 | 1 | EA | 4,400.00 | 4,400 |
| Pump Schedule: | | | | |
| RP-1 | 1 | EA | 1,100.00 | 1,100 |
| HP-1 | 1 | EA | 1,100.00 | 1,100 |
| PVC Venting | 232 | LF | 64.00 | 14,848 |
| Water Heater Piping, valve and trim | 1 | LS | 12,000.00 | 12,000 |
| Grease Interceptor: | | | | |
| GI - 1 Interior | 2 | EA | 15,500.00 | 31,000 |
| GEGI - 1 Precast grease trap (2500 gal) | | by site | | |
| Mixing Valve: | | | | |
| MV-1 | 1 | EA | 2,167.00 | 2,167 |
| MV-2 | 1 | EA | 800.00 | 800 |
| Leonard 170-lf point of use - allow | 15 | EA | 250.00 | 3,750 |
| Main Kitchen equipment hookup | 1 | LS | 35,000.00 | 35,000 |
| Roof/Storm Drain System | | | | |
| Underground D/W/V Pipe: | | | | |
| 5" | 84 | LF | 48.00 | 4,032 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| 6" | 128 | LF | 61.00 | 7,808 |
| 8" | 461 | LF | 96.00 | 44,256 |
| 10" | 320 | LF | 110.00 | 35,200 |
| 12" | 205 | LF | 132.00 | 27,060 |
| FCO | 20 | LF | 425.00 | 8,500 |
| Above Ground D/W/V Pipe: | | | | |
| 4" | 440 | LF | 44.00 | 19,360 |
| 5" | 1,691 | LF | 48.00 | 81,168 |
| 6" | 955 | LF | 62.50 | 59,688 |
| 8" | 509 | LF | 97.50 | 49,628 |
| 12" | 29 | LF | 136.00 | 3,944 |
| CO | 40 | EA | 400.00 | 16,000 |
| Roof drain - dbl bowl | 36 | EA | 1,450.00 | 52,200 |
| Over Flor Drain | 15 | EA | 1,650.00 | 24,750 |
| Insulate leader | 1,000 | LF | 22.00 | 22,000 |
| | | | | |
| Sanitary System | | | | |
| Underground D/W/V Pipe: | | | | |
| 2" | 347 | LF | 30.75 | 10,670 |
| 3" | 684 | LF | 38.00 | 25,992 |
| 4" | 883 | LF | 44.00 | 38,852 |
| 6" | 370 | LF | 63.50 | 23,495 |
| Grease Trap Inline | 2 | EA | 12,500.00 | 25,000 |
| 4,000 gal. PC Trap | 1 | EA | 19,000.00 | 19,000 |
| FCO | 1 | EA | 425.00 | 425 |
| | | | | |
| Above Ground D/W/V Pipe: | | | | |
| 2"-6" | 8,058 | LF | 41.00 | 330,378 |
| Trench Drain | 16 | LF | 1,450.00 | 23,200 |
| Oil 1 | 2 | EA | 3,000.00 | 6,000 |
| FD | 22 | EA | 720.00 | 15,840 |
| | | | | |
| Copper Pipe: | | | | |
| Domestic Piping | 11,900 | LF | 35.00 | 416,500 |
| | | | | |
| 1" Pipe Insul.: | | | | |
| Domestic Piping | 11,900 | LF | 8.75 | 104,125 |
| | | | | |
| Gas Pipe: | | | | |
| 1" | 103 | LF | 29.50 | 3,039 |
| 2" | 267 | LF | 38.00 | 10,146 |
| 4" | 196 | LF | 56.00 | 10,976 |
| Kitchen Piping | 1 | LS | 10,000.00 | 10,000 |
| Boiler Room Connections | 1 | LS | 15,000.00 | 15,000 |
| | | | | |
| Kitchend Emergency Shut off | 1 | EA | 2,600.00 | 2,600 |
| Isoaltion Valve | 1 | LS | 10,000.00 | 10,000 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Radon Piping: | | | | |
| 4" Perf | 1,460 | LF | 26.00 | 37,960 |
| 6" Perf | 4 | LF | 29.00 | 116 |
| 4" CPVC | 40 | LF | 42.00 | 1,680 |
| 6" CPVC | 84 | LF | 46.00 | 3,864 |
| FCO | 20 | EA | 400.00 | 8,000 |
| Radon roof mast | 3 | EA | 1,800.00 | 5,400 |
| Underslab Drainage ??? | 56,000 | SF | 1.20 | 67,200 |
| BF Preventer @ Mech | 1 | LS | 5,000.00 | 5,000 |
| Underground Water Service: | | | | |
| 6" | 10 | LF | 150.00 | 1,500 |
| Meter Install | 1 | EA | 1,200.00 | 1,200 |
| 6" BFP | 1 | EA | 12,500.00 | 12,500 |
| Test , permit misc gc | 1 | LS | 50,000.00 | 50,000 |
| General Requirement Temp Gas and Water | 1 | LS | 50,000.00 | 50,000 |
| | | | | --- |
| | | | | 2,307,592 |
| TOTAL D20 - PLUMBING | $16.30 | /SF | | 2,307,592 |

D30 - HVAC

D3010 HVAC

230001 HVAC*

| | | | | |
|---|---|---|---|---|
| Rooftop Unit ( HW Coil w/ DX Cooling ): | | | | |
| RTU-1 | 12,000 | CFM | 12.25 | 147,000 |
| RTU-2 | 12,000 | CFM | 12.25 | 147,000 |
| RTU-3 | 9,800 | CFM | 12.25 | 120,050 |
| RTU-4 | 9,000 | CFM | 12.25 | 110,250 |
| RTU-5 | 7,200 | CFM | 12.25 | 88,200 |
| RTU-6 | 6,900 | CFM | 12.25 | 84,525 |
| RTU-7 | 7,600 | CFM | 12.25 | 93,100 |
| RTU-8 | 2,400 | CFM | 12.25 | 29,400 |
| RTU-9 | 7,000 | CFM | 12.25 | 85,750 |
| RTU-10 | 7,000 | CFM | 12.25 | 85,750 |
| RTU-11 | 3,800 | CFM | 12.25 | 46,550 |
| RTU-12 | 7,000 | CFM | 12.25 | 85,750 |
| RTU-13 | 7,000 | CFM | 12.25 | 85,750 |
| RTU-14 | 9,800 | CFM | 12.25 | 120,050 |
| RTU-15 | 2,500 | CFM | 12.25 | 30,625 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| RTU-16 | 6,500 | CFM | 12.25 | 79,625 |
| Make-Up Air Unit: | | | | |
| MAU-1 | 7,000 | CFM | 5.50 | 38,500 |
| Hot Water Boiler (FBN-1250): | | | | |
| B-1 | 1 | EA | 36,500.00 | 36,500 |
| B-2 | 1 | EA | 36,500.00 | 36,500 |
| AS-1 | 1 | EA | 3,800.00 | 3,800 |
| ET- 1,2 | 2 | EA | 6,500.00 | 13,000 |
| Boiler Valve and trim | 1 | LS | 25,000.00 | 25,000 |
| AS | 2 | EA | 3,600.00 | 7,200 |
| 6" CPVC Boiler flue | | see plumbing | | |
| Boiler flue roof term | 2 | EA | 3,500.00 | 7,000 |
| Chemical treatment | 1 | LS | 4,500.00 | 4,500 |
| HW pump | 2 | EA | 7,500.00 | 15,000 |
| Boiler pump | 2 | EA | 1,500.00 | 3,000 |
| Radiation Schedule: | | | | |
| BB-1 - no cover | 1,476 | LF | 68.50 | 101,106 |
| Modulating valve | 56 | EA | 275.00 | 15,400 |
| Balance/ISO valve | 112 | EA | 90.00 | 10,080 |
| Hot Water Devices: | | | | |
| Unit heater | 4 | EA | 1,100.00 | 4,400 |
| Cabinet heater | 6 | EA | 3,500.00 | 21,000 |
| Modulating valve | 10 | EA | 275.00 | 2,750 |
| Balance/ISO valve | 20 | EA | 90.00 | 1,800 |
| Hot Water Distribution piping | 141,600 | SF | 5.65 | 800,040 |
| Displacement Diffuser: | | | | |
| DD-1 thru 4 | 180 | EA | 950.00 | 171,000 |
| Fan Schedule: | | | | |
| EF-# | 1 | EA | 3,800.00 | 3,800 |
| EF-# | 1 | EA | 3,800.00 | 3,800 |
| EF-# | 1 | EA | 3,800.00 | 3,800 |
| EF-# | 1 | EA | 3,800.00 | 3,800 |
| KEF-# | 1 | EA | 5,500.00 | 5,500 |
| DEF-# | 1 | EA | 4,800.00 | 4,800 |
| ILF-# | 1 | EA | 3,500.00 | 3,500 |
| Water to Water Heat Exchanger: | | | | |
| HX-1 | 1 | EA | 15,000.00 | 15,000 |
| Fan Coils: | | | | |
| FC-1 | 1 | EA | 2,100.00 | 2,100 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| FC-2,3,4 | 3 | EA | 2,550.00 | 7,650 |
| FC-5,6 | 2 | EA | 1,850.00 | 3,700 |
| ACCU-1 | 1 | EA | 3,300.00 | 3,300 |
| ACCU-2,3,4 | 3 | EA | 4,500.00 | 13,500 |
| ACCU-5,6 | 2 | EA | 3,500.00 | 7,000 |
| Refrigerant piping | 850 | LF | 34.00 | 28,900 |
| VAV Box (Single Duct w/Reheat): | | | | |
| 6" to 14" | 47 | EA | 985.00 | 46,295 |
| 6" to 14" w/ reheat | 47 | EA | 1,320.00 | 62,040 |
| Mod. valve | 47 | EA | 275.00 | 12,925 |
| Drain valve | 47 | EA | 90.00 | 4,230 |
| Balance/shut off | 94 | EA | 95.00 | 8,930 |
| Equipment: | | | | |
| CP-1 | 1 | LS | 5,000.00 | 5,000 |
| ASF-1 | 1 | LS | 7,500.00 | 7,500 |
| EPH-1 | 1 | LS | 3,500.00 | 3,500 |
| EPH-2 | 1 | LS | 3,500.00 | 3,500 |
| Elec Room Exhaust fan and Louver | 1 | LS | 3,500.00 | 3,500 |
| Elec Room Exhaust and Intake louver damper | 1 | EA | 3,500.00 | 3,500 |
| Ductless Split Air-Conditioning Unit: | | | | |
| Split AC system | 4 | EA | 12,500.00 | 50,000 |
| Air Distribution: | | | | |
| Grills dampers and diffusers | 141,600 | SF | 0.65 | 92,040 |
| Galvanized ductwork | 115,000 | LBS | 9.50 | 1,092,500 |
| 2" Duct insul | 80,000 | SF | 4.85 | 388,000 |
| Sound Attenuation ( supply only ) | 117,500 | CFM | 0.65 | 76,375 |
| Kitchen hood exhaust duct - welded | 2,000 | LBS | 17.50 | 35,000 |
| Alum. dishwasher ductwork | 1,200 | LBS | 12.00 | 14,400 |
| Fire wrap at duct | 650 | SF | 9.00 | 5,850 |
| Temperature Control: | | | | |
| AHU/ERV | 15 | EA | 22,500.00 | 337,500 |
| Boiler and Pumps | 1 | LS | 40,000.00 | 40,000 |
| VAV | 98 | EA | 1,250.00 | 122,500 |
| HW Devices | 10 | EA | 1,600.00 | 16,000 |
| Exhaust Fan | 7 | EA | 2,500.00 | 17,500 |
| Fan Coil and Split System | 10 | EA | 2,500.00 | 25,000 |
| Misc. temp control | 1 | LS | 100,000.00 | 100,000 |
| Seismic control | 1 | LS | 50,000.00 | 50,000 |
| Test and balance | 141,600 | GSF | 0.65 | 92,040 |
| GC & misc. | 1 | LS | 50,000.00 | 50,000 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| *Fire safing carried w/ fittings | | | | |
| *excludes temporary heat and ventilation | | | | |
| | | | | --- |
| | | | | 5,632,726 |
| TOTAL D30 - HVAC | $39.78 | /sf | | 5,632,726 |

D40 - FIRE PROTECTION

D4010 SPRINKLERS

210001 FIRE SUPPRESSION*

| | | | | |
|---|---|---|---|---|
| Sprinkler System | 141,600 | SF | 4.40 | 623,040 |
| | | | | --- |
| | | | | 623,040 |
| TOTAL D40 - FIRE PROTECTION | $4.40 | /sf | | 623,040 |

D50 - ELECTRICAL

D5010 ELECTRICAL SERVICE & DISTRIBUTION

260001 ELECTRICAL*

| | | | | |
|---|---|---|---|---|
| 2,000 AMP Service, Panels and Feeders | 1 | LS | 68,000.00 | 68,000 |
| Panels and Feeders | 141,600 | SF | 4.35 | 615,960 |
| Transformer | 4 | EA | 8,000.00 | 32,000 |
| Digital metering | 1 | LS | 35,000.00 | 35,000 |
| 250 kw Emergency Power | 1 | EA | 155,000.00 | 155,000 |
| General Power Devices | 141,600 | SF | 2.30 | 325,680 |
| Mechanical Wiring | 141,600 | SF | 1.75 | 247,800 |
| PV Rough-in | 1 | LS | 25,000.00 | 25,000 |
| Misc. Power Wiring Devices: | | | | |
| Devices | 141,600 | GSF | 1.50 | 212,400 |
| Branch Wiring | 141,600 | GSF | 1.20 | 169,920 |
| Kitchen Connection | 1 | LS | 40,000.00 | 40,000 |
| Mechanical Wiring | 141,600 | GSF | 1.50 | 212,400 |

*excludes PV

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| | | | | --- |
| | | | | 2,139,160 |

D5020 LIGHTING & BRANCH WIRING

| | | | | |
|---|---|---|---|---|
| Lighting Branch Wiring | 141,600 | SF | 1.50 | 212,400 |
| Dali Lighting Control System | 141,600 | SF | 2.65 | 375,240 |
| Light fixture - furnish and install | 141,600 | SF | 7.50 | 1,062,000 |
| | | | | --- |
| | | | | 1,649,640 |

D5030 COMMUNICATION & SECURITY

Division 26:

Division 27:

| | | | | |
|---|---|---|---|---|
| Section 271100 - Communications Equipment Rm Fittings: | | | | |
| Allow for idf/mdf Fitout | 1 | LS | 75,000.00 | 75,000 |
| Section 271300 - Tele Communications Dist. Riser & Grnd Sys: | | | | |
| Master ground bars, lugs, sleeves, w/0 awg and #6 awg cables, and cabling | 1 | LS | 195,000.00 | 195,000 |
| Section 271500 - Communications Horizontal Cabling: | | | | |
| Tele/data wiring, box and data port | 141,600 | SF | 2.65 | 375,240 |
| Section 272100 - Data Communications Network Equip - LAN/Wi-Fi Equip: | | | | |
| Equipment total includes: | 1 | LS | 110,000.00 | 110,000 |
| Server rack | | | | |
| Phone system rack | | | | |
| Public address rack | | | | |
| Video surv. rack | | | | |
| Media dist. rack | | | | |
| Telecom rack | | | | |
| Fiber dist. rack | | | | |
| Section 273100 - Voice Communication Equipment (Avaya): | | | | |
| Phone System | 1 | LS | 65,000.00 | 65,000 |
| Section 274100 - Cafeteria Sound System | 1 | LS | 50,000.00 | 50,000 |
| Section 274100 - Gym Sound System | 1 | LS | 50,000.00 | 50,000 |
| Section 274100 - Media Center Sound System | 1 | LS | 50,000.00 | 50,000 |
| Section 274100 - Chorus | 1 | LS | 35,000.00 | 35,000 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Section 274120 Speech Reinforcement Systems: | | | | |
| Classroom Reinforcement | 68 | EA | 2,850.00 | 193,800 |
| Section 275116 - Public Address System: | | | | |
| PA and Clock System | 141,600 | SF | 0.95 | 134,520 |
| Section 275319 Bi-Directional Amplification System (DAS): | | | | |
| DAS System | 1 | LS | 85,000.00 | 85,000 |
| Division 28: | | | | |
| Section 281300 - Access Control and | | | | |
| Section 281600 - Intrusion Detection Systems: | | | | |
| Access Control | 141,600 | SF | 1.15 | 162,840 |
| Section 282000 - Video Surveillance CCTV System: | | | | |
| Head end rack w/equip & poe ethernet sw | 1 | LS | 125,000.00 | 125,000 |
| Interior dome camera | 58 | EA | 1,850.00 | 107,300 |
| Ext. WP - exterior bkt mtd | 13 | EA | 2,200.00 | 28,600 |
| Section 282000 - Door Intercom/Video System (A1 phone): | | | | |
| Master station - video | 1 | EA | 1,650.00 | 1,650 |
| Door entrance sta - video UP | 1 | EA | 1,250.00 | 1,250 |
| PS power supply | 1 | EA | 500.00 | 500 |
| System cabling | 1 | LS | 10,000.00 | 10,000 |
| Central controller w/program | 1 | LS | 10,000.00 | 10,000 |
| | | | | --- |
| | | | | 1,865,700 |
| D5090 OTHER ELECTRICAL SYSTEMS | | | | |
| Fire Alarm | | | | |
| Fire Alarm | 141,600 | GSF | 2.65 | 375,240 |
| Lighitng protection | 1 | LS | 75,000.00 | 75,000 |
| Temporary light and Power | 141,600 | SF | 0.85 | 120,360 |
| | | | | --- |
| | | | | 570,600 |
| TOTAL D50 - ELECTRICAL | $43.96 | /sf | | 6,225,100 |

E. EQUIPMENT & FURNISHINGS

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| E10 - EQUIPMENT | | | | |
| E1010 COMMERCIAL EQUIPMENT | | | | |
| 114000 FOOD SERVICE EQUIPMENT | | | | |
| Kitchen equipment & casework | 1 | LS | 545,000.00 | 545,000 |
| | | | | --- |
| | | | | 545,000 |
| E1090 OTHER EQUIPMENT | | | | |
| 113100 APPLIANCES | | | | |
| Staff Dinning Rm ( ea): | | | | |
| Refrigerator -full size | 1 | EA | 1,400.00 | 1,400 |
| Microwave | 1 | EA | 500.00 | 500 |
| Dishwasher | | N/A | | |
| Teacher Planning Rm ( ea): | | | | |
| Refrigerator -full size | 3 | EA | 1,400.00 | 4,200 |
| Microwave | 3 | EA | 500.00 | 1,500 |
| Medical Suite : | | | | |
| Refrigerator -full size | 1 | EA | 1,400.00 | 1,400 |
| K Classroom Suite: | | | | |
| Refrigerator -full size | | N/A | | |
| Dishwasher | | N/A | | |
| Range | | N/A | | |
| Range hood | | N/A | | |
| Kitchen washer and dryer | W / Kitchen Equipment | | | |
| 116600 ATHLETIC & SPORTS EQUIPMENT | | | | |
| Gym: | | | | |
| Basketball backstops - electric | 8 | EA | 9,500.00 | 76,000 |
| Wall padding - full perimeter | 1,650 | SF | 17.00 | 28,050 |
| Motor op gym divider curtain - 22'h | 1,518 | SF | 16.00 | 24,288 |
| Volley ball court equip. | 2 | PR | 700.00 | 1,400 |
| Scoreboard | 1 | EA | 22,500.00 | 22,500 |
| Motor op Bleacher | 400 | EA | 125.00 | 50,000 |
| Elec. mat hoist | | NIC | | |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Batting cage | | NIC | | |
| Climbing wall-8'H bouldering rock wall w/ pads | 1 | LS | 20,000.00 | 20,000 |
| 115213 PROJECTION SCREENS | | | | |
| Motorized projection screen | 8 | EA | 7,500.00 | 60,000 |
| 119000 MISC. EQUIPMENT | | | | |
| Technology: | | | | |
| Ceiling mounted projector | 8 | EA | 1,600.00 | 12,800 |
| Flat screen wall mtd monitor for digital signage | 1 | EA | 4,000.00 | 4,000 |
| Interactive projector w/wire guards | 1 | EA | 2,500.00 | 2,500 |
| Motorized retractable projector screen | 1 | EA | 12,000.00 | 12,000 |
| Short throw projector | 82 | EA | 1,600.00 | 131,200 |
| Tech cart | | FF&E | | |
| Vault main office | | NIC | | |
| Kiln | 1 | EA | 4,000.00 | 4,000 |
| Metal storage shelving | | NIC | | |
| Library equipment | | NIC | | |
| Loading dock trash compactor | | NIC | | |
| Loading dock dumpster | | NIC | | |
| Loading dock bumpers | 1 | LS | 3,500.00 | 3,500 |
| Power op changing table- Hoyer lift | | w/ ff&e | | |
| | | | | --- |
| | | | | 461,238 |
| TOTAL E10 - EQUIPMENT | | | | 1,006,238 |
| E20 - FURNISHINGS | | | | |
| E 2010 FIXED FURNISHINGS | | | | |
| 122413 WINDOW TREATMENT | | | | |
| Exterior Manual Op Window Shade - : | | | | |
| Typ. windows | 7,487 | SF | 7.25 | 54,281 |
| Exterior Motor Op Shade-Allow: | | | | |
| Clerestory window | 174 | SF | 25.00 | 4,350 |
| Café | 402 | SF | 25.00 | 10,050 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Media ctr | 470 | SF | 25.00 | 11,750 |
| Misc int shades | 1 | LS | 10,000.00 | 10,000 |
| 123550 CASEWORK | | | | |
| Copy base & cubbies mail | 19 | LF | 550.00 | 10,450 |
| M1 Teach wardrobe | 63 | EA | 1,800.00 | 113,400 |
| M2 Tall storage cabinet | 24 | EA | 1,800.00 | 43,200 |
| M3 Cubbies w/upper shelving | 623 | LF | 725.00 | 451,675 |
| M4 Under window shelving art rm unit | 64 | LF | 350.00 | 22,400 |
| M4 - Under window shelving unit | 1,447 | LF | 350.00 | 506,450 |
| M5 Base & wall art cabinet | 50 | LF | 675.00 | 33,750 |
| M5 Base and wall cabinet | 523 | LF | 635.00 | 332,105 |
| M5 Base only (commons) | 142 | LF | 450.00 | 63,900 |
| 129000 MISCELLANEOUS FURNISHING | | | | |
| Choral risers | | W/FFE | | |
| Band classroom risers | | W/FFE | | |
| Stage risers | | W/FFE | | |
| | | | | --- |
| | | | | 1,667,761 |
| E2020 MOVABLE FURNISHINGS | | NIC | | |
| | | | | --- |
| | | | | 0 |
| TOTAL E20 - FURNISHINGS | | | | 1,667,761 |

F. SPECIAL CONSTRUCTION & DEMOLITION

F10 - SPECIAL CONSTRUCTION

| | | | | |
|---|---|---|---|---|
| F1010 SPECIAL STRUCTURES | | N/A | | |
| | | | | --- |
| | | | | 0 |
| TOTAL F10 - SPECIAL CONSTRUCTION | | | | 0 |

F20 - SELECTIVE BUILDING DEMOLITION

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| F2010 BUILDING ELEMENTS DEMOLITION | See Grand Summary | | | |
| | | | | --- |
| | | | | 0 |
| F2020 HAZARDOUS COMPONENTS ABATEMENT | See Grand Summary | | | |
| | | | | --- |
| | | | | 0 |
| TOTAL F20 - SELECTIVE BUILDING DEMOLITION | | | | 0 |

G. BUILDING SITEWORK

G10 - SITE PREPARATION

G1010 SITE CLEARING

311000 SITE PREPARATION & CLEARING

| | | | | |
|---|---|---|---|---|
| Construction entrance | 2 | EA | 10,000.00 | 20,000 |
| Construction fence | 3,209 | LF | 12.00 | 38,508 |
| Erosion control | 3,272 | LF | 4.50 | 14,724 |
| Drain inlet protection | 32 | EA | 50.00 | 1,600 |
| Erosion control maintenance | 1 | LS | 15,000.00 | 15,000 |
| Cut & cap site utilities: | | | | |
| Catch Basin | 35 | EA | 475.00 | 16,625 |
| Drain Manhole | 2 | EA | 475.00 | 950 |
| Drain Pipe | 4,850 | LF | 32.00 | 155,200 |
| Sewer manhole | 7 | EA | 475.00 | 3,325 |
| Sewer Pipe | 5,100 | LF | 24.00 | 122,400 |
| Fire Hydrant | 3 | EA | 500.00 | 1,500 |
| Strip & stack top soil - 6" | 8,036 | CY | 7.85 | 63,083 |
| Selective Clear and Grub | 1 | LS | 25,000.00 | 25,000 |
| Saw cut walk | 25 | LF | 5.00 | 125 |
| Saw cut drive | 25 | LF | 5.00 | 125 |
| Site - Remove Existing: | | | | |
| Remove Lack Street | 40,000 | SF | 1.20 | 48,000 |
| Asphalt drive and curbing | 167,833 | SF | 0.95 | 159,441 |
| Misc. site demolition | 1 | LS | 50,000.00 | 50,000 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| | | | | --- |
| | | | | 735,606 |

G1020 SITE DEMOLITION & RELOCATIONS

| | | | | |
|---|---|---|---|---|
| Building Removal | SEE GRAND SUMMARY | | | |
| | | | | --- |
| | | | | 0 |

G1030 SITE EARTHWORK

310000 EARTHWORK

| | | | | |
|---|---|---|---|---|
| Site Cut and Fill to Rough Grade: | | | | |
| Site Cut | 18,246 | CY | 11.25 | 205,268 |
| Site Fill - reuse mat'l | 5,000 | CY | 11.00 | 55,000 |
| Site Fill - supply ordinary borrow | 22,191 | CY | 19.00 | 421,629 |
| Soil Disposal: | | | | |
| Arsnic Disposal ( 20 ppm or less ) | 13,246 | CY | 22.00 | 291,412 |
| Trucking | 13,246 | CY | 18.00 | 238,428 |
| Geo tech Fabric | 175,000 | SF | 0.78 | 136,500 |
| Site Rough Grading | 37,900 | SY | 2.30 | 87,170 |
| Layout, Mobilization, Supervision | 1 | LS | 250,000.00 | 250,000 |
| Ledge Removal - Allowance: | | | | |
| Ledge removal - open | 100 | CY | 65.00 | 6,500 |
| Ledge removal - trench | 100 | CY | 110.00 | 11,000 |
| Remove of Unsuitables | | N/A | | |
| Temporary Access Road and Phasing Logistics: | | | | |
| Temporary Construction Road | 1 | LS | 75,000.00 | 75,000 |
| Dust Control | 1 | LS | 15,000.00 | 15,000 |
| Street Sweeping | 1 | LS | 15,000.00 | 15,000 |
| | | | | --- |
| | | | | 1,807,907 |

G1040 HAZARDOUS WASTE REMEDIATION

| | | | | |
|---|---|---|---|---|
| | | NIC | | |
| | | | | --- |
| | | | | 0 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| TOTAL G10 - SITE PREPARATION | | | | 2,543,512 |

G20 - SITE IMPROVEMENTS

G2010 ROADWAYS

321000 PAVING AND CURBING

| | | | | |
|---|---|---|---|---|
| Bituminous Pavement (1 1/2" Wear & 2 1/2" Base): | | | | |
| Bit Pavement | 19,038 | SY | 27.00 | 514,026 |
| 18" Gravel base @ bit drive | 6,345 | CY | 31.50 | 199,868 |
| Lake street: | | | | |
| Bit Pavement | 28,000 | SY | 3.00 | 84,000 |
| 18" Gravel base @ bit drive | 4,667 | CY | 31.50 | 147,000 |
| Curbing: | | | | |
| Granite curb - straight | 5,750 | LF | 41.50 | 238,625 |
| Granite curb - radial | 3,019 | LF | 45.50 | 137,365 |
| Lake Street Curb | 2,500 | LF | 44.00 | 110,000 |
| Parking striping | 1 | LS | 15,000.00 | 15,000 |
| | | | | --- |
| | | | | 1,445,883 |

G2020 PARKING LOTS

*Included with G2010

---
0

G2030 PEDESTRIAN PAVING

321000 PAVING AND CURBING

| | | | | |
|---|---|---|---|---|
| Stabalized Stone Dust Patch | | | | |
| 2" Stone duct | 4,521 | SF | 3.80 | 17,180 |
| 12" Gravel @ bit walk | 144 | CY | 34.00 | 4,906 |
| Concrete Walk: | | | | |
| 6" Concrete Pavement | 38,624 | SF | 7.95 | 307,061 |
| 12" Gravel @ conc. walks | 1,239 | CY | 34.00 | 42,123 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Unit Pavers - Walk: | | | | |
| Unit paver | 9,945 | SF | 18.50 | 183,983 |
| 8" Gravel @ paver | 245 | SF | 34.00 | 8,330 |
| HC tactile paver | 10 | EA | 365.00 | 3,650 |
| | | | | --- |
| | | | | 567,232 |

G2040 SITE DEVELOPMENT

323100 SITE IMPROVEMENTS

| | | | | |
|---|---|---|---|---|
| Playground Safety Surface - Poured in Place Surface (2 loc): | | | | |
| 1/2" Top surface, 5" base mat( poured in place) | 23,300 | SF | 17.35 | 404,255 |
| 8" Dense crushed stone | 575 | CY | 38.00 | 21,850 |
| 6" Gravel base | 575 | CY | 34.00 | 19,550 |
| 6" Perf collector pipe & flat drain | 23,000 | GSF | 0.50 | 11,500 |
| Perm Curb | 1,006 | LF | 48.00 | 48,288 |
| Playground Equipment | 1 | LS | 175,000.00 | 175,000 |
| Cast In Place Concrete Wall: | | | | |
| Wall footing | 42 | CY | 395.00 | 16,590 |
| Conc Wall - 8 to 20' | 36 | CY | 1,125.00 | 40,500 |
| Wall Type W | 76 | LF | 500.00 | 38,000 |
| Site Stairs: | | | | |
| Handrail | 36 | LF | 225.00 | 8,100 |
| Conc Stair Tread - 12" | 232 | LFR | 89.00 | 20,648 |
| Stair Foundation | 10 | CY | 775.00 | 7,750 |
| Concrete Ramp: | | | | |
| Wall Footing | 7 | CY | 350.00 | 2,450 |
| Found Wall | 11 | CY | 900.00 | 9,900 |
| 4" Ramp slab | 617 | SF | 8.00 | 4,936 |
| Wall Rail | 50 | LF | 200.00 | 10,000 |
| Guard Rail | 92 | LF | 265.00 | 24,380 |
| SW Concrete Seat Wall ( 482 lf): | | | | |
| Crushed stone footing | 482 | LF | 15.00 | 7,230 |
| Perf Drain | 482 | LF | 32.00 | 15,424 |
| Filter Fabric | 1,500 | SF | 0.85 | 1,275 |
| Excavate and Haul Spoil | 65 | CY | 50.00 | 3,250 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Granular Fill | 35 | CY | 36.00 | 1,260 |
| Common Fill | 35 | CY | 20.00 | 700 |
| Wall Footing | 36 | CY | 375.00 | 13,500 |
| 4000 psi concrete (inc place and bar) | 140 | CY | 925.00 | 129,500 |
| 050001 MISCELLANEOUS & ORNAMENTAL IRON* | | | | |
| Bollards: | | | | |
| 6" Galv. Metal bollard @ equip pads | 6 | EA | 950.00 | 5,700 |
| Decorative bollard 1st main entry | 25 | EA | 1,500.00 | 37,500 |
| 323100 SITE IMPROVEMENTS | | | | |
| Fencing: | | | | |
| F1 4' Ornamental | 376 | LF | 88.00 | 33,088 |
| F2 6' Decorative/security fence | 124 | LF | 110.00 | 13,640 |
| Gates: | | | | |
| G2 4' decorative/security - DBL | 1 | EA | 4,000.00 | 4,000 |
| Vehicular Guard Rail | 2,497 | LF | 62.00 | 154,814 |
| Allowance: | | | | |
| Raised Planting Bed Curb | 207 | LF | 55.00 | 11,385 |
| Trash/recycle receptacle | 4 | EA | 2,000.00 | 8,000 |
| Bike loops | 10 | EA | 450.00 | 4,500 |
| Entry sign B | 1 | LS | 35,000.00 | 35,000 |
| Entry sign a | 1 | LS | 20,000.00 | 20,000 |
| Electronic school zone signals | 1 | LS | 60,000.00 | 60,000 |
| Parking/traffic signage | 1 | LS | 7,500.00 | 7,500 |
| Dumpster pad | 200 | SF | 16.00 | 3,200 |
| Flag pole w/base | 1 | EA | 7,200.00 | 7,200 |
| | | | | --- |
| | | | | 1,441,363 |
| G2050 LANDSCAPING | | | | |
| 329000 PLANTING | | | | |
| Trees: | | | | |
| Street trees (4" cal - B&B) | 119 | EA | 1,200.00 | 142,800 |
| Flowering trees (3" cal - B&B) | 53 | EA | 875.00 | 46,375 |
| Evergreen trees (8-10' ht - B&B) | 14 | EA | 590.00 | 8,260 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Specimen trees (4"cal - B&B) | 7 | EA | 1,200.00 | 8,400 |
| Shrubs | 2,150 | EA | 115.00 | 247,250 |
| Perennials | 9,300 | EA | 18.00 | 167,400 |
| Lawn: | | | | |
| Sod lawn | 39,350 | SF | 1.00 | 39,350 |
| No mow fescue | 72,510 | SF | 0.30 | 21,753 |
| No mow fescue lawn | 264,260 | SF | 0.30 | 79,278 |
| 18" Soil @ plant bed | 500 | CY | 48.00 | 24,000 |
| 6" Loam - Lawn | 6,965 | CY | 48.00 | 334,320 |
| Irrigation system: | | | | |
| Filed Irrigation | 30,000 | SF | 1.10 | 33,000 |
| Irrigation Well | 1 | LS | 50,000.00 | 50,000 |
| | | | | --- |
| | | | | 1,202,186 |
| TOTAL G20 - SITE IMPROVEMENTS | | | | 4,656,664 |

G30 - SITE MECHANICAL UTILITIES

G3010 WATER SUPPLY

330000 UTILITIES

| | | | | |
|---|---|---|---|---|
| 12" Lake Street Connection | 2 | LOC | 9,000.00 | 18,000 |
| 4" Main | 205 | LF | 64.00 | 13,120 |
| 6" Main | 317 | LF | 72.50 | 22,983 |
| 8" Main | 2,696 | LF | 85.00 | 229,160 |
| 12" Main | 985 | LF | 110.00 | 108,350 |
| Hydrant | 6 | EA | 2,350.00 | 14,100 |
| 12" Gate valve | 4 | EA | 3,100.00 | 12,400 |
| 8" Gate valve | 6 | EA | 1,650.00 | 9,900 |
| 6" Gate valve | 7 | EA | 1,400.00 | 9,800 |
| 4" Gate valve | 1 | EA | 1,350.00 | 1,350 |
| Temporary Construction Water Service | 1 | LS | 25,000.00 | 25,000 |
| | | | | --- |
| | | | | 464,163 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| G3020 SANITARY SEWER | | | | |
| 330000 UTILITIES | | | | |
| 4,000 Gal. Grease trap W/ BLDG | INC. W/ PLUMBING | | | |
| 6" PVC | 1,059 | LF | 65.00 | 68,835 |
| 8" PVC | 72 | LF | 69.00 | 4,968 |
| Sanitary manhole | 7 | EA | 4,100.00 | 28,700 |
| Tap exisitng smh | 1 | EA | 2,000.00 | 2,000 |
| | | | | --- |
| | | | | 104,503 |
| G3030 STORM SEWER | | | | |
| 330000 UTILITIES | | | | |
| Site Drainage : | | | | |
| Catch basin | 43 | EA | 4,500.00 | 193,500 |
| Drain Manhole | 36 | EA | 4,500.00 | 162,000 |
| Treatment chamber ( not shown ) | 2 | EA | 12,500.00 | 25,000 |
| Tap exisitng dmh | 1 | EA | 2,000.00 | 2,000 |
| Piping and Trenching: | | | | |
| 8" CPP | 27 | LF | 56.00 | 1,512 |
| 12" CPP | 3,364 | LF | 69.75 | 234,639 |
| 18" CPP | 1,316 | LF | 82.00 | 107,912 |
| 24" CPP | 475 | LF | 82.00 | 38,950 |
| Infiltration Field ( rev. total 6,900 GSF ) | | | | |
| Excavate Field | 1,533 | CY | 10.00 | 15,330 |
| Haul spoil | 1,533 | CY | 22.00 | 33,726 |
| 3/4" Washed Aggregate | 680 | CY | 77.00 | 52,360 |
| Process gravel | 128 | CY | 45.00 | 5,760 |
| Ordianry Borrow | 128 | CY | 19.00 | 2,432 |
| 36" Perf Pipe | 1,200 | LF | 87.00 | 104,400 |
| Geotech fabric | 26,400 | SF | 0.85 | 22,440 |
| Bio Retention Field: | | | | |
| Excavate Field | 498 | CY | 10.00 | 4,980 |
| Haul spoil | 498 | CY | 22.00 | 10,956 |
| 3/4" Washed Aggregate | 82 | CY | 77.00 | 6,314 |
| Pea stone | 30 | CY | 95.00 | 2,850 |
| Bio Media Soil Mix | 166 | CY | 120.00 | 19,920 |
| Mulch | 22 | CY | 75.00 | 1,650 |
| 4" Perf Pipe | 500 | LF | 38.50 | 19,250 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Riser and overflow | 1 | LS | 3,500.00 | 3,500 |
| | | | | --- |
| | | | | 1,071,381 |

G3060 FUEL DISTRIBUTION

330000 UTILITIES

| | | | | |
|---|---|---|---|---|
| Gas Service: | | | | |
| Gas Pipe | | By utility | | |
| Trench excavation & backfill | 1,640 | LF | 36.50 | 59,860 |
| Service Meter Pad | 1 | EA | 2,500.00 | 2,500 |
| | | | | --- |
| | | | | 62,360 |

G3090 OTHER SITE MECHANICAL UTILITIES N/A

| | |
|---|---|
| | --- |
| | 0 |
| TOTAL G30 - SITE MECHANICAL UTILITIES | 1,702,407 |

G40 - SITE ELECTRICAL UTILITIES

G4010 ELECTRICAL DISTRIBUTION

330000 UTILITIES

| | | | | |
|---|---|---|---|---|
| Generator Pad | 200 | SF | 25.00 | 5,000 |
| Transformer pad | 200 | SF | 25.00 | 5,000 |
| Trench, Backfill and Concrete: | | | | |
| Primary Ductbank - separate trench | 1,041 | LF | 75.00 | 78,075 |
| Tele/data ductbank - separate trench | 1,041 | LF | 75.00 | 78,075 |
| Secondary Duct bank | 41 | LF | 75.00 | 3,075 |
| Irrigation Well ductbank | 227 | LF | 39.00 | 8,853 |
| Vehicle Station Feed | 100 | LF | 39.00 | 3,900 |
| Site Sign Feed | 400 | LF | 39.00 | 15,600 |
| Hand Hole | 8 | EA | 985.00 | 7,880 |

260001 ELECTRICAL*

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| D&R all secondary feeders from xfmr in vault | 1 | LS | 5,320.00 | 5,320 |
| Co-ord PRI service removal | 1 | LS | 1,824.00 | 1,824 |
| Co-ord communication serv removal | 1 | LS | 456.00 | 456 |
| Exist. gen/set D&R complete | 1 | LS | 9,180.00 | 9,180 |
| Exist. gen/set wiring complete | 1 | LS | 1,520.00 | 1,520 |
| Co-rod removal of O/H service thru wood pole to modulars | 1 | LS | 1,824.00 | 1,824 |
| Ductbank | | | | |
| Pole dressing - PRI | 1 | EA | 1,125.00 | 1,125 |
| Primary Ductbank | | | | |
| PVC-4"C-w/PS | 4,524 | LF | 5.90 | 26,692 |
| Tele/data ductbank | | | | |
| PVC-4"C-w/PS | 1,864 | LF | 5.90 | 10,998 |
| Secondary: | | | | |
| PVC-4"C-w/PS | 205 | LF | 5.90 | 1,210 |
| Emergency: | | | | |
| Gen/set pad grndg | 1 | EA | 750.00 | 750 |
| Gen/set pad 90 deg & sleeves | 1 | EA | 500.00 | 500 |
| Gen/set mtd EPO WP | 1 | EA | 350.00 | 350 |
| Bldg mtd EPO | 1 | EA | 450.00 | 450 |
| PVC-2"C-4#600 & 1#1/0 (x2) | 192 | LF | 38.29 | 7,352 |
| PVC-1 1/4"C-12#10 | 192 | LF | 2.38 | 457 |
| PVC-1 1/4"C-w/ PS | 192 | LF | 1.80 | 346 |
| PVC-3"C- w/ PS | 192 | LF | 4.50 | 864 |
| Well Feed | | | | |
| PVC-2"C-3#8 $ 1#10 | 227 | LF | 6.35 | 1,441 |
| Vehicular Charging Station: | | | | |
| PVC-2"C-3#8 $ 1#10 | 100 | LF | 6.35 | 635 |
| Charging Station | 2 | EA | 1,850.00 | 3,700 |
| Site Sign Feed: | | | | |
| PVC-1"C-single mode fiber | 400 | LF | 2.00 | 800 |
| PVC-1"C-3#8 $ 1#10 | 400 | LF | 1.20 | 480 |
| Xfmr pad grounding | 1 | EA | 879.00 | 879 |
| Gen/set pad grounding | 1 | EA | 603.00 | 603 |
| Xfmr pad 90 deg & sleeves | 1 | EA | 623.00 | 623 |
| Gen/set 90 Deg & sleeves | 1 | EA | 503.00 | 503 |
| | | | | --- |
| | | | | 286,338 |

G4020 SITE LIGHTING

<u>330000 UTILITIES</u>

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| Site light trenching | 4,857 | LF | 18.50 | 89,855 |
| Light Pole base - 6' Precast | 49 | EA | 800.00 | 39,200 |
| 260001 ELECTRICAL* | | | | |
| Lighting Fixtures: | | | | |
| ZF - Flag pole light | 2 | EA | 766.00 | 1,532 |
| ZT2-20'alum w/head | 38 | EA | 2,632.00 | 100,016 |
| ZT22-20'alum w/twin head | 11 | EA | 3,596.00 | 39,556 |
| Pole base anchor bolts setups | 49 | EA | 79.00 | 3,871 |
| Pole base grounding w/elbow | 49 | EA | 208.00 | 10,192 |
| Pole base sleeves & nipples | 49 | EA | 228.00 | 11,172 |
| PVC-1 1/4"C-2#8 & 1#10 | 4,857 | LF | 3.81 | 18,505 |
| | | | | --- |
| | | | | 313,899 |
| TOTAL G40 - SITE ELECTRICAL UTILITIES | | | | 600,237 |

PROJECT: Beal Elementary School
LOCATION: Shrewsbury, MA
CLIENT: Lamoureux-Pagano Architects
DATE: 28-Aug-18

## *ALTERNATES*

| | |
|---|---|
| LAKE STREET ALIGNMENT | 1,238,757 |
| IRRIGATION WELL AND SYSTEM | 118,322 |
| FIRE SEPARATION WALL | 261,008 |

Beal Elem School - Alternates 8/28/2018

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| LAKE STREET ALIGNMENT | | | | |
| Earthwork and Prep | 1 | LS | 175,000.00 | 175,000 |
| Remove Lake Street | 40,000 | SF | 1.20 | 48,000 |
| Lake street: | | | | |
| Bit Pavement | 28,000 | SY | 3.00 | 84,000 |
| 18" Gravel base @ bit drive | 4,667 | CY | 31.50 | 147,000 |
| Lake Street Curb | 2,500 | LF | 44.00 | 110,000 |
| Utilites | 1 | LS | 295,000.00 | 295,000 |
| | | | | --- |
| SUBTOTAL | | | | 859,000 |
| DESIGN CONTINGENCY | | 10 % | | 85,900 |
| | | | | --- |
| SUBTOTAL | | | | 944,900 |
| CM CONTINGENCY | | 4 % | | 37,796 |
| | | | | --- |
| SUBTOTAL | | | | 982,696 |
| ESCALATION ( winter 2019 ) | | 3 % | | 29,481 |
| | | | | --- |
| SUBTOTAL | | | | 1,012,177 |
| GENERAL CONDITIONS | | 10 % | | 101,218 |
| | | | | --- |
| SUBTOTAL | | | | 1,113,395 |
| GENERAL REQUIREMNTS | | 2.5 % | | 27,835 |
| | | | | --- |
| SUBTOTAL | | | | 1,141,229 |
| BUILDING PERMIT | | 0 % | | 0 |
| | | | | --- |
| SUBTOTAL | | | | 1,141,229 |
| P&P BOND | | 5 % | | 57,061 |
| | | | | --- |
| SUBTOTAL | | | | 1,198,291 |
| GENERAL LIABILITY INSURANCE | | 1.35 % | | 16,177 |
| | | | | --- |
| SUBTOTAL | | | | 1,214,468 |
| FEE | | 2 % | | 24,289 |
| | | | | --- |
| TOTAL | | | | 1,238,757 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|
| IRRIGATION WELL AND SYSTEM | | | | |
| Irrigation system: | | | | |
| Field Irrigation | 30,000 | SF | 1.10 | 33,000 |
| Irrigation Well | 1 | LS | 50,000.00 | 50,000 |
| | | | | --- |
| SUBTOTAL | | | | 83,000 |
| DESIGN CONTINGENCY | | 10 % | | 8,300 |
| | | | | --- |
| SUBTOTAL | | | | 91,300 |
| CM CONTINGENCY | | 3 % | | 2,739 |
| | | | | --- |
| SUBTOTAL | | | | 94,039 |
| ESCALATION ( winter 2019 ) | | 6 % | | 5,642 |
| | | | | --- |
| SUBTOTAL | | | | 99,681 |
| GENERAL CONDITIONS | | 10 % | | 9,968 |
| | | | | --- |
| SUBTOTAL | | | | 109,649 |
| GENERAL REQUIREMNTS | | 2.5 % | | 2,741 |
| | | | | --- |
| SUBTOTAL | | | | 112,391 |
| BUILDING PERMIT | | 0 % | | 0 |
| | | | | --- |
| SUBTOTAL | | | | 112,391 |
| P&P BOND | | 0.85 % | | 955 |
| | | | | --- |
| SUBTOTAL | | | | 113,346 |
| GENERAL LIABILITY INSURANCE | | 1.35 % | | 1,530 |
| | | | | --- |
| SUBTOTAL | | | | 114,876 |
| FEE | | 3 % | | 3,446 |
| | | | | --- |
| TOTAL | | | | 118,322 |

| DESCRIPTION | QUANTITY | UNIT | UNIT COST | TOTAL |
|---|---|---|---|---|

Q. Independent OPM Cost Estimate

## Schematic Design Estimate

# Beal Elementary School

## 214 Lake Street

Shrewsbury, MA

**PM&C LLC**
20 Downer Ave, Suite 1C
Hingham, MA 02043
(T) 781-740-8007
(F) 781-740-1012

Prepared for:

**PMA**

August 31, 2018

PM&C

**Beal Elementary School**
214 Lake Street
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate**

**MAIN CONSTRUCTION COST SUMMARY**

| | Construction Start | Gross Floor Area | $/sf | Estimated Construction Cost |
|---|---|---|---|---|
| **NEW BUILDING** | Oct-19 | | | |
| NEW BUILDING | | 141,600 | $299.46 | $42,403,469 |
| DEMOLISH EXISTING SCHOOL | | 100,000 | $6.00 | $600,000 |
| REMOVE HAZARDOUS MATERIALS | | | | $1,250,000 |
| LAKE STREET REALIGNMENT | | | | $1,104,433 |
| MULTIPURPOSE FIELD IRRIGATION | | | | $28,375 |
| SITEWORK | | | | $8,187,698 |
| SUB-TOTAL | | 141,600 | $378.35 | $53,573,975 |
| ESCALATION - (assumed 4% PA) | 4.7% | | | $2,517,977 |
| DESIGN AND PRICING CONTINGENCY | 10.00% | | | $5,609,195 |
| SUB-TOTAL | | 141,600 | $435.74 | $61,701,147 |
| CM/GMP CONTINGENCY | 3% | | | $1,851,034 |
| GENERAL CONDITIONS | 25 | months | $160,000 | $4,000,000 |
| GENERAL REQUIREMENTS | 3% | | | $2,026,565 |
| SUB-TOTAL | | 141,600 | $491.38 | $69,578,746 |
| PERFORMANCE AND PAYMENT BOND | 0.76% | | | $528,798 |
| BUILDER'S RISK INSURANCE | 0.12% | | By Owner | $0 |
| GENERAL LIABILITY INSURANCE | 1.17% | | | $814,071 |
| PERMIT | | | | Waived |
| CM FEE | 2.50% | | | $1,773,040 |
| **TOTAL OF ALL CONSTRUCTION** | | 141,600 | $513.38 | **$72,694,655** |
| **ADDITIONAL COSTS** | | | | |
| Lake Street Realignment | | | DEDUCT | **($1,502,029)** |
| Multipurpose Field Irrigation | | | DEDUCT | **($38,590)** |

**Beal Elementary School**
214 Lake Street
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate**

This Schematic Design cost estimate was produced from drawings, specifications and other documentation prepared by Lamoureux Pagano Associates, Architects and their design team dated September 12, 2018. Design and engineering changes occurring subsequent to the issue of these documents have not been incorporated in this estimate.

This estimate includes all direct construction costs, construction manager's overhead, fee and design contingency. Cost escalation assumes start dates indicated.

Bidding conditions are expected to be public bidding under Chapter 149a of the Massachusetts General Laws to pre-qualified construction managers, and pre-qualified sub-contractors, open specifications for materials and manufactures.

The estimate is based on prevailing wage rates for construction in this market and represents a reasonable opinion of cost. It is not a prediction of the successful bid from a contractor as bids will vary due to fluctuating market conditions, errors and omissions, proprietary specifications, lack or surplus of bidders, perception of risk, etc. Consequently the estimate is expected to fall within the range of bids from a number of competitive contractors or subcontractors, however we do not warrant that bids or negotiated prices will not vary from the final construction cost estimate.

**ITEMS NOT CONSIDERED IN THIS ESTIMATE**

Items not included in this estimate are:

- Land acquisition, feasibility, and financing costs
- All professional fees and insurance
- Site or existing conditions surveys investigations costs, including to determine subsoil conditions
- All Furnishings, Fixtures and Equipment
- Items identified in the design as Not In Contract (NIC)
- Items identified in the design as by others
- Owner supplied and/or installed items as indicated in the estimate
- Utility company back charges, including work required off-site
- Work to City streets and sidewalks, (except as noted in this estimate)
- Construction contingency
- Contaminated soils removal

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**Beal Elementary School**
**214 Lake Street**
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate**

GFA 141,600

## *CONSTRUCTION COST SUMMARY*

| | *BUILDING SYSTEM* | | *SUB-TOTAL* | *TOTAL* | *$/SF* | *%* |
|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | |
| **A10** | **FOUNDATIONS** | | | | | |
| | A1010 | Standard Foundations | $1,927,684 | | | |
| | A1020 | Special Foundations | $0 | | | |
| | A1030 | Lowest Floor Construction | $1,413,660 | **$3,341,344** | $23.60 | 7.9% |
| **A20** | **BASEMENT CONSTRUCTION** | | | | | |
| | A2010 | Basement Excavation | $0 | | | |
| | A2020 | Basement Walls | $0 | **$0** | $0.00 | 0.0% |
| **B10** | **SUPERSTRUCTURE** | | | | | |
| | B1010 | Upper Floor Construction | $1,967,127 | | | |
| | B1020 | Roof Construction | $2,828,329 | **$4,795,456** | $33.87 | 11.3% |
| **B20** | **EXTERIOR CLOSURE** | | | | | |
| | B2010 | Exterior Walls | $5,822,862 | | | |
| | B2020 | Windows | $1,316,807 | | | |
| | B2030 | Exterior Doors | $121,623 | **$7,261,292** | $51.28 | 17.1% |
| **B30** | **ROOFING** | | | | | |
| | B3010 | Roof Coverings | $2,218,430 | | | |
| | B3020 | Roof Openings | $13,000 | **$2,231,430** | $15.76 | 5.3% |
| **C10** | **INTERIOR CONSTRUCTION** | | | | | |
| | C1010 | Partitions | $2,812,325 | | | |
| | C1020 | Interior Doors | $793,080 | | | |
| | C1030 | Specialties/Millwork | $831,084 | **$4,436,489** | $31.33 | 10.5% |
| **C20** | **STAIRCASES** | | | | | |
| | C2010 | Stair Construction | $204,000 | | | |
| | C2020 | Stair Finishes | $19,872 | **$223,872** | $1.58 | 0.5% |
| **C30** | **INTERIOR FINISHES** | | | | | |
| | C3010 | Wall Finishes | $1,294,248 | | | |
| | C3020 | Floor Finishes | $1,421,569 | | | |
| | C3030 | Ceiling Finishes | $1,184,950 | **$3,900,767** | $27.55 | 9.2% |
| **D10** | **CONVEYING SYSTEMS** | | | | | |
| | D1010 | Elevator | $123,000 | **$123,000** | $0.87 | 0.3% |
| **D20** | **PLUMBING** | | | | | |
| | D20 | Plumbing | $2,140,620 | **$2,140,620** | $15.12 | 5.0% |

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**Beal Elementary School**
**214 Lake Street**
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate**

GFA 141,600

## *CONSTRUCTION COST SUMMARY*

| | *BUILDING SYSTEM* | | *SUB-TOTAL* | *TOTAL* | *$/SF* | *%* |
|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | |
| **D30** | **HVAC** | | | | | |
| | D30 | HVAC | $6,035,427 | **$6,035,427** | $42.62 | 14.2% |
| **D40** | **FIRE PROTECTION** | | | | | |
| | D40 | Fire Protection | $675,390 | **$675,390** | $4.77 | 1.6% |
| **D50** | **ELECTRICAL** | | | | | |
| | D5010 | Service & Distribution | $1,068,425 | | | |
| | D5020 | Lighting & Power | $1,454,797 | | | |
| | D5030 | Communication & Security Systems | $1,853,367 | | | |
| | D5040 | Other Electrical Systems | $294,500 | **$4,671,089** | $32.99 | 11.0% |
| **E10** | **EQUIPMENT** | | | | | |
| | E10 | Equipment | $972,265 | **$972,265** | $6.87 | 2.3% |
| **E20** | **FURNISHINGS** | | | | | |
| | E2010 | Fixed Furnishings | $1,595,028 | | | |
| | E2020 | Movable Furnishings | NIC | **$1,595,028** | $11.26 | 3.8% |
| **F10** | **SPECIAL CONSTRUCTION** | | | | | |
| | F10 | Special Construction | $0 | **$0** | $0.00 | 0.0% |
| **F20** | **HAZMAT REMOVALS** | | | | | |
| | F2010 | Building Elements Demolition | $0 | | | |
| | F2020 | Hazardous Components Abatement | $0 | **$0** | $0.00 | 0.0% |
| **TOTAL DIRECT COST (Trade Costs)** | | | | **$42,403,469** | $299.46 | 100.0% |

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**Beal Elementary School**
**214 Lake Street**
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate**

GFA 141,600

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| | ***GROSS FLOOR AREA CALCULATION*** | | | | | | |
| | First Floor | | | 56,720 | | | |
| | Second Floor | | | 84,880 | | | |
| | ***TOTAL GROSS FLOOR AREA (GFA)*** | | | | **141,600** | ***sf*** | |
| ***A10*** | ***FOUNDATIONS*** | | | | | | |
| **A1010** | **STANDARD FOUNDATIONS** | | | | | | |
| *033000* | *CONCRETE* | | | | | | |
| | Strip Footings | *632* | *CY* | | | | |
| | Foundation Walls | *423* | *CY* | | | | |
| | Retaining Walls | *457* | *CY* | | | | |
| | Spread Footings | *386* | *CY* | | | | |
| | Total Foundation Concrete | *1,898* | *CY* | | | | |
| | Strip footings | | | | | | |
| | Formwork | **6,968** | sf | 12.00 | 83,616 | | |
| | Re-bar | **52,440** | lbs. | 1.30 | 68,172 | | |
| | Concrete material; 4,000 psi | **632** | cy | 138.00 | 87,216 | | |
| | Placing concrete | **632** | cy | 90.00 | 56,880 | | |
| | Foundation walls | | | | | | |
| | Formwork | **14,512** | sf | 16.00 | 232,192 | | |
| | Re-bar | **36,280** | lbs. | 1.30 | 47,164 | | |
| | Concrete material; 4,000 psi | **423** | cy | 138.00 | 58,374 | | |
| | Placing concrete | **423** | cy | 90.00 | 38,070 | | |
| | Form shelf | **1,814** | lf | 10.00 | 18,140 | | |
| | Retaining walls | | | | | | |
| | Formwork | **14,080** | sf | 20.00 | 281,600 | | |
| | Re-bar | **70,400** | lbs. | 1.30 | 91,520 | | |
| | Concrete material; 4,000 psi | **457** | cy | 138.00 | 63,066 | | |
| | Placing concrete | **457** | cy | 90.00 | 41,130 | | |
| | Form shelf | **440** | lf | 10.00 | 4,400 | | |
| | Spread Footings | | | | | | |
| | Formwork | **6,624** | sf | 14.00 | 92,736 | | |
| | Re-bar | **13,904** | lbs. | 1.30 | 18,075 | | |
| | Concrete material; 4,000 psi | **386** | cy | 130.00 | 50,180 | | |
| | Placing concrete | **386** | cy | 70.00 | 27,020 | | |
| | Set anchor bolts grout plates | **138** | ea | 150.00 | 20,700 | | |
| *070001* | *WATERPROOFING, DAMPPROOFING AND CAULKING* | | | | | | |
| | Dampproofing at brick shelf | **7,256** | sf | 3.00 | NR | | |
| | Waterproofing retaining wall | **10,560** | sf | 7.00 | 73,920 | | |
| *072100* | *THERMAL INSULATION* | | | | | | |
| | Insulation | **14,296** | sf | 3.00 | 42,888 | | |
| *312000* | *EARTHWORK* | | | | | | |
| | Strip footings | | | | | | |
| | Excavation | **6,277** | cy | 15.00 | 94,155 | | |
| | Store on site for reuse | **6,277** | cy | 10.00 | 62,770 | | |
| | Backfill with selected existing material | **4,765** | cy | 16.00 | 76,240 | | |
| | Spread footings | | | | | | |
| | Excavation | **1,656** | cy | 16.00 | 26,496 | | |

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**Beal Elementary School**
**214 Lake Street**
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate**

GFA 141,600

| | CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| | **NEW BUILDING** | | | | | | | |
| 56 | | Store on site for reuse | **1,656** | cy | 10.00 | 16,560 | | |
| 57 | | Backfill with selected existing material | **1,270** | cy | 16.00 | 20,320 | | |
| 58 | | Miscellaneous | | | | | | |
| 59 | | Retaining wall backfill | **1** | ls | 80,000.00 | 80,000 | | |
| 60 | | Gravel fill beneath footings, 12" | **449** | cy | 36.00 | 16,164 | | |
| 61 | | Perimeter drain at retaining wall | **440** | lf | 18.00 | 7,920 | | |
| 62 | | Underslab E&B for plumbing | **1** | ls | 15,000.00 | 15,000 | | |
| 63 | | Dewatering for foundation work | **1** | ls | 15,000.00 | 15,000 | | |
| 64 | | SUBTOTAL | | | | | 1,927,684 | |
| 65 | | | | | | | | |
| 66 | **A1020** | **SPECIAL FOUNDATIONS** | | | | | | |
| 67 | | No work in this section | | | | | | |
| 68 | | SUBTOTAL | | | | | - | |
| 69 | | | | | | | | |
| 70 | **A1030** | **LOWEST FLOOR CONSTRUCTION** | | | | | | |
| 71 | | | | | | | | |
| 72 | *033000* | *CONCRETE* | | | | | | |
| 73 | | Slab on grade, 5" thick | *90,910* | *sf* | | | | |
| 74 | | Vapor barrier | **90,910** | sf | 1.00 | 90,910 | | |
| 75 | | WWF reinforcement | **104,547** | sf | 1.10 | 115,002 | | |
| 76 | | Concrete - 5" thick; 4,000 psi | **1,471** | cy | 138.00 | 202,998 | | |
| 77 | | Placing concrete | **1,471** | cy | 45.00 | 66,195 | | |
| 78 | | Finishing and curing concrete | **90,910** | sf | 2.50 | 227,275 | | |
| 79 | | Sawcut full depth control joints | **90,910** | sf | 0.20 | 18,182 | | |
| 80 | | Elevator pit walls | | | | | | |
| 81 | | formwork | **480** | sf | 20.00 | 9,600 | | |
| 82 | | reinforcement | **720** | lbs. | 1.30 | 936 | | |
| 83 | | concrete material | **6** | cy | 138.00 | 828 | | |
| 84 | | placing concrete | **6** | cy | 120.00 | 720 | | |
| 85 | | Slab @ elevator pit | | | | | | |
| 86 | | formwork | **80** | sf | 14.00 | 1,120 | | |
| 87 | | reinforcement | **750** | lbs. | 1.30 | 975 | | |
| 88 | | concrete material in slab | **9** | cy | 138.00 | 1,242 | | |
| 89 | | placing concrete | **9** | cy | 120.00 | 1,080 | | |
| 90 | | Miscellaneous | | | | | | |
| 91 | | Cafeteria concrete platform steps | **156** | lfr | 120.00 | 18,720 | | |
| 92 | | Premium for ramp at platform | **275** | sf | 10.00 | 2,750 | | |
| 93 | | Moisture mitigation admixture | **1,471** | cy | 70.00 | NR | | |
| 94 | | Loading dock | **1** | ls | 10,000.00 | 10,000 | | |
| 95 | | Equipment pads | **1** | ls | 15,000.00 | 15,000 | | |
| 96 | | | | | | | | |
| 97 | *070001* | *WATERPROOFING, DAMPPROOFING AND CAULKING* | | | | | | |
| 98 | | Bentonite water stops | **1** | ls | 500.00 | 500 | | |
| 99 | | Cementitious waterproofing to elevator pit | **340** | sf | 16.00 | 5,440 | | |
| 100 | | | | | | | | |
| 101 | *072100* | *THERMAL INSULATION* | | | | | | |
| 102 | | Rigid insulation; 2ft at perimeter | **6,100** | sf | 2.25 | 13,725 | | |
| 103 | | | | | | | | |
| 104 | *312000* | *EARTHWORK* | | | | | | |
| 105 | | Slab on grade | | | | | | |
| 106 | | Structural fill to make up levels | **13,162** | cy | 30.00 | 394,860 | | |
| 107 | | Gravel fill, 12" | **3,367** | cy | 36.00 | 121,212 | | |
| 108 | | Compact existing sub-grade and proof roll | **90,910** | sf | 1.00 | 90,910 | | |
| 109 | | Radon mitigation system | | sf | | - | | |

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**Beal Elementary School**
**214 Lake Street**
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate**

GFA 141,600

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| | Elevator Pit | | | | | | |
| | Excavation for elevator pit | **84** | cy | 30.00 | 2,520 | | |
| | Store for re-use | **84** | cy | 10.00 | 840 | | |
| | Backfill with imported material | **4** | cy | 30.00 | 120 | | |
| | SUBTOTAL | | | | | 1,413,660 | |
| | ***TOTAL - FOUNDATIONS*** | | | | | | **$3,341,344** |
| ***A20*** | ***BASEMENT CONSTRUCTION*** | | | | | | |
| **A2010** | **BASEMENT EXCAVATION** | | | | | | |
| | **No Work in this section** | | | | | | |
| | SUBTOTAL | | | | | - | |
| **A2020** | **BASEMENT WALLS** | | | | | | |
| | **No Work in this section** | | | | | | |
| | SUBTOTAL | | | | | - | |
| | ***TOTAL - BASEMENT CONSTRUCTION*** | | | | | | |
| ***B10*** | ***SUPERSTRUCTURE*** | | | | | | |
| | | **13.7** | **lbs/sf** | | | | |
| **B1010** | **FLOOR CONSTRUCTION** | **972** | **tns** | | | | |
| *033000* | *CONCRETE* | | | | | | |
| | WWF reinforcement | **58,294** | sf | 1.10 | 64,123 | | |
| | Concrete Fill to metal deck; 5-1/2" thick; normal weight | **903** | cy | 138.00 | 124,614 | | |
| | Place and finish concrete | **50,690** | sf | 2.25 | 114,053 | | |
| | Rebar to decks | **15,207** | lbs | 1.20 | 18,248 | | |
| | Moisture mitigation admixture | **903** | cy | 70.00 | NR | | |
| *051200* | *STRUCTURAL STEEL FRAMING* | | | | | | |
| | Steel framing - 14#/SF | **355** | tns | 3,800.00 | 1,349,000 | | |
| | Premium for HSS | **89** | tns | 350.00 | 31,150 | | |
| | 3" Metal galvanized floor deck | **50,690** | sf | 3.50 | 177,415 | | |
| | Shear studs | **10,138** | ea | 3.80 | 38,524 | | |
| | Miscellaneous | | | | | | |
| | Allowance for expansion joints | **1** | ls | 25,000.00 | 25,000 | | |
| | Allowance for beam penetrations | **1** | ls | 15,000.00 | 15,000 | | |
| *078400* | *FIREPROOFING/FIRESTOPPING* | | | | | | |
| | Fire proofing to columns and beams | **50,690** | sf | 2.25 | not required | | |
| | Fire stopping floors | **1** | ls | 10,000.00 | 10,000 | | |
| | SUBTOTAL | | | | | 1,967,127 | |
| **B1020** | **ROOF CONSTRUCTION** | | | | | | |
| *033000* | *CONCRETE* | | | | | | |
| | WWF reinforcement | **4,830** | sf | 1.10 | 5,313 | | |
| | Concrete Fill to metal deck; 6" thick; normal weight | **61** | cy | 138.00 | 8,418 | | |

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**Beal Elementary School**
**214 Lake Street**
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate** GFA 141,600

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| | Place and finish concrete | **4,200** | sf | 2.25 | 9,450 | | |
| | Rebar to decks | **1,260** | lbs | 1.30 | 1,638 | | |
| *051200* | *STRUCTURAL STEEL FRAMING* | | | | | | |
| | Steel framing - 13.5#/SF | **617** | tns | 3,800.00 | 2,344,600 | | |
| | Premium for HSS | **9** | tns | 350.00 | 3,150 | | |
| | 1-1/2" Metal galvanized roof deck | **84,420** | sf | 3.00 | 253,260 | | |
| | 3" NCAS roof deck at gymnasium | **7,000** | sf | 9.00 | 63,000 | | |
| | Canopy framing | **26** | tns | 4,500.00 | 117,000 | | |
| | Roof screen support | **5** | tns | 4,500.00 | 22,500 | | |
| *078400* | *FIREPROOFING/FIRESTOPPING* | | | | | | |
| | Fire proofing to columns, beams and deck | **84,420** | sf | 3.00 | not required | | |
| | Intumescent paint to exposed beams | | | | NIC | | |
| | SUBTOTAL | | | | | 2,828,329 | |
| | ***TOTAL - SUPERSTRUCTURE*** | | | | | | **$4,795,456** |
| ***B20*** | ***EXTERIOR CLOSURE*** | **65,547** | **TOTAL CLOSURE AREA** | | | | |
| **B2010** | **EXTERIOR WALLS** | *53,809* | sf | | | | |
| *040001* | *MASONRY* | | | | | | |
| | Brick veneer, modular | **25,246** | sf | 36.00 | 908,856 | | |
| | Precast base | **6,323** | sf | 80.00 | 505,840 | | |
| | Precast base @ retaining wall | **1,550** | sf | 80.00 | 124,000 | | |
| | Staging to exterior wall | **53,809** | sf | 3.50 | 188,332 | | |
| *052000* | *MISC. METALS* | | | | | | |
| | Misc. angles, lintels etc. at masonry | **33,119** | sf | 1.00 | 33,119 | | |
| *070001* | *WATERPROOFING, DAMPPROOFING AND CAULKING* | | | | | | |
| | Air and vapor barrier | **53,809** | sf | 6.50 | 349,759 | | |
| | AVB at window openings | **5,411** | lf | 4.00 | 21,644 | | |
| | AVB at soffits | **5,270** | sf | 6.50 | 34,255 | | |
| | Miscellaneous sealants | **53,809** | sf | 0.20 | 10,762 | | |
| *070002* | *ROOFING AND FLASHING* | | | | | | |
| | Single ply membrane to backside of parapet | **1,100** | sf | 8.00 | 8,800 | | |
| | Miscellaneous flashings | **53,809** | sf | 0.65 | 34,976 | | |
| *072100* | *THERMAL INSULATION* | | | | | | |
| | Batt insulation with cavity mat | **52,259** | sf | 4.00 | 209,036 | | |
| | Rigid insulation, 3" | **52,259** | sf | 3.50 | 182,907 | | |
| | Insulation at soffits | **5,270** | sf | 4.00 | 21,080 | | |
| | Insulation at window openings | **5,411** | lf | 6.00 | 32,466 | | |
| *074000* | *WALL PANELS* | | | | | | |
| | Composite wall panels, "Alunatural Green Zinc" Larson by Alucoil | **20,690** | sf | 80.00 | 1,655,200 | | |
| | Composite panel at canopy soffits/ overhangs | **5,270** | sf | 80.00 | 421,600 | | |
| | Composite panel at roof screen w/ corrugated backup | **880** | sf | 70.00 | 61,600 | | |

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**Beal Elementary School**
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31-Aug-18

**Schematic Design Estimate**

GFA 141,600

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| | Mock up | **1** | ls | 50,000.00 | 50,000 | | |
| *092900* | *GYPSUM BOARD ASSEMBLIES* | | | | | | |
| | 1/2" exterior gypsum sheathing | **52,259** | sf | 2.90 | 151,551 | | |
| | 1/2" exterior gypsum sheathing to backside of parapet | **1,100** | sf | 2.00 | 2,200 | | |
| | 8" metal stud | **52,259** | sf | 11.00 | 574,849 | | |
| | GWB lining, 5/8" | **52,259** | sf | 3.00 | 156,777 | | |
| | Framing at soffits | **5,270** | sf | 13.90 | 73,253 | | |
| *101400* | *SIGNAGE* | | | | | | |
| | Exterior signage | **1** | ls | 10,000.00 | 10,000 | | |
| | SUBTOTAL | | | | | 5,822,862 | |
| **B2020** | **WINDOWS** | *11,402* | sf | | | | |
| *061000* | *ROUGH CARPENTRY* | | | | | | |
| | Wood blocking at openings | **5,411** | lf | 14.00 | 75,754 | | |
| *070001* | *WATERPROOFING, DAMPPROOFING AND CAULKING* | | | | | | |
| | Backer rod & double sealant | **5,411** | lf | 9.00 | 48,699 | | |
| *080001* | *WINDOWS* | | | | | | |
| | Windows/Storefront | **7,986** | sf | 94.00 | 750,684 | | |
| | Curtainwall | **3,016** | sf | 120.00 | 361,920 | | |
| | Clerestory | **400** | sf | 90.00 | 36,000 | | |
| | Premium for operable windows, allow | **1** | ls | 30,000.00 | 30,000 | | |
| | Sun shades, horizontal @ Cafeteria | **42** | lf | 250.00 | 10,500 | | |
| *089000* | *LOUVERS* | | | | | | |
| | Louvers | **50** | sf | 65.00 | 3,250 | | |
| | SUBTOTAL | | | | | 1,316,807 | |
| **B2030** | **EXTERIOR DOORS** | | | | | | |
| *061000* | *ROUGH CARPENTRY* | | | | | | |
| | Wood blocking at openings | **231** | lf | 4.00 | 924 | | |
| *079200* | *JOINT SEALANTS* | | | | | | |
| | Backer rod & double sealant | **231** | lf | 9.00 | 2,079 | | |
| *081110* | *DOORS, FRAMES & HARDWARE* | | | | | | |
| | Hollow metal door, frame & hardware, single leaf | **3** | ea | 1,900.00 | 5,700 | | |
| | Hollow metal door, frame & hardware, double leaf | **1** | pr | 3,300.00 | 3,300 | | |
| *083300* | *OVERHEAD DOOR* | | | | | | |
| | Overhead coiling grille, 34' x 8' | **1** | ea | 16,320.00 | 16,320 | | |
| *084110* | *ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS* | | | | | | |
| | Glazed aluminum entrance doors including frame and hardware; double | **8** | pr | 9,500.00 | 76,000 | | |
| | Glazed aluminum entrance doors including frame and hardware; single | **1** | ea | 4,300.00 | 4,300 | | |
| *087100* | *DOOR HARDWARE* | | | | | | |

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| | Automatic opening | **2** | ea | 6,500.00 | 13,000 | | |
| | SUBTOTAL | | | | | 121,623 | |
| | ***TOTAL - EXTERIOR CLOSURE*** | | | | | | **$7,261,292** |
| ***B30*** | ***ROOFING*** | | | | | | |
| **B3010** | **ROOF COVERINGS** | | | | | | |
| *061000* | *ROUGH CARPENTRY* | | | | | | |
| | Rough blocking | **15,260** | lf | 7.00 | 106,820 | | |
| *070002* | *ROOFING AND FLASHING* | | | | | | |
| | EPDM roofing, 90 mil unreinforced, 30 year warranty; | **86,660** | sf | 18.00 | 1,559,880 | | |
| | EPDM roofing, 90 mil unreinforced, 30 year warranty at canopies | **5,270** | sf | 18.00 | 94,860 | | |
| | Standing seam metal roof; complete | **4,760** | sf | 38.00 | 180,880 | | |
| | Miscellaneous Roofing | | | | | | |
| | Roof edge fascia, flashings | **3,815** | lf | 30.00 | 114,450 | | |
| | MCM fascia at standing seam roof and canopy edge | **1,888** | sf | 80.00 | 151,040 | | |
| | Walkway pads | **1** | ls | 7,500.00 | 7,500 | | |
| | Roof ladder | **2** | ea | 1,500.00 | 3,000 | | |
| | SUBTOTAL | | | | | 2,218,430 | |
| **B3020** | **ROOF OPENINGS** | | | | | | |
| | Roof hatch | **4** | ea | 2,500.00 | 10,000 | | |
| | Elevator vent | **1** | ea | 3,000.00 | 3,000 | | |
| | SUBTOTAL | | | | | 13,000 | |
| | ***TOTAL - ROOFING*** | | | | | | **$2,231,430** |
| ***C10*** | ***INTERIOR CONSTRUCTION*** | | | | | | |
| **C1010** | **PARTITIONS** | | | | | | |
| *055000* | *MISCELLANEOUS METALS* | | | | | | |
| | Support for operable partition | **60** | lf | 120.00 | 7,200 | | |
| *061000* | *ROUGH CARPENTRY* | | | | | | |
| | Rough blocking | **17,966** | lf | 6.00 | 107,796 | | |
| *080002* | *GLASS AND GLAZING* | | | | | | |
| | Interior storefront | **1,350** | sf | 85.00 | 114,750 | | |
| *070001* | *WATERPROOFING, DAMPPROOFING AND CAULKING* | | | | | | |
| | Miscellaneous sealants throughout building | **141,600** | sf | 1.00 | 141,600 | | |
| *092900* | *GYPSUM BOARD ASSEMBLIES* | | | | | | |
| | S4A - 3-5/8" MS, 1 layer GWB b/s, insulation | **46,830** | sf | 11.50 | 538,545 | | |
| | S6A - 6" MS, 1 layer GWB b/s, insulation | **29,895** | sf | 12.50 | 373,688 | | |
| | S4G - 3-5/8" MS, 2 layers GWB o/s, 1 layer GWB o/s, insulation | **1,950** | sf | 13.00 | 25,350 | | |
| | S6H - 6" MS, 2 layers GWB b/s, insulation | **30,675** | sf | 16.50 | 506,138 | | |

PM&C

**Beal Elementary School**
**214 Lake Street**
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate**

GFA 141,600

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| | S6J - 6" MS staggered in 6" track, 2 layers GWB b/s, insulation | **2,595** | sf | 17.50 | 45,413 | | |
| | S4K - 2 rows 3-5/8" MS, 2 layers GWB b/s, 2 layers insulation | **3,975** | sf | 20.00 | 79,500 | | |
| | Elevator shaft | **1,950** | sf | 18.00 | 35,100 | | |
| | Stair | **5,340** | sf | 18.00 | 96,120 | | |
| | Gym | **2,565** | sf | 17.00 | 43,605 | | |
| | Plumbing chase | **4,425** | sf | 15.00 | 66,375 | | |
| | | | | | | | |
| | Fire separation wall; 8" CMU | **4,547** | sf | 35.00 | 159,145 | | |
| | Miscellaneous GWB assemblies | **141,600** | gsf | 3.00 | 424,800 | | |
| *102228* | *FOLDING PANEL PARTITION* | | | | | | |
| | Operable partition at stage | **590** | sf | 80.00 | 47,200 | | |
| | SUBTOTAL | | | | | 2,812,325 | |
| **C1020** | **INTERIOR DOORS** | | | | | | |
| *061000* | *ROUGH CARPENTRY* | | | | | | |
| | Wood blocking at openings | **4,736** | lf | 4.00 | 18,944 | | |
| *070001* | *WATERPROOFING, DAMPPROOFING AND CAULKING* | | | | | | |
| | Backer rod & double sealant | **4,736** | lf | 6.00 | 28,416 | | |
| *081110* | *DOORS, FRAMES & HARDWARE* | | | | | | |
| | Single leaf | **228** | ea | 1,650.00 | 376,200 | | |
| | Double leaf | **43** | pr | 3,200.00 | 137,600 | | |
| | Sidelights | **75** | ea | 1,040.00 | 78,000 | | |
| | Premium for fire separation doors, double | **5** | pr | 5,000.00 | 25,000 | | |
| *083110* | *ACCESS DOORS AND FRAMES* | | | | | | |
| | Access doors | **1** | ls | 1,500.00 | 1,500 | | |
| *083300* | *OVERHEAD DOOR* | | | | | | |
| | Overhead coiling grille, 34' x 8' | **1** | ea | 16,320.00 | 16,320 | | |
| *084110* | *ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS* | | | | | | |
| | Glazed aluminum doors including frame and hardware; double door | **8** | pr | 8,000.00 | 64,000 | | |
| *090007* | *PAINTING* | | | | | | |
| | Finish doors and frames | **314** | ea | 150.00 | 47,100 | | |
| | SUBTOTAL | | | | | 793,080 | |
| **C1030** | **SPECIALTIES / MILLWORK** | | | | | | |
| *055000* | *MISCELLANEOUS METALS* | | | | | | |
| | Rail support for elevator cabs | **1** | loc | 3,000.00 | 3,000 | | |
| | Railing at open to below areas | **160** | lf | 500.00 | 80,000 | | |
| | Guardrail at platform ramp | **18** | lf | 300.00 | 5,400 | | |
| | Handrail at platform ramps | **85** | lf | 150.00 | 12,750 | | |
| | Miscellaneous metals throughout building | **141,600** | sf | 1.00 | 141,600 | | |
| | Column enclosures | **1** | ls | 50,000.00 | 50,000 | | |

PM&C

**Beal Elementary School**
**214 Lake Street**
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate**

GFA 141,600

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| *061000* | *ROUGH CARPENTRY* | | | | | | |
| | Backer panels in electrical closets | **1** | ls | 1,500.00 | 1,500 | | |
| | Wood blocking at interiors | **141,600** | gsf | 0.50 | 70,800 | | |
| *062000* | *FINISH CARPENTRY* | | | | | | |
| | Admin reception desk, allow | **1** | ls | 12,000.00 | 12,000 | | |
| | Media center circulation desk | **20** | lf | 700.00 | 14,000 | | |
| *101100* | *VISUAL DISPLAY SURFACES* | | | | | | |
| | Tack Board | **3,375** | sf | 20.00 | 67,500 | | |
| | White Board | **5,970** | sf | 22.00 | 131,340 | | |
| | Interactive White Board, 8' - markerboard | **82** | ea | 832.00 | 68,224 | | |
| | Scissor lift for projector | **1** | ea | 4,500.00 | 4,500 | | |
| *101400* | *SIGNAGE* | | | | | | |
| | Building directory | **1** | loc | 3,000.00 | 3,000 | | |
| | Room Signs | **271** | loc | 120.00 | 32,520 | | |
| | Other signage | **1** | ls | 2,500.00 | 2,500 | | |
| *102110* | *TOILET COMPARTMENTS* | | | | | | |
| | ADA | **10** | ea | 1,600.00 | 16,000 | | |
| | Standard | **31** | ea | 1,200.00 | 37,200 | | |
| | Urinal screen | **7** | ea | 400.00 | 2,800 | | |
| *102800* | *TOILET ACCESSORIES* | | | | | | |
| | Gang bathroom | **10** | rms | 2,350.00 | 23,500 | | |
| | Gang bathroom @ classrooms | **4** | rms | 1,500.00 | 6,000 | | |
| | Single bathroom | **21** | rms | 1,100.00 | 23,100 | | |
| | Janitors Closet Accessories | **3** | rms | 300.00 | 900 | | |
| *104400* | *FIRE PROTECTION SPECIALTIES* | | | | | | |
| | Fire extinguisher cabinets | **47** | ea | 350.00 | 16,450 | | |
| *109900* | *MISCELLANEOUS SPECIALTIES* | | | | | | |
| | Cubicle curtain & track at nurse | **3** | ea | 500.00 | 1,500 | | |
| | Allowance for wall protection | **1** | ls | 3,000.00 | 3,000 | | |
| | SUBTOTAL | | | | | 831,084 | |
| | ***TOTAL - INTERIOR CONSTRUCTION*** | | | | | | **$4,436,489** |
| ***C20*** | ***STAIRCASES*** | | | | | | |
| **C2010** | **STAIR CONSTRUCTION** | | | | | | |
| *033000* | *CONCRETE* | | | | | | |
| | Concrete fill to stairs | **4** | flt | 2,500.00 | 10,000 | | |
| *055000* | *MISCELLANEOUS METALS* | | | | | | |
| | Egress stairs | **3** | flt | 28,000.00 | 84,000 | | |
| | Lobby monumental stairs/including finish | **1** | flt | 110,000.00 | 110,000 | | |
| | SUBTOTAL | | | | | 204,000 | |
| **C2020** | **STAIR FINISHES** | | | | | | |

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| *090005* | *RESILIENT FLOORS* | | | | | | |
| | Rubber treads/risers | **480** | lfr | 22.00 | 10,560 | | |
| | Rubber landings | **308** | sf | 14.00 | 4,312 | | |
| *090007* | *PAINTING* | | | | | | |
| | Paint to staircases | **4** | flt | 1,250.00 | 5,000 | | |
| | SUBTOTAL | | | | | 19,872 | |
| | ***TOTAL - STAIRCASES*** | | | | | | **$223,872** |
| ***C30*** | ***INTERIOR FINISHES*** | | | | | | |
| **C3010** | **WALL FINISHES** | | | | | | |
| *062000* | *FINISH CARPENTRY* | | | | | | |
| | Miscellaneous wood trim/millwork | **1** | ls | 75,000.00 | 75,000 | | |
| *090002* | *TILE* | | | | | | |
| | Wall tile at lobby, corridor and common areas, 5' | **14,350** | sf | 26.00 | 373,100 | | |
| | Wall tile at cafeteria, 7' | **1,015** | sf | 26.00 | 26,390 | | |
| | Wall tile at stairs, 7' | **3,486** | sf | 24.00 | 83,664 | | |
| | Wall tile at kitchen, 9' | **5,850** | sf | 22.00 | 128,700 | | |
| | Ceramic wall tile at bathrooms, 8' | **12,288** | sf | 22.00 | 270,336 | | |
| *098400* | *ACOUSTICAL ROOM COMPONENTS* | | | | | | |
| | Fabric wrapped wall panels at cafeteria, 4' | **940** | sf | 30.00 | 28,200 | | |
| | Fabric wrapped wall panels at stage, 5' | **700** | sf | 30.00 | 21,000 | | |
| | Acoustic wall panels at music, allow | **500** | sf | 30.00 | 15,000 | | |
| | Acoustic wall panels at lobby, allow | **500** | sf | 30.00 | 15,000 | | |
| | Fiberglass wall panels at gym, 4' | **1,380** | sf | 20.00 | 27,600 | | |
| *090007* | *PAINTING* | | | | | | |
| | Paint to GWB | **287,823** | sf | 0.80 | 230,258 | | |
| | SUBTOTAL | | | | | 1,294,248 | |
| **C3020** | **FLOOR FINISHES** | | | | | | |
| *033000* | *CONCRETE* | | | | | | |
| | Sealed concrete | **2,400** | sf | 1.50 | 3,600 | | |
| *090002* | *TILE* | | | | | | |
| | Quarry tile at kitchen | **3,060** | sf | 26.00 | 79,560 | | |
| | Ceramic tile at bathrooms; per finish schedule | **4,040** | sf | 22.00 | 88,880 | | |
| | Terrazzo tile at lobby | **5,620** | sf | 28.00 | 157,360 | | |
| | Quarry tile base | **650** | lf | 20.00 | 13,000 | | |
| | Ceramic tile base | **1,536** | lf | 20.00 | 30,720 | | |
| | Terrazzo tile base | **595** | sf | 20.00 | 11,900 | | |
| *090005* | *RESILIENT FLOORS* | | | | | | |
| | Sheet linoleum, Marmoleum; with premium adhesive | **96,605** | sf | 7.50 | 724,538 | | |
| | Rubber Base | **32,202** | lf | 3.00 | 96,606 | | |

PM&C

**Beal Elementary School**
**214 Lake Street**
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate** GFA 141,600

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| *096810* | *TILE CARPETING* | | | | | | |
| | Carpet tile | **6,615** | sf | 6.22 | 41,145 | | |
| *096460* | *WOOD ATHLETIC FLOORING* | | | | | | |
| | Wood athletic floor at gym | **7,000** | sf | 18.50 | 129,500 | | |
| | Vented base | **345** | lf | 8.00 | 2,760 | | |
| | Hardwood floor at stage | **2,100** | sf | 20.00 | 42,000 | | |
| | SUBTOTAL | | | | | 1,421,569 | |
| **C3030** | **CEILING FINISHES** | | | | | | |
| *090003* | *ACOUSTICAL TILE* | | | | | | |
| | ACT, 2' x 2' | **102,860** | sf | 5.50 | 565,730 | | |
| | ACT, 2' x 2' washable @ kitchen | **3,060** | sf | 6.50 | 19,890 | | |
| | ACT @ Cafeteria - specialty baffle system | **5,000** | sf | 40.00 | 200,000 | | |
| | ACT @ Lobby - metalworks open cell | **5,620** | sf | 45.00 | 252,900 | | |
| *092900* | *GYPSUM BOARD ASSEMBLIES* | | | | | | |
| | GWB soffits; vertical @ wall cabinets and cubbies | **4,779** | sf | 20.00 | 95,580 | | |
| | GWB soffits; allow | **1** | ls | 20,000.00 | 20,000 | | |
| *090007* | *PAINTING* | | | | | | |
| | Paint to exposed ceilings | **8,900** | sf | 1.50 | 13,350 | | |
| | Paint to exposed ceilings - gymnasium | **7,000** | sf | 2.50 | 17,500 | | |
| | SUBTOTAL | | | | | 1,184,950 | |
| | ***TOTAL - INTERIOR FINISHES*** | | | | | | **3,900,767** |
| ***D10*** | ***CONVEYING SYSTEMS*** | | | | | | |
| **D1010** | **ELEVATOR** | | | | | | |
| *055000* | *MISCELLANEOUS METALS* | | | | | | |
| | Pit ladder and miscellaneous metals | **1** | ls | 3,000.00 | 3,000 | | |
| *142100* | *ELECTRIC TRACTION ELEVATOR* | | | | | | |
| | New elevator; 2 stop; passenger | **1** | ea | 120,000.00 | 120,000 | | |
| | SUBTOTAL | | | | | 123,000 | |
| | ***TOTAL - CONVEYING SYSTEMS*** | | | | | | **$123,000** |
| ***D20*** | ***PLUMBING*** | | | | | | |
| **D20** | **PLUMBING, GENERALLY** | | | | | | |
| | Equipment | | | | | | |
| | Gas fired hot water heater, includes vent piping | **1** | ea | 32,500.00 | 32,500 | | |
| | Hot Water; storage tank | **2** | ea | 3,850.00 | 7,700 | | |
| | Expansion tank | **1** | ea | 1,000.00 | 1,000 | | |
| | Air Separator | **1** | ea | 750.00 | 750 | | |
| | Reduced pressure backflow preventer, 4" main | **1** | ea | 4,850.00 | 4,850 | | |
| | Connection to gas meter (provided by others) | **1** | ea | 1,400.00 | 1,400 | | |

| | CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| | | **NEW BUILDING** | | | | | | |
| 533 | | Backflow preventer, local | **2** | ea | 725.00 | 1,450 | | |
| 534 | | Water meter assembly | **1** | ea | 4,500.00 | 4,500 | | |
| 535 | | Mixing valve; Master | **1** | ea | 4,800.00 | 4,800 | | |
| 536 | | Mixing valve; Sub | **2** | ea | 2,500.00 | 5,000 | | |
| 537 | | Hot water circulation pump assembly | **2** | ea | 1,450.00 | 2,900 | | |
| 538 | | Kitchen floor sink | **6** | ea | 1,200.00 | 7,200 | | |
| 539 | | Roof drain | **70** | ea | 1,150.00 | 80,500 | | |
| 540 | | Floor drain | **16** | ea | 900.00 | 14,400 | | |
| 541 | | Trench Drain | **13** | lf | 85.00 | 1,105 | | |
| 542 | | Trap primer | **17** | ea | 1,050.00 | 17,850 | | |
| 543 | | Wall hydrant | **8** | ea | 425.00 | 3,400 | | |
| 544 | | Hose bibb | **11** | ea | 325.00 | 3,575 | | |
| 545 | | VTR (vent through roof) | **19** | ea | 350.00 | 6,650 | | |
| 546 | | Emergency shower/eyewash w TMV | **1** | ea | 3,800.00 | 3,800 | | |
| 547 | | Oil/Water separator | **2** | ea | 6,100.00 | 12,200 | | |
| 548 | | Interior grease interceptor | **2** | ea | 6,850.00 | 13,700 | | |
| 549 | | Exterior grease interceptor; 1500 gallons | **1** | ea | 12,500.00 | 12,500 | | |
| 550 | | Rough-in & connection to kitchen equipment | **1** | ls | 35,000.00 | 35,000 | | |
| 551 | | Plumbing Fixtures | | | | | | |
| 552 | | Water Closet | **62** | ea | 1,200.00 | 74,400 | | |
| 553 | | Urinal | **8** | ea | 1,150.00 | 9,200 | | |
| 554 | | Lavatory; wall hung | **46** | ea | 1,050.00 | 48,300 | | |
| 555 | | Sink (drop in); classroom with drinking fountain | **68** | ea | 1,300.00 | 88,400 | | |
| 556 | | Sink (drop in); general | **16** | ea | 1,200.00 | 19,200 | | |
| 557 | | Sink w/ sediment trap; art room | **4** | ea | 3,850.00 | 15,400 | | |
| 558 | | Shower w/ 36" X 36" stall | **3** | ea | 4,500.00 | 13,500 | | |
| 559 | | Janitor Sink w/ mop rack | **5** | ea | 1,800.00 | 9,000 | | |
| 560 | | Water Fountain; Bi-level with bottle fill | **5** | ea | 6,500.00 | 32,500 | | |
| 561 | | Domestic Water Piping | | | | | | |
| 562 | | Copper pipe type L with fittings & hangers | **11,460** | lf | 30.00 | 343,800 | | |
| 563 | | Valves & accessories | **1** | ls | 42,500.00 | 42,500 | | |
| 564 | | Sanitary Waste And Vent Piping | | | | | | |
| 565 | | Cast iron pipe with fittings & hangers | **7,600** | lf | 45.00 | 342,000 | | |
| 566 | | Grease waste pipe with fittings & hangers | **1,100** | lf | 48.00 | 52,800 | | |
| 567 | | Storm Drainage System, Primary and Secondary | | | | | | |
| 568 | | Storm drainage pipe with fittings & hangers | **4,580** | lf | 55.00 | 251,900 | | |
| 569 | | Downspout | **15** | ea | 1,150.00 | 17,250 | | |
| 570 | | Pipe insulation | | | | | | |
| 571 | | Domestic pipe insulation | **11,460** | lf | 10.50 | 120,330 | | |
| 572 | | Storm pipe insulation (horizontal only) | **1,350** | lf | 12.00 | 16,200 | | |
| 573 | | Natural Gas Piping | | | | | | |
| 574 | | Natural gas pipe with fittings & hangers | **1,150** | lf | 43.00 | 49,450 | | |
| 575 | | Valves & accessories | **1** | ls | 7,500.00 | 7,500 | | |
| 576 | | Miscellaneous | | | | | | |
| 577 | | Underslab drainage, at lowest level | **56,720** | sf | 3.00 | 170,160 | | |
| 578 | | System testing and flushing | **1** | ls | 18,700.00 | 18,700 | | |
| 579 | | Coring, cutting, sleeves & fire stopping | **1** | ls | 6,300.00 | 6,300 | | |
| 580 | | Seismic Restraints and Structural Steel Comp. | **1** | ls | 10,000.00 | 10,000 | | |

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| | Hydraulic lifts/rigging | **1** | ls | 27,500.00 | 27,500 | | |
| | Shop drawings / BIM / ENG Support / As-Built | **1** | ls | 45,900.00 | 45,900 | | |
| | Commissioning Support | **1** | ls | 8,400.00 | 8,400 | | |
| | Fees & permits | **1** | ls | 21,300.00 | 21,300 | | |
| | SUBTOTAL | | | | | 2,140,620 | |
| | ***TOTAL - PLUMBING*** | | | | | | **$2,140,620** |
| ***D30*** | ***HVAC*** | | | | | | |
| **D30** | **HVAC, GENERALLY** | | | | | | |
| | HVAC Equipment | | | | | | |
| | Gas fired HW condensing boiler, 1250 mbh | **2** | ea | 47,500.00 | 95,000 | | |
| | Expansion tank | **1** | ea | 4,250.00 | 4,250 | | |
| | Air separator | **1** | ea | 2,500.00 | 2,500 | | |
| | Unit heater | **1** | ea | 800.00 | 800 | | |
| | Fan Coil Unit, AC unit with ACCU; 2 Ton | **3** | ea | 8,850.00 | 26,550 | | |
| | Cabinet unit heater | **4** | ea | 1,700.00 | 6,800 | | |
| | Heat Exchanger; plate and frame, 50 gpm | **1** | ea | 16,650.00 | 16,650 | | |
| | Chemical feed system | **1** | ea | 3,750.00 | 3,750 | | |
| | Glycol feed system | **1** | ea | 15,000.00 | 15,000 | | |
| | Fin-Tube radiant panels | **2,100** | lf | 85.00 | 178,500 | | |
| | Pumps | | | | | | |
| | Heating hot water pump with VFD; 393 gpm (P-1/P-2) | **2** | ea | 9,250.00 | 18,500 | | |
| | Boiler pump with VFD; 120 gpm (P-3/P-4) | **2** | ea | 2,820.00 | 5,640 | | |
| | Glycol water pump with VFD; 333 gpm (P-5/P-6) | **2** | ea | 7,825.00 | 15,650 | | |
| | Air Distribution Equipment | | | | | | |
| | Air Handling Unit | | | | | | |
| | RTU-1 12000 CFM DX UNIT, HOT WATER COIL | **1** | ea | 124,200.00 | 124,200 | | |
| | RTU-2 12000 CFM DX UNIT, HOT WATER COIL | **1** | ea | 124,200.00 | 124,200 | | |
| | RTU-3 9800 CFM DX UNIT, HOT WATER COIL | **1** | ea | 101,430.00 | 101,430 | | |
| | RTU-4 9000 CFM DX UNIT, HOT WATER COIL | **1** | ea | 93,150.00 | 93,150 | | |
| | RTU-5 7200 CFM DX UNIT, HOT WATER COIL | **1** | ea | 74,520.00 | 74,520 | | |
| | RTU-6 6900 CFM DX UNIT, HOT WATER COIL | **1** | ea | 71,415.00 | 71,415 | | |
| | RTU-7 7600 CFM DX UNIT, HOT WATER COIL | **1** | ea | 78,660.00 | 78,660 | | |
| | RTU-8 2400 CFM DX UNIT, HOT WATER COIL | **1** | ea | 25,200.00 | 25,200 | | |
| | RTU-9 7000 CFM DX UNIT, HOT WATER COIL | **1** | ea | 72,540.00 | 72,540 | | |
| | RTU-10 7000 CFM DX UNIT, HOT WATER COIL | **1** | ea | 72,540.00 | 72,540 | | |
| | RTU-11 3800 CFM DX UNIT, HOT WATER COIL | **1** | ea | 39,900.00 | 39,900 | | |
| | RTU-12 7000 CFM DX UNIT, HOT WATER COIL | **1** | ea | 72,540.00 | 72,540 | | |
| | RTU-13 7000 CFM DX UNIT, HOT WATER COIL | **1** | ea | 72,540.00 | 72,540 | | |
| | RTU-14 9800 CFM DX UNIT, HOT WATER COIL | **1** | ea | 101,430.00 | 101,430 | | |
| | RTU-15 2500 CFM DX UNIT, HOT WATER COIL | **1** | ea | 26,250.00 | 26,250 | | |
| | RTU-16 6500 CFM DX UNIT, HOT WATER COIL | **1** | ea | 67,275.00 | 67,275 | | |
| | MAU-1 3500 CFM, HOT WATER COIL | **1** | ea | 36,750.00 | 36,750 | | |
| | Terminal Unit; VAV | **97** | ea | 1,500.00 | 145,500 | | |
| | Miscellaneous air distribution equipment | **1** | ls | 70,100.00 | 70,100 | | |
| | Supply and Exhaust fans | | | | | | |

PM&C

**Beal Elementary School**
**214 Lake Street**
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate**

GFA 141,600

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| | EF-1 Exhaust Fan, 300 cfm | **1** | ea | 1,050.00 | 1,050 | | |
| | EF-2 Exhaust Fan, 450 cfm | **1** | ea | 1,575.00 | 1,575 | | |
| | EF-3 Exhaust Fan, 750 cfm | **1** | ea | 2,625.00 | 2,625 | | |
| | EF-4 Exhaust Fan, 1800 cfm | **1** | ea | 5,130.00 | 5,130 | | |
| | KEF-1 Kitchen Exhaust Fan, 2794 cfm | **1** | ea | 11,875.00 | 11,875 | | |
| | DEF-1 Exhaust Fan, 1200 cfm | **1** | ea | 5,100.00 | 5,100 | | |
| | ILF-1 Exhaust Fan, 500 cfm | **1** | ea | 1,750.00 | 1,750 | | |
| | Sheet metal & Accessories | | | | | | |
| | Galvanized ductwork with fittings & hangers | **115,600** | lbs | 10.50 | 1,213,800 | | |
| | Welded black iron grease exhaust ductwork | **6,500** | lbs | 14.50 | 94,250 | | |
| | Duct insulation | **75,140** | sf | 4.15 | 311,831 | | |
| | Seal duct | **17,340** | lf | 0.45 | 7,803 | | |
| | Firewrap kitchen duct insulation | **4,250** | sf | 6.50 | 27,625 | | |
| | Displacement Diffuser | **96** | ea | 850.00 | 81,600 | | |
| | RGD's w/ volume damper | **334** | ea | 240.00 | 80,160 | | |
| | Miscellaneous sheet metal accessories | **1** | ls | 65,000.00 | 65,000 | | |
| | Hydronic Piping | | | | | | |
| | Hot Water Piping | | | | | | |
| | Hot water piping | **141,600** | sf | 4.15 | 587,640 | | |
| | Valves & accessories | **1** | ls | 29,400.00 | 29,400 | | |
| | Refrigerant Piping | | | | | | |
| | Ductless split system refrig lineset w/ insulation | **435** | lf | 31.50 | 13,703 | | |
| | Ductless split system valves & accessories | **3** | ea | 800.00 | 2,400 | | |
| | Condensate Drain Piping | | | | | | |
| | Condensate piping with fittings & hangers | **4,350** | lf | 12.00 | 52,200 | | |
| | Piping Insulation | | | | | | |
| | Piping insulation | **141,600** | sf | 2.00 | 283,200 | | |
| | Controls (DDC) | | | | | | |
| | Automatic temperature controls | **141,600** | sf | 5.25 | 743,400 | | |
| | Balancing | | | | | | |
| | Testing & balancing | **141,600** | sf | 0.80 | 113,280 | | |
| | Miscellaneous | | | | | | |
| | System permit inspection, flushing and turnover | **1** | ls | 57,100.00 | 57,100 | | |
| | Coring, cutting, sleeves & fire stopping | **1** | ls | 38,600.00 | 38,600 | | |
| | Seismic Restraints and Structural Steel Comp. | **1** | ls | 3,500.00 | 3,500 | | |
| | Hydraulic lifts/rigging | **1** | ls | 84,000.00 | 84,000 | | |
| | Shop drawings / BIM / ENG Support / As-Built | **1** | ls | 167,900.00 | 167,900 | | |
| | Commissioning Support | **1** | ls | 28,400.00 | 28,400 | | |
| | Fees & permits | **1** | ls | 59,800.00 | 59,800 | | |
| | SUBTOTAL | | | | | 6,035,427 | |
| | ***TOTAL - HVAC*** | | | | | | **$6,035,427** |
| ***D40*** | ***FIRE PROTECTION*** | | | | | | |
| **D40** | **FIRE PROTECTION, GENERALLY** | | | | | | |
| | Fire pump w/ jockey pump, controller | **1** | ea | 48,500.00 | NR | | |
| | Double check valve assembly | **1** | ea | 8,500.00 | 8,500 | | |

PM&C

**Beal Elementary School**
**214 Lake Street**
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate** GFA 141,600

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| | Wet alarm check valve assembly | **1** | ea | 4,500.00 | 4,500 | | |
| | Fire department connections | **1** | ea | 2,400.00 | 2,400 | | |
| | Dry valve w/ mini compressor | **1** | ea | 4,850.00 | 4,850 | | |
| | Zone control valve station | **4** | ea | 2,850.00 | 11,400 | | |
| | Ansul System; Kitchen | **1** | ea | 15,000.00 | W/equipment | | |
| | Sprinkler heads | **141,600** | sf | 1.00 | 141,600 | | |
| | Branch sprinkler piping w fittings & hangers | **141,600** | sf | 2.15 | 304,440 | | |
| | Main sprinkler piping with fittings & hangers | **141,600** | sf | 1.00 | 141,600 | | |
| | Miscellaneous | | | | | | |
| | Fire suppression standpipe (temporary standpipe; const. phase) | **1** | ea | 5,000.00 | 5,000 | | |
| | System permit inspection, flushing and turnover | 1 | ls | 700.00 | 700 | | |
| | Coring, cutting, sleeves & fire stopping | 1 | ls | 8,900.00 | 8,900 | | |
| | Seismic Restraints and Structural Steel Comp. | 1 | ls | 3,000.00 | 3,000 | | |
| | Hydraulic lifts/rigging | 1 | ls | 9,300.00 | 9,300 | | |
| | Shop drawings / BIM / ENG Support / As-Built | 1 | ls | 21,700.00 | 21,700 | | |
| | Commissioning Support | 1 | ls | 700.00 | 700 | | |
| | Fees & permits | 1 | ls | 6,800.00 | 6,800 | | |
| | SUBTOTAL | | | | | 675,390 | |
| | ***TOTAL - FIRE PROTECTION*** | | | | | | **$675,390** |
| ***D50*** | ***ELECTRICAL*** | | | | | | |
| **D5010** | **SERVICE & DISTRIBUTION** | | | | | | |
| | **Gear & Distribution** | | | | | | |
| | Normal Power | | | | | | |
| | Meter | **1** | ea | 350.00 | 350 | | |
| | Digital monitoring | **1** | ls | 3,500.00 | 3,500 | | |
| | 2000A 480/277V main switchboard | **1** | ea | 65,000.00 | 65,000 | | |
| | 400A 480/277V distribution panelboard | **5** | ea | 12,000.00 | 60,000 | | |
| | 125A 480/277V panelboard | **4** | ea | 1,850.00 | 7,400 | | |
| | 75 KVA transformer (K-13 rated) | **9** | ea | 11,175.00 | 100,575 | | |
| | 225A 208/120V double tub panelboard | **4** | ea | 4,500.00 | 18,000 | | |
| | 225A 208/120V panelboard | **5** | ea | 2,350.00 | 11,750 | | |
| | 100A 208/120V panelboard | **1** | ea | 1,650.00 | 1,650 | | |
| | Sub metering panel | **1** | ea | 850.00 | 850 | | |
| | Grounding | **1** | ls | 8,000.00 | 8,000 | | |
| | 400A feed | **900** | lf | 110.00 | 99,000 | | |
| | 250A feed | **50** | lf | 59.00 | 2,950 | | |
| | 225A feed | **175** | lf | 52.00 | 9,100 | | |
| | 125A feed | **2,400** | lf | 29.00 | 69,600 | | |
| | Emergency power | | | | | | |
| | 200KW diesel emergency generator set with WP | **1** | ls | 85,000.00 | 85,000 | | |
| | Annunciator | **1** | ea | 2,500.00 | 2,500 | | |
| | 400A ATS | **1** | ea | 7,875.00 | 7,875 | | |
| | 250A ATS | **1** | ea | 6,670.00 | 6,670 | | |
| | 400A 480/277V distribution panelboard | **2** | ea | 12,000.00 | 24,000 | | |
| | 200A 480/277V panelboard | **1** | ea | 2,350.00 | 2,350 | | |
| | 100A 480/277V panelboard | **11** | ea | 1,650.00 | 18,150 | | |
| | 75 KVA transformer (K-13 rated) | **2** | ea | 11,175.00 | 22,350 | | |
| | 250A 208/120V distribution panelboard | **2** | ea | 13,500.00 | 27,000 | | |

PM&C

**Beal Elementary School**
**214 Lake Street**
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate** GFA 141,600

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| | **NEW BUILDING** | | | | | | |
| | 100A 208/120V panelboard | **2** | ea | 2,650.00 | 5,300 | | |
| | Sub metering panel | **3** | ea | 850.00 | 2,550 | | |
| | 400A feed | **85** | lf | 110.00 | 9,350 | | |
| | 250A feed | **225** | lf | 59.00 | 13,275 | | |
| | 225A feed | **20** | lf | 52.00 | 1,040 | | |
| | 125A feed | **30** | lf | 28.00 | 840 | | |
| | 100A feed | **2,800** | lf | 25.00 | 70,000 | | |
| | Photovoltaic System | | | | | | |
| | Photovoltaic System equipment & installation | | | | NIC | | |
| | Rough-in & power provisions, allow | **1** | ls | 20,000.00 | 20,000 | | |
| | Equipment Wiring | | | | | | |
| | Elevator cab power feed and connection | **1** | ea | 1,500.00 | 1,500 | | |
| | Elevator feed and connection | **1** | ea | 3,500.00 | 3,500 | | |
| | Fire pump feed and connection | **1** | ea | 8,500.00 | 8,500 | | |
| | Jockey pump feed and connection | **1** | ea | 1,500.00 | NR | | |
| | Split unit feed, connection & safety switch | **3** | ea | 2,500.00 | 7,500 | | |
| | Boiler feed, connection & safety switch | **2** | ea | 1,500.00 | 3,000 | | |
| | EF feed, connection, & safety switch | **7** | ea | 1,500.00 | 10,500 | | |
| | MAU feed and connection | **1** | ea | 3,500.00 | 3,500 | | |
| | Pump feed, connection & safety switch | **8** | ea | 1,500.00 | 12,000 | | |
| | RTU feed, connection & safety switch WP | **16** | ea | 4,000.00 | 64,000 | | |
| | CUH feed, connection, & MS | **4** | ea | 650.00 | 2,600 | | |
| | FCU feed, connection, & MS | **3** | ea | 650.00 | 1,950 | | |
| | VFD's feed and connection only | **6** | ea | 850.00 | 5,100 | | |
| | Kiln feed and connection, allow | **1** | ea | 1,000.00 | 1,000 | | |
| | Lift feed, connection & safety switch | **1** | ea | 1,200.00 | 1,200 | | |
| | Misc equipment feed and connections | **141,600** | sf | 1.00 | 141,600 | | |
| | Kitchen Equipment power | **1** | ls | 25,000.00 | 25,000 | | |
| | SUBTOTAL | | | | | 1,068,425 | |
| | | | | | | | |
| **D5020** | **LIGHTING & POWER** | | | | | | |
| | Lighting & Branch Power | | | | | | |
| | AD8 | **372** | ea | 960.00 | 357,120 | | |
| | B2 | **3** | ea | 225.00 | 675 | | |
| | B4 | **40** | ea | 225.00 | 9,000 | | |
| | C | **57** | ea | 160.00 | 9,120 | | |
| | D | **321** | ea | 300.00 | 96,300 | | |
| | Gym Lighting (allow) | **24** | ea | 550.00 | 13,200 | | |
| | K2 | **26** | ea | 300.00 | 7,800 | | |
| | LP50 | **18** | ea | 650.00 | 11,700 | | |
| | PS2 | **21** | ea | 350.00 | 7,350 | | |
| | U2 | **32** | ea | 150.00 | 4,800 | | |
| | SS4 | **16** | ea | 250.00 | 4,000 | | |
| | W | **618** | lf | 100.00 | 61,800 | | |
| | ZW2 | **7** | ea | 450.00 | 3,150 | | |
| | Exit (allow) | **25** | ea | 200.00 | 5,000 | | |
| | Pit light, allow | **1** | ea | 150.00 | 150 | | |
| | Roof fixture at mechanical equipment, allow | **8** | ea | 250.00 | 2,000 | | |
| | Lighting not shown at this scope level | **141,600** | sf | 1.25 | 177,000 | | |
| | Lighting controls | | | | | | |
| | Network Lighting controls | **141,600** | sf | 1.00 | 141,600 | | |
| | Photocell, allow | **1** | ea | 225.00 | 225 | | |

| | CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| | **NEW BUILDING** | | | | | | | |
| 783 | | Daylight/Occupancy sensor | **219** | ea | 180.00 | 39,420 | | |
| 784 | | Single pole switch LV | **100** | ea | 26.00 | 2,600 | | |
| 785 | | Dimming switch | **105** | ea | 55.00 | 5,775 | | |
| 786 | | Dimming system, media center | **1** | ls | 2,500.00 | 2,500 | | |
| 787 | | Dimming system, cafeteria | **1** | ls | 2,500.00 | 2,500 | | |
| 788 | | Branch devices | | | | | | |
| 789 | | Duplex receptacle | **643** | ea | 22.00 | 14,146 | | |
| 790 | | Double duplex receptacle | **153** | ea | 44.00 | 6,732 | | |
| 791 | | Double duplex receptacle, in floor box | **2** | ea | 44.00 | 88 | | |
| 792 | | GFI duplex receptacle | **51** | ea | 36.00 | 1,836 | | |
| 793 | | Floor box | **2** | ea | 550.00 | 1,100 | | |
| 794 | | Special purpose receptacle, allow | **6** | ea | 65.00 | 390 | | |
| 795 | | Lighting and branch circuitry | | | | | | |
| 796 | | Device plate WP | **10** | ea | 17.00 | 170 | | |
| 797 | | Device plate | **950** | ea | 5.00 | 4,750 | | |
| 798 | | Device box | **2,500** | ea | 30.00 | 75,000 | | |
| 799 | | 3/4" conduit | **5,000** | lf | 7.00 | 35,000 | | |
| 800 | | #12 THHN | **25,000** | lf | 0.72 | 18,000 | | |
| 801 | | 12-2 MC cable | **38,000** | lf | 4.00 | 152,000 | | |
| 802 | | 12-3 MC cable | **7,000** | lf | 4.60 | 32,200 | | |
| 803 | | Cat cabling | **5,000** | lf | 1.40 | 7,000 | | |
| 804 | | Devices and cabling not shown at this scope level | **141,600** | sf | 1.00 | 141,600 | | |
| 805 | | SUBTOTAL | | | | | 1,454,797 | |
| 806 | | | | | | | | |
| 807 | **D5030** | **COMMUNICATION & SECURITY SYSTEMS** | | | | | | |
| 808 | | Fire Alarm | | | | | | |
| 809 | | Control panel | **1** | ea | 12,000.00 | 12,000 | | |
| 810 | | NAC power extender | **4** | ea | 850.00 | 3,400 | | |
| 811 | | Annunciator | **2** | ea | 1,500.00 | 3,000 | | |
| 812 | | Graphic map | **1** | ea | 850.00 | 850 | | |
| 813 | | Terminal cabinet | **2** | ea | 1,000.00 | 2,000 | | |
| 814 | | Radio Master box | **1** | ea | 8,500.00 | 8,500 | | |
| 815 | | Drill key | **1** | ea | 120.00 | 120 | | |
| 816 | | Beacon | **2** | ea | 225.00 | 450 | | |
| 817 | | Bell | **1** | ea | 150.00 | 150 | | |
| 818 | | Knox box | **1** | ea | 600.00 | 600 | | |
| 819 | | Initiating device | **101** | ea | 140.00 | 14,140 | | |
| 820 | | CO detector | **1** | ea | 140.00 | 140 | | |
| 821 | | Duct smoke detector with remote test switch, allow | **16** | ea | 450.00 | 7,200 | | |
| 822 | | Audio/visual device | **115** | ea | 125.00 | 14,375 | | |
| 823 | | Visual device | **71** | ea | 115.00 | 8,165 | | |
| 824 | | RAI | **33** | ea | 95.00 | 3,135 | | |
| 825 | | Tamper/flow switch, allow | **10** | ea | 90.00 | 900 | | |
| 826 | | Elevator recall connection | **1** | ea | 152.00 | 152 | | |
| 827 | | Control/monitor module, allow | **25** | ea | 140.00 | 3,500 | | |
| 828 | | Wire guard, allow | **4** | ea | 85.00 | 340 | | |
| 829 | | Device box | **375** | ea | 30.00 | 11,250 | | |
| 830 | | 3/4" conduit | **500** | lf | 7.00 | 3,500 | | |
| 831 | | #14 THHN | **1,500** | lf | 0.70 | 1,050 | | |
| 832 | | FA MC cable | **11,500** | lf | 4.50 | 51,750 | | |
| 833 | | Testing & programming | **1** | ls | 3,500.00 | 3,500 | | |
| 834 | | Devices and cabling not shown at this scope level | **141,600** | sf | 1.00 | 141,600 | | |

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**Beal Elementary School**
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31-Aug-18

**Schematic Design Estimate**

GFA 141,600

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| 835 | Bi-Directional Amplification System | | | | | | |
| 836 | BDA system, allow | **1** | ls | 75,000.00 | 75,000 | | |
| 837 | 2-way Call communication | | | | NIC | | |
| 838 | Telecommunications | | | | | | |
| 839 | MDF closet | **1** | loc | 8,500.00 | 8,500 | | |
| 840 | IDF closet | **4** | loc | 5,500.00 | 22,000 | | |
| 841 | IPTV System | **1** | ls | 175,000.00 | 175,000 | | |
| 842 | Network switching (By others) | | | | By others | | |
| 843 | 1-port device | **85** | ea | 20.00 | 1,700 | | |
| 844 | 2-port device | **123** | ea | 40.00 | 4,920 | | |
| 845 | WAP device | **37** | ea | 350.00 | 12,950 | | |
| 846 | PH device (2-port device) | **20** | ea | 40.00 | 800 | | |
| 847 | PL device (3-port) | **20** | ea | 60.00 | 1,200 | | |
| 848 | Cat. 6 cable | **80,000** | lf | 1.20 | 96,000 | | |
| 849 | Backbone cabling | **500** | lf | 15.00 | 7,500 | | |
| 850 | Rough-in with conduit stubs and backboxes | **290** | ea | 120.00 | 34,800 | | |
| 851 | 4" sleeve | **12** | ea | 250.00 | 3,000 | | |
| 852 | MDF/IDF closet rough-in | **1** | loc | 2,000.00 | 2,000 | | |
| 853 | Closet backboard | **5** | ea | 500.00 | 2,500 | | |
| 854 | System Grounding | **1** | ls | 2,500.00 | 2,500 | | |
| 855 | Devices and cabling not shown at this scope level | **141,600** | sf | 1.75 | 247,800 | | |
| 856 | Master Clock/PA system (Wireless Clock) | | | | | | |
| 857 | Head end | **1** | ls | 20,000.00 | 20,000 | | |
| 858 | ECS | **85** | ea | 250.00 | 21,250 | | |
| 859 | Clock | **85** | ea | 200.00 | 17,000 | | |
| 860 | Speaker | **115** | ea | 250.00 | 28,750 | | |
| 861 | Speaker TB | **20** | ea | 350.00 | 7,000 | | |
| 862 | Device box with conduit stub to ceiling | **170** | ea | 120.00 | 20,400 | | |
| 863 | Cabling | **11,000** | lf | 1.20 | 13,200 | | |
| 864 | Speech Reinforcement | **79** | ea | 2,200.00 | 173,800 | | |
| 865 | Security System | | | | | | |
| 866 | Security system head-end | **1** | ls | 30,000.00 | 30,000 | | |
| 867 | CCTV camera | **3** | ea | 950.00 | 2,850 | | |
| 868 | Card reader | **1** | ea | 350.00 | 350 | | |
| 869 | Door contact | **5** | ea | 200.00 | 1,000 | | |
| 870 | Video unit (complete) | **1** | ea | 2,000.00 | 2,000 | | |
| 871 | Electric lock (provided by DHC) | **4** | ea | 250.00 | 1,000 | | |
| 872 | PT/TS (provided by DHC) | **4** | ea | 150.00 | 600 | | |
| 873 | Rough-in | | | | | | |
| 874 | Door rough-in | **4** | ea | 1,500.00 | 6,000 | | |
| 875 | Device box with conduit stub | **4** | ea | 95.00 | 380 | | |
| 876 | 3/4" conduit | **1,000** | lf | 7.00 | 7,000 | | |
| 877 | Cabling | **2,000** | lf | 1.50 | 3,000 | | |
| 878 | Security devices not shown at this scope level | **141,600** | sf | 2.50 | 354,000 | | |
| 879 | Gymnasium | | | | | | |
| 880 | Scoreboard and time clocks, allow | **1** | ea | 12,000.00 | 12,000 | | |
| 881 | Motorized backboard feed and connection, allow | **6** | ea | 1,500.00 | 9,000 | | |
| 882 | Divide curtain feed and connection | **1** | ea | 1,500.00 | 1,500 | | |
| 883 | Theatrical | | | | | | |
| 884 | Stage lighting, dimming and controls equipment | **1** | ls | NIC | By owner | | |
| 885 | Installation & rough-in, allow | **1** | ls | 25,000.00 | 25,000 | | |
| 886 | Dimming rack installation | **1** | ea | 1,500.00 | 1,500 | | |

PM&C

**Beal Elementary School**
**214 Lake Street**
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate** GFA 141,600

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| | Hoist feed and connection, allow | **3** | ea | 1,500.00 | 4,500 | | |
| | Audio/Visual (Rough-in only) | | | | | | |
| | Audio/Visual (Rough-in) | **141,600** | sf | 0.25 | 35,400 | | |
| | Projector screen feed and connection | **1** | ea | 450.00 | 450 | | |
| | Sound Systems | | | | | | |
| | Sound system, gymnasium | **1** | ls | 10,000.00 | 10,000 | | |
| | Sound system, cafeteria | **1** | ls | 10,000.00 | 10,000 | | |
| | Sound system, Media Center | **1** | ls | 10,000.00 | 10,000 | | |
| | Rough-in | **3** | ea | 3,500.00 | 10,500 | | |
| | Sound system, stage | **1** | ls | 15,000.00 | 15,000 | | |
| | Rough-in | **1** | ls | 5,000.00 | 5,000 | | |
| | SUBTOTAL | | | | | 1,853,367 | |
| **D5040** | **OTHER ELECTRICAL SYSTEMS** | | | | | | |
| | Miscellaneous | | | | | | |
| | Temp power and lights | **1** | ls | 80,000.00 | 80,000 | | |
| | Coordination & BIM | **1** | ls | 70,000.00 | 70,000 | | |
| | Seismic | **1** | ls | 5,000.00 | 5,000 | | |
| | Coordination study and testing | **1** | ls | 5,000.00 | 5,000 | | |
| | Identification | **1** | ls | 2,500.00 | 2,500 | | |
| | Fire stopping | **1** | ls | 5,000.00 | 5,000 | | |
| | Lightning Protection | **1** | ls | 57,000.00 | 57,000 | | |
| | Fees & Permits | **1** | ls | 70,000.00 | 70,000 | | |
| | SUBTOTAL | | | | | 294,500 | |
| | ***TOTAL - ELECTRICAL*** | | | | | | **$4,671,089** |
| ***E10*** | ***EQUIPMENT*** | | | | | | |
| **E10** | **EQUIPMENT, GENERALLY** | | | | | | |
| *113100* | *APPLIANCES* | | | | | | |
| | Residential appliances | **1** | ls | 10,000.00 | 10,000 | | |
| | Kiln | **1** | ea | 3,000.00 | 3,000 | | |
| | SUBTOTAL | | | | | | |
| *114000* | *FOODSERVICE EQUIPMENT* | | | | | | |
| | Kitchen equipment, allowance provided | **1** | ls | 545,000.00 | 545,000 | | |
| *115213* | *PROJECTION SCREENS* | | | | | | |
| | Ceiling mounted screen at Cafeteria | **1** | ea | 15,000.00 | 15,000 | | |
| | Short throw projectors | **82** | ea | 1,600.00 | 131,200 | | |
| | Flat screen TV | **1** | ea | 8,000.00 | 8,000 | | |
| | Retractable screen at Gymnasium | **1** | ea | 10,000.00 | 10,000 | | |
| | Motorized projection screen at Common | **7** | ea | 5,000.00 | 35,000 | | |
| *116100* | *THEATRE EQUIPMENT* | | | | | | |
| | Stage curtain and rigging | **1** | ls | 50,000.00 | 50,000 | | |
| *116600* | *ATHLETIC EQUIPMENT* | | | | | | |
| | Bouldering rockwall with pads, 8' high | **1** | ls | 45,000.00 | 45,000 | | |
| | Chinup bar | **1** | ls | 2,000.00 | 2,000 | | |

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| | Gym wall pads | **2,415** | sf | 11.00 | 26,565 | | |
| | Volley ball mounting | **1** | l | 2,500.00 | 2,500 | | |
| | Basketball backstops; retractable | **6** | ea | 9,000.00 | 54,000 | | |
| | Gymnasium dividing net | **1,750** | sf | 20.00 | 35,000 | | |
| | Bleachers, motorized telescoping | | | | FF&E | | |
| | SUBTOTAL | | | | | 972,265 | |
| | ***TOTAL - EQUIPMENT*** | | | | | | **$972,265** |
| ***E20*** | ***FURNISHINGS*** | | | | | | |
| **E2010** | **FIXED FURNISHINGS** | | | | | | |
| *122100* | *WINDOW TREATMENT* | | | | | | |
| | Single roller shades, manual | **10,624** | sf | 7.00 | 74,368 | | |
| | Motorized shades at Cafeteria | **378** | sf | 30.00 | 11,340 | | |
| | Interior blinds | **2,550** | sf | 8.00 | 20,400 | | |
| *123000* | *CASEWORK* | | | | | | |
| | Kindergarten | *8* | ea | | - | | |
| | Base cabinet with plam countertop | **96** | lf | 350.00 | 33,600 | | |
| | Upper cabinets | **96** | lf | 220.00 | 21,120 | | |
| | Perimeter casework - open with fine-tube grill | **108** | lf | 350.00 | 37,800 | | |
| | Perimeter casework - with doors | **108** | lf | 250.00 | 27,000 | | |
| | Cubbies with coat hooks and upper lockable shelving | **120** | lf | 650.00 | 78,000 | | |
| | Tall storage cabinet, 4' | **8** | ea | 2,000.00 | 16,000 | | |
| | Teacher wardrobe, 4' | **8** | ea | 2,000.00 | 16,000 | | |
| | General Classroom | *32* | ea | | - | | |
| | Base cabinet with plam countertop | **96** | lf | 350.00 | 33,600 | | |
| | Upper cabinets | **96** | lf | 220.00 | 21,120 | | |
| | Perimeter casework - open | **432** | lf | 350.00 | 151,200 | | |
| | Perimeter casework - with doors | **432** | lf | 250.00 | 108,000 | | |
| | Cubbies with coat hooks and upper lockable shelving | **480** | lf | 650.00 | 312,000 | | |
| | Teacher wardrobe, 4' | **32** | ea | 2,000.00 | 64,000 | | |
| | Substantially Separate | *4* | ea | | - | | |
| | Base cabinet with plam countertop | **12** | lf | 350.00 | 4,200 | | |
| | Upper cabinets | **12** | lf | 220.00 | 2,640 | | |
| | Perimeter casework - open | **54** | lf | 350.00 | 18,900 | | |
| | Perimeter casework - with doors | **54** | lf | 250.00 | 13,500 | | |
| | Cubbies with coat hooks and upper lockable shelving | **60** | lf | 650.00 | 39,000 | | |
| | Teacher wardrobe, 4' | **4** | ea | 2,000.00 | 8,000 | | |
| | Inclusion | *12* | ea | | - | | |
| | Base cabinet with plam countertop | **108** | lf | 350.00 | 37,800 | | |
| | Upper cabinets | **108** | lf | 220.00 | 23,760 | | |
| | Perimeter casework - open | **72** | lf | 350.00 | 25,200 | | |
| | Perimeter casework - with doors | **72** | lf | 250.00 | 18,000 | | |
| | Tall storage cabinet, 4' | **12** | ea | 2,000.00 | 24,000 | | |
| | Teacher wardrobe, 4' | **12** | ea | 2,000.00 | 24,000 | | |

PM&C

**Beal Elementary School**
**214 Lake Street**
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate**

GFA 141,600

| | CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| | | **NEW BUILDING** | | | | | | |
| 989 | | ELE | *3* | ea | | - | | |
| 990 | | Base cabinet with plam countertop | **27** | lf | 350.00 | 9,450 | | |
| 991 | | Upper cabinets | **27** | lf | 220.00 | 5,940 | | |
| 992 | | Perimeter casework - open | **18** | lf | 350.00 | 6,300 | | |
| 993 | | Perimeter casework - with doors | **18** | lf | 250.00 | 4,500 | | |
| 994 | | Tall storage cabinet, 4' | **3** | ea | 2,000.00 | 6,000 | | |
| 995 | | Teacher wardrobe, 4' | **3** | ea | 2,000.00 | 6,000 | | |
| 996 | | OT/PT | *2* | ea | | - | | |
| 997 | | Base cabinet with plam countertop | **40** | lf | 350.00 | 14,000 | | |
| 998 | | Upper cabinets | **40** | lf | 220.00 | 8,800 | | |
| 999 | | Perimeter casework - open | **27** | lf | 350.00 | 9,450 | | |
| 1000 | | Perimeter casework - with doors | **27** | lf | 250.00 | 6,750 | | |
| 1001 | | Teacher wardrobe, 4' | **2** | ea | 2,000.00 | 4,000 | | |
| 1002 | | Music Room | *2* | ea | | - | | |
| 1003 | | Base cabinet with plam countertop | **24** | lf | 350.00 | 8,400 | | |
| 1004 | | Upper cabinets | **24** | lf | 220.00 | 5,280 | | |
| 1005 | | Perimeter casework - open | **13** | lf | 350.00 | 4,550 | | |
| 1006 | | Perimeter casework - with doors | **13** | lf | 250.00 | 3,250 | | |
| 1007 | | Tall storage cabinet, 4' | **2** | ea | 2,000.00 | 4,000 | | |
| 1008 | | Teacher wardrobe, 4' | **2** | ea | 2,000.00 | 4,000 | | |
| 1009 | | Teacher Planning | *4* | ea | | - | | |
| 1010 | | Base cabinet with plam countertop | **48** | lf | 350.00 | 16,800 | | |
| 1011 | | Upper cabinets | **48** | lf | 220.00 | 10,560 | | |
| 1012 | | Faculty Dining | | | | | | |
| 1013 | | Base cabinet with plam countertop | **12** | lf | 350.00 | 4,200 | | |
| 1014 | | Upper cabinets | **12** | lf | 220.00 | 2,640 | | |
| 1015 | | Perimeter casework - open | **15** | lf | 350.00 | 5,250 | | |
| 1016 | | Perimeter casework - with doors | **15** | lf | 250.00 | 3,750 | | |
| 1017 | | Common | | | | | | |
| 1018 | | Base cabinet with plam countertop | **168** | lf | 350.00 | 58,800 | | |
| 1019 | | Art Room' | | | | | | |
| 1020 | | Art Base cabinet with epoxy countertop | **52** | lf | 500.00 | 26,000 | | |
| 1021 | | Upper cabinets | **52** | lf | 220.00 | 11,440 | | |
| 1022 | | Perimeter casework - open | **33** | lf | 350.00 | 11,550 | | |
| 1023 | | Perimeter casework - with doors | **33** | lf | 250.00 | 8,250 | | |
| 1024 | | Media Center | | | | | | |
| 1025 | | Base cabinet with plam countertop | **29** | lf | 350.00 | 10,150 | | |
| 1026 | | Upper cabinets | **29** | lf | 220.00 | 6,380 | | |
| 1027 | | Nurse | | | | | | |
| 1028 | | Base cabinet with plam countertop | **17** | lf | 350.00 | 5,950 | | |
| 1029 | | Upper cabinets | **17** | lf | 220.00 | 3,740 | | |
| 1030 | | Mail/Duplicating | | | | | | |
| 1031 | | Base cabinet with plam countertop | **20** | lf | 350.00 | 7,000 | | |
| 1032 | | Upper cabinets | **20** | lf | 220.00 | 4,400 | | |
| 1033 | | | | | | | | |
| 1034 | *124810* | *ENTRANCE FLOOR MAT AND FRAMES* | | | | | | |
| 1035 | | Grille at Vestibules | **510** | sf | 45.00 | 22,950 | | |
| 1036 | | SUBTOTAL | | | | | 1,595,028 | |
| 1037 | | | | | | | | |

PM&C

**Beal Elementary School**
**214 Lake Street**
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate**

GFA 141,600

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **NEW BUILDING** | | | | | | | |
| **E2020** | **MOVABLE FURNISHINGS** | | | | | | |
| | All movable furnishings to be provided and installed by owner | | | | | | |
| | SUBTOTAL | | | | | NIC | |
| | ***TOTAL - FURNISHINGS*** | | | | | | **$1,595,028** |
| ***F10*** | ***SPECIAL CONSTRUCTION*** | | | | | | |
| **F10** | **SPECIAL CONSTRUCTION** | | | | | | |
| | No items in this section | | | | | | |
| | SUBTOTAL | | | | | | |
| | ***TOTAL - SPECIAL CONSTRUCTION*** | | | | | | |
| ***F20*** | ***SELECTIVE BUILDING DEMOLITION*** | | | | | | |
| **F2010** | **BUILDING ELEMENTS DEMOLITION** | | | | | | |
| | No items in this section | | | | | | |
| | SUBTOTAL | | | | | | |
| **F2020** | **HAZARDOUS COMPONENTS ABATEMENT** | | | | | | |
| | See main summary for HazMat allowance | | | | See Summary | | |
| | SUBTOTAL | | | | | | |
| | ***TOTAL - SELECTIVE BUILDING DEMOLITION*** | | | | | | |

PM&C

**Beal Elementary School**
214 Lake Street
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate**

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **SITEWORK** | | | | | | | |
| | | | | | | | |
| ***G*** | ***SITEWORK*** | | | | | | |
| | | | | | | | |
| **G10** | **SITE PREPARATION & DEMOLITION** | | | | | | |
| | Site construction fence/barricades | **3,420** | lf | 12.00 | 41,040 | | |
| | Site construction fence gates | **2** | ea | 10,000.00 | 20,000 | | |
| | Stabilized construction entrance - allowance | **4,000** | sf | 6.00 | 24,000 | | |
| | Pavement/curbing removal, crush and re-use for sub-base | **183,500** | sf | 1.00 | 183,500 | | |
| | Remove existing drain line | **4,850** | lf | 30.00 | 145,500 | | |
| | Remove existing drainage catch basins | **35** | ea | 350.00 | 12,250 | | |
| | Remove existing drainage manholes | **2** | ea | 500.00 | 1,000 | | |
| | Remove existing sewer line | **1,800** | lf | 30.00 | 54,000 | | |
| | Remove existing sewer manholes | **4** | ea | 500.00 | 2,000 | | |
| | Remove existing water line | **3,300** | lf | 30.00 | 99,000 | | |
| | Remove existing fire hydrants | **3** | ea | 400.00 | 1,200 | | |
| | Miscellaneous demolition | **1** | ls | 50,000.00 | 50,000 | | |
| | Site Earthwork | | | | | | |
| | Strip Topsoil | **18,127** | cy | 12.00 | 217,524 | | |
| | Fine grading | **664,760** | sf | 0.20 | 132,952 | | |
| | Cut | **28,950** | cy | 10.00 | 289,500 | | |
| | Fill with onsite materials | **28,950** | cy | 10.00 | 289,500 | | |
| | Membrane to cap soils; geofabric | **176,770** | sf | 0.75 | 132,578 | | |
| | Premium for moving on site naturally occurring arsenic soil content | **13,000** | cy | 8.00 | 104,000 | | |
| | Arsenic removal allowance | **1** | ls | 150,000.00 | 150,000 | | |
| | Silt fence/erosion control, wash bays, stock piles | **3,420** | lf | 12.00 | 41,040 | | |
| | Inlet protection | **32** | ea | 250.00 | 8,000 | | |
| | Silt fence maintenance and monitoring | **1** | ls | 15,000.00 | 15,000 | | |
| | Hazardous Waste Remediation | | | | | | |
| | Remove existing underground fuel storage tanks | | | | NIC | | |
| | Dispose/treat contaminated soils | | | | NIC | | |
| | SUBTOTAL | | | | | 2,013,584 | |
| | | | | | | | |
| **G20** | **SITE IMPROVEMENTS** | | | | | | |
| | Hot Mix Asphalt Paving | *179,160* | *sf* | | | | |
| | gravel base; 18" thick | **9,953** | cy | 36.00 | 358,308 | | |
| | bituminous concrete; 4" thick | **19,907** | sy | 26.00 | 517,582 | | |
| | VGC | **9,245** | lf | 39.00 | 360,555 | | |
| | Parking spaces | **1** | ls | 5,000.00 | 5,000 | | |
| | Other road markings | **1** | ls | 10,000.00 | 10,000 | | |
| | Traffic signs | **1** | ls | 10,000.00 | 10,000 | | |
| | Pedestrian Paving | | | | | | |
| | Bituminous sidewalk | *1,150* | *sf* | | | | |
| | gravel base; 12" thick | **43** | cy | 36.00 | 1,548 | | |
| | bituminous concrete; 2-3/4" thick | **1,150** | sf | 2.50 | 2,875 | | |
| | Concrete paving | *37,330* | *sf* | | | | |
| | gravel base; 12" thick | **1,565** | cy | 36.00 | 56,340 | | |
| | 6" concrete paving | **41,610** | sf | 6.50 | 270,465 | | |
| | Concrete ramp | **650** | sf | 15.00 | 9,750 | | |
| | Concrete steps - treads and risers | **45** | lf | 190.00 | 8,550 | | |
| | Concrete pavers | | | | | | |
| | Precast concrete pavers | **10,100** | sf | 17.00 | 171,700 | | |
| | gravel base; 12" thick | **251** | cy | 38.00 | 9,538 | | |
| | concrete base; 6" thick | **10,100** | sf | 6.00 | 60,600 | | |
| | Playground | *23,555* | *sf* | | - | | |

PM&C

**Beal Elementary School**
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31-Aug-18

**Schematic Design Estimate**

| | CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| | **SITEWORK** | | | | | | | |
| 55 | | gravel base; 12" thick | **872** | cy | 36.00 | 31,392 | | |
| 56 | | Play surface; poured rubber | **23,555** | sf | 18.00 | 423,990 | | |
| 57 | | Stabilized aggregate | **6,710** | sf | 2.00 | 13,420 | | |
| 58 | | | | | | | | |
| 59 | | Site Improvements | | | | | | |
| 60 | | **Site entry signs A & B** | | | | | | |
| 61 | | Strip footings | | | | | | |
| 62 | | Excavation | **36** | cy | 15.00 | 540 | | |
| 63 | | Store on site for reuse | **36** | cy | 18.00 | 648 | | |
| 64 | | Backfill with imported fill | **33** | cy | 30.00 | 990 | | |
| 65 | | Formwork | **56** | sf | 12.00 | 672 | | |
| 66 | | Re-bar | **280** | lbs. | 1.30 | 364 | | |
| 67 | | Concrete material; 3,000 psi | **3** | cy | 130.00 | 390 | | |
| 68 | | Placing concrete | **3** | cy | 80.00 | 240 | | |
| 69 | | Sign wall | | | | | | |
| 70 | | Formwork | **448** | sf | 14.00 | 6,272 | | |
| 71 | | Re-bar | **896** | lbs. | 1.30 | 1,165 | | |
| 72 | | Concrete material; 4,000 psi | **13** | cy | 138.00 | 1,794 | | |
| 73 | | Placing concrete | **13** | cy | 80.00 | 1,040 | | |
| 74 | | Premium for form liner | **224** | sf | 10.00 | 2,240 | | |
| 75 | | Powder coated 1/8" thick metal sign | **20** | sf | 60.00 | 1,200 | | |
| 76 | | Dimensional letters | **20** | ea | 150.00 | 3,000 | | |
| 77 | | LCD display screens | **2** | ea | 5,000.00 | 10,000 | | |
| 78 | | **Site Walls** | | | | | | |
| 79 | | Strip footings | | | | | | |
| 80 | | Excavation | **216** | cy | 15.00 | 3,240 | | |
| 81 | | Store on site for reuse | **216** | cy | 18.00 | 3,888 | | |
| 82 | | Backfill with imported fill | **197** | cy | 30.00 | 5,910 | | |
| 83 | | Formwork | **334** | sf | 12.00 | 4,008 | | |
| 84 | | Re-bar | **1,670** | lbs. | 1.30 | 2,171 | | |
| 85 | | Concrete material; 3,000 psi | **19** | cy | 130.00 | 2,470 | | |
| 86 | | Placing concrete | **19** | cy | 80.00 | 1,520 | | |
| 87 | | Site Walls | | | | | | |
| 88 | | Formwork | **1,274** | sf | 14.00 | 17,836 | | |
| 89 | | Re-bar | **2,548** | lbs. | 1.30 | 3,312 | | |
| 90 | | Concrete material; 4,000 psi | **25** | cy | 138.00 | 3,450 | | |
| 91 | | Placing concrete | **25** | cy | 80.00 | 2,000 | | |
| 92 | | Premium for form liner | **546** | sf | 10.00 | 5,460 | | |
| 93 | | | | | | | | |
| 94 | | Segmental retaining wall | **885** | sf | 45.00 | 39,825 | | |
| 95 | | Seat walls | **486** | lf | 350.00 | 170,100 | | |
| 96 | | Cantilevered wooden bench | **70** | lf | 200.00 | 14,000 | | |
| 97 | | | | | | | | |
| 98 | | Flag pole | **1** | ea | 6,500.00 | 6,500 | | |
| 99 | | Bollards | **1** | ls | 3,000.00 | 3,000 | | |
| 100 | | Bicycle racks | **1** | ls | 15,000.00 | 15,000 | | |
| 101 | | Ornamental trash/recycling receptacles | **1** | ls | 20,000.00 | 20,000 | | |
| 102 | | Play equipment | **1** | ls | 175,000.00 | 175,000 | | |
| 103 | | Raised planter beds | **110** | lf | 45.00 | 4,950 | | |

| | CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| | | **SITEWORK** | | | | | | |
| 104 | | Ornamental fence, 4' | **390** | lf | 140.00 | 54,600 | | |
| 105 | | Louvered screen fence, 6' | **130** | lf | 120.00 | 15,600 | | |
| 106 | | Gate, double, 4' ornamental | **1** | ea | 4,000.00 | 4,000 | | |
| 107 | | Vehicle gate, double | **2** | ea | 4,000.00 | 8,000 | | |
| 108 | | Guard rail | **2,390** | lf | 55.00 | 131,450 | | |
| 109 | | Accessible guardrail | **165** | lf | 70.00 | 11,550 | | |
| 110 | | Ramp rail | **40** | lf | 250.00 | 10,000 | | |
| 111 | | Handrail | **36** | lf | 120.00 | 4,320 | | |
| 112 | | SUBTOTAL | | | | | 3,095,328 | |
| 113 | | | | | | | | |
| 114 | | Multipurpose field - Grass | *22,700* | *sf* | | - | | |
| 115 | | Gravel base - assumed 12" thick | **841** | cy | 40.00 | 33,640 | | |
| 116 | | Sod lawn | **22,700** | sf | 1.25 | 28,375 | | |
| 117 | | Irrigation (w/ well) | **22,700** | sf | 1.25 | Alternate | | |
| 118 | | Landscaping | | | | | | |
| 119 | | Topsoil - amend existing topsoil | **10,190** | cy | 22.00 | 224,180 | | |
| 120 | | Topsoil - import, 12" deep | **4,283** | cy | 50.00 | 214,150 | | |
| 121 | | Bioengineered soil at bioretention basin, 2' deep | **156** | cy | 70.00 | 10,920 | | |
| 122 | | Sod lawn | **3,740** | sf | 1.25 | 4,675 | | |
| 123 | | No mow fescue sod lawn | **83,455** | sf | 1.50 | 125,183 | | |
| 124 | | No mow fescue hydro seed lawn | **267,260** | sf | 0.30 | 80,178 | | |
| 125 | | Street trees, 4" cal | **118** | ea | 1,200.00 | 141,600 | | |
| 126 | | Flowering trees, 3" cal | **53** | ea | 1,000.00 | 53,000 | | |
| 127 | | Evergreen trees, 8-10' | **14** | ea | 800.00 | 11,200 | | |
| 128 | | Specimen trees, 4" cal | **8** | ea | 1,500.00 | 12,000 | | |
| 129 | | Shrub mix, 3 gal 48" oc | **2,150** | ea | 40.00 | 86,000 | | |
| 130 | | Rain garden mix -shrub/perennial, 3 gal 48" oc | **24,860** | sf | 2.00 | 49,720 | | |
| 131 | | Perennial/grass mix, 1 gal 18" oc | **9,300** | ea | 15.00 | 139,500 | | |
| 132 | | SUBTOTAL | | | | | 1,214,321 | |
| 133 | | | | | | | | |
| 134 | **G30** | **CIVIL MECHANICAL UTILITIES** | | | | | | |
| 135 | | Water supply; Pricing includes E&B and bedding | | | | | | |
| 136 | | DI piping; 4" | **217** | lf | 70.00 | 15,190 | | |
| 137 | | DI piping; 6" | **425** | lf | 80.00 | 34,000 | | |
| 138 | | DI piping; 8" | **2,555** | lf | 100.00 | 255,500 | | |
| 139 | | FD connection | **2** | ea | 2,000.00 | 4,000 | | |
| 140 | | Gate valves | **9** | ea | 750.00 | 6,750 | | |
| 141 | | 8" x 4" tee | **1** | ea | 900.00 | 900 | | |
| 142 | | 8" x 8" tee | **1** | ea | 450.00 | 450 | | |
| 143 | | Hydrant | **5** | ea | 2,600.00 | 13,000 | | |
| 144 | | Sanitary; Pricing includes E&B and bedding | | | | | | |
| 145 | | Manholes | **8** | ea | 4,500.00 | 36,000 | | |
| 146 | | Grease trap, 4,000 gallon | **1** | ea | 12,500.00 | w/plumbing | | |
| 147 | | 4" PVC | **60** | lf | 35.00 | 2,100 | | |
| 148 | | 6" PVC | **995** | lf | 55.00 | 54,725 | | |
| 149 | | 8" PVC | **80** | lf | 60.00 | 4,800 | | |
| 150 | | Connect to existing drain | **1** | ea | 3,000.00 | 3,000 | | |
| 151 | | Storm water; Pricing includes E&B and bedding | | | | | | |
| 152 | | 8" CPP | **30** | lf | 54.00 | 1,620 | | |
| 153 | | 12" CPP | **3,030** | lf | 65.00 | 196,950 | | |
| 154 | | 18" CPP | **1,320** | lf | 70.00 | 92,400 | | |
| 155 | | 24" CPP | **465** | lf | 80.00 | 37,200 | | |

PM&C

**Beal Elementary School**
214 Lake Street
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate**

| | CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|---|
| | | **SITEWORK** | | | | | | |
| 156 | | WQS | **3** | ea | 9,000.00 | 27,000 | | |
| 157 | | Catch basin | **37** | ea | 3,800.00 | 140,600 | | |
| 158 | | DMH | **28** | ea | 4,200.00 | 117,600 | | |
| 159 | | Connect to existing drain | **2** | ea | 5,000.00 | 10,000 | | |
| 160 | | Bio retention | **2,100** | sf | 10.00 | 21,000 | | |
| 161 | | Underground Recharge System | *7,200* | sf | | - | | |
| 162 | | 36" perforated CPP pipe | **1,200** | lf | 140.00 | 168,000 | | |
| 163 | | Excavate and dispose off site | **1,333** | cy | 35.00 | 46,655 | | |
| 164 | | Back-fill infiltration bed with 3/4" crushed stone wrapped in filter fabric | **1,019** | cy | 45.00 | 45,855 | | |
| 165 | | Gas service | | | | | | |
| 166 | | E&B trench for new gas pipe - install by plumbing | **1,670** | lf | 22.00 | 36,740 | | |
| 167 | | SUBTOTAL | | | | | 1,372,035 | |
| 168 | | | | | | | | |
| 169 | **G40** | **ELECTRICAL UTILITIES** | | | | | | |
| 170 | | Power | | | | | | |
| 171 | | Utility co. back charges, allow | | | | By Owner | | |
| 172 | | New power riser pole | **1** | ea | 1,000.00 | 1,000 | | |
| 173 | | Primary ductbank 2-5" PVC conduits | **1,020** | lf | 90.00 | 91,800 | | |
| 174 | | Power Handhole | **4** | ea | 1,500.00 | 6,000 | | |
| 175 | | Exterior pad mounted transformer | | | | By Utility co. | | |
| 176 | | Transformer pad | **1** | ea | 2,500.00 | 2,500 | | |
| 177 | | Secondary ductbank with 2000A feeder | **20** | lf | 475.00 | 9,500 | | |
| 178 | | Generator ductbank with 400A, 250A & 100A feeder and control wiring | **160** | lf | 225.00 | 36,000 | | |
| 179 | | Communications | | | | | | |
| 180 | | New communication riser pole | **1** | ea | 800.00 | 800 | | |
| 181 | | Communication ductbank 4-4" PVC conduits | **1,020** | lf | 80.00 | 81,600 | | |
| 182 | | Communication handhole | **4** | ea | 1,500.00 | 6,000 | | |
| 183 | | Site Lighting | | | | | | |
| 184 | | ZT2 | **38** | ea | 2,000.00 | 76,000 | | |
| 185 | | ZT22 | **11** | ea | 2,600.00 | 28,600 | | |
| 186 | | Base | **49** | ea | 350.00 | 17,150 | | |
| 187 | | Circuitry | **5,000** | lf | 15.00 | 75,000 | | |
| 188 | | Well pump | | | | | | |
| 189 | | 2" conduit | **290** | lf | 12.00 | 3,480 | | |
| 190 | | Cabling and connection | **1** | ea | 2,500.00 | 2,500 | | |
| 191 | | Vehicle Charging Station | | | | | | |
| 192 | | EV charging station including Power/communication (allow) | **3** | ea | 6,500.00 | 19,500 | | |
| 193 | | Site Security | | | | | | |
| 194 | | CCTV surveillance at site | **1** | ls | 35,000.00 | 35,000 | | |
| 195 | | SUBTOTAL | | | | | 492,430 | |
| 196 | | | | | | | | |
| 197 | | **TOTAL - SITE DEVELOPMENT** | | | | | | ***$8,187,698*** |

PM&C

**Beal Elementary School**
214 Lake Street
Shrewsbury, MA

31-Aug-18

**Schematic Design Estimate**

| CSI CODE | DESCRIPTION | QTY | UNIT | UNIT COST | EST'D COST | SUB TOTAL | TOTAL COST |
|---|---|---|---|---|---|---|---|
| **ADDITIONAL COSTS** | | | | | | | |
| | ***LAKE STREET REALIGNMENT*** | | | | | | |
| **G10** | **SITE PREPARATION & DEMOLITION** | | | | | | |
| | Pavement/curbing removal, crush and re-use for sub-base | **23,600** | sf | 1.00 | 23,600 | | |
| | Site Earthwork | | | | | | |
| | Fine grading | **32,465** | sf | 0.20 | 6,493 | | |
| | Cut | **11,333** | cy | 10.00 | 113,330 | | |
| | Export surplus material, assume to like site | **11,333** | cy | 16.00 | 181,328 | | |
| | Premium for naturally occurring arsenic soil content | | | | not required | | |
| | Hazardous Waste Remediation | | | | | | |
| | Remove existing underground fuel storage tanks | | | | NIC | | |
| | Dispose/treat contaminated soils | | | | NIC | | |
| | SUBTOTAL | | | | | 324,751 | |
| **G20** | **SITE IMPROVEMENTS** | | | | | | |
| | Hot Mix Asphalt Paving | *28,185* | | | | | |
| | gravel base; 18" thick | **1,566** | cy | 40.00 | 62,640 | | |
| | bituminous concrete; 4" thick | **3,132** | sy | 26.00 | 81,432 | | |
| | VGC | **2,015** | lf | 39.00 | 78,585 | | |
| | Other road markings | **1** | ls | 2,000.00 | 2,000 | | |
| | Traffic signs | **1** | ls | 2,500.00 | 2,500 | | |
| | Concrete paving | *4,280* | *sf* | | | | |
| | gravel base; 12" thick | **1,565** | cy | 40.00 | 62,600 | | |
| | 6" concrete paving | **41,610** | sf | 6.00 | 249,660 | | |
| | Concrete ramp | **650** | sf | 15.00 | 9,750 | | |
| | Concrete steps - treads and risers | **45** | lf | 120.00 | 5,400 | | |
| | SUBTOTAL | | | | | 554,567 | |
| **G30** | **CIVIL MECHANICAL UTILITIES** | | | | | | |
| | Water supply; Pricing includes E&B and bedding | | | | | | |
| | DI piping; 6" | **28** | lf | 80.00 | 2,240 | | |
| | DI piping; 8" | **30** | lf | 100.00 | 3,000 | | |
| | DI piping; 12" | **990** | lf | 140.00 | 138,600 | | |
| | Connect to existing | **2** | loc | 8,000.00 | 16,000 | | |
| | Gate valves | **7** | ea | 750.00 | 5,250 | | |
| | 8" x 12" tee | **1** | ea | 900.00 | 900 | | |
| | Hydrant | **1** | ea | 2,600.00 | 2,600 | | |
| | Storm water; Pricing includes E&B and bedding | | | | | | |
| | 12" CPP | **365** | lf | 65.00 | 23,725 | | |
| | Catch basin | **4** | ea | 3,800.00 | 15,200 | | |
| | DMH | **3** | ea | 4,200.00 | 12,600 | | |
| | Connect to existing drain | **1** | ea | 5,000.00 | 5,000 | | |
| | SUBTOTAL | | | | | 225,115 | |
| | **TOTAL - LAKE STREET REALIGNMENT** | | | | | | ***$1,104,433*** |
| | ***IRRIGATION*** | | | | | | |
| **G20** | **SITE IMPROVEMENTS** | | | | | | |
| | Irrigation (w/ well) | **22,700** | sf | 1.25 | 28,375 | | |
| | SUBTOTAL | | | | | 28,375 | |
| | **TOTAL - IRRIGATION** | | | | | | ***$28,375*** |

# 4.1.2 SCHEMATIC DESIGN BINDER

## R. Updated Project Work Plan

1. Updated Project Directory
2. Design Work Plan
3. Updated Project Schedule
4. MHC Project Notification Form

# SCHEMATIC DESIGN

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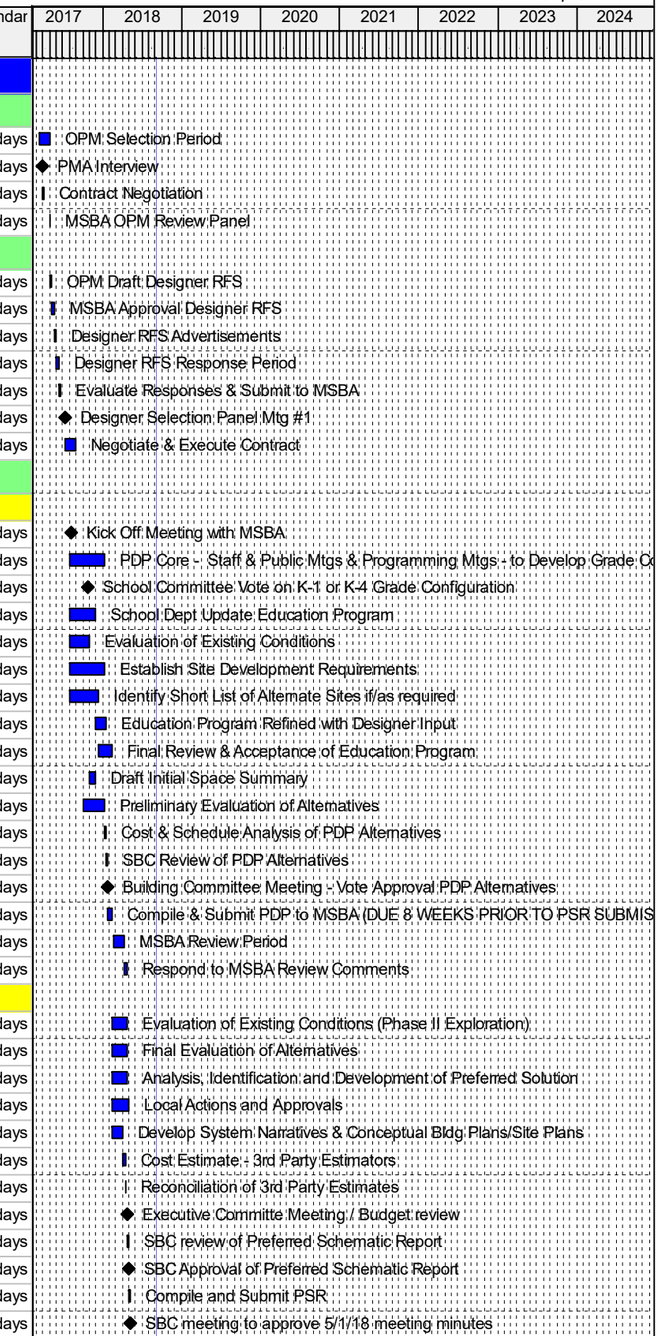
- School Building Committee Vote on Schematic Design Submission: September 4, 2018
- Schematic Design MSBA Submission: September 12, 2018
- Project Scope and Budget conference with MSBA: To Be Determined
- MSBA Board Meeting and Vote to approve Schematic Design: October 31, 2018
- City Council vote for Funding the Project: November 6, 2018
- Design Development Phase and MSBA Submission: November 2018 - February 2019
- 60% CD Phase and MSBA Submission: February 2019 – May 2019
- 90% CD Phase and MSBA Submission: May 2019 – July 2019
- 100% CD's complete: September 2019

| Activity ID | Activity Name | Original Duration | Start | Finish | Actual Start | Actual Finish | Total Float | Calendar |
|---|---|---|---|---|---|---|---|---|
| **Update 9 New Beal Elementary School Project - MSBA FS/SD Schedule** | | | | | | | | |
| **OPM Selection** | | | | | | | | |
| A1010 | OPM Selection Period | 33 | 15-Mar-17 A | 01-May-17 A | 15-Mar-17 | 01-May-17 | | Standard 5 Day Workweek w holidays |
| A1000 | PMA Interview | 0 | | 30-Mar-17 A | | 30-Mar-17 | | Standard 5 Day Workweek w holidays |
| A1020 | Contract Negotiation | 4 | 31-Mar-17 A | 06-Apr-17 A | 31-Mar-17 | 06-Apr-17 | | Standard 5 Day Workweek w holidays |
| A1380 | MSBA OPM Review Panel | 2 | 01-May-17 A | 03-May-17 A | 01-May-17 | 03-May-17 | | Standard 5 Day Workweek w holidays |
| **Designer Selection** | | | | | | | | |
| A1030 | OPM Draft Designer RFS | 6 | 04-May-17 A | 12-May-17 A | 04-May-17 | 12-May-17 | | Standard 5 Day Workweek w holidays |
| A1040 | MSBA Approval Designer RFS | 10 | 12-May-17 A | 26-May-17 A | 12-May-17 | 26-May-17 | | Standard 5 Day Workweek w holidays |
| A1060 | Designer RFS Advertisements | 3 | 24-May-17 A | 29-May-17 A | 24-May-17 | 29-May-17 | | Standard 5 Day Workweek w holidays |
| A1050 | Designer RFS Response Period | 13 | 29-May-17 A | 16-Jun-17 A | 29-May-17 | 16-Jun-17 | | Standard 5 Day Workweek w holidays |
| A1070 | Evaluate Responses & Submit to MSBA | 4 | 17-Jun-17 A | 23-Jun-17 A | 17-Jun-17 | 23-Jun-17 | | Standard 5 Day Workweek w holidays |
| A1080 | Designer Selection Panel Mtg #1 | 0 | | 11-Jul-17 A | | 11-Jul-17 | | Standard 5 Day Workweek w holidays |
| A1100 | Negotiate & Execute Contract | 27 | 12-Jul-17 A | 30-Aug-17 A | 12-Jul-17 | 30-Aug-17 | | Standard 5 Day Workweek w holidays |
| **FEASIBILITY STUDY - 9 MONTHS** | | | | | | | | |
| **Preliminary Design Program (6 Months)** | | | | | | | | |
| A1390 | Kick Off Meeting with MSBA | 0 | | 11-Aug-17 A | | 11-Aug-17 | | Standard 5 Day Workweek w holidays |
| A1560 | PDP Core - Staff & Public Mtgs & Programming Mtgs - to Develop Grade Configuration | 59 | 01-Aug-17 A | 11-Jan-18 A | 01-Aug-17 | 11-Jan-18 | | Standard 5 Day Workweek w holidays |
| A1570 | School Committee Vote on K-1 or K-4 Grade Configuration | 0 | | 25-Oct-17 A | | 25-Oct-17 | | Standard 5 Day Workweek w holidays |
| A1110 | School Dept Update Education Program | 85 | 01-Aug-17 A | 01-Dec-17 A | 01-Aug-17 | 01-Dec-17 | | Standard 5 Day Workweek w holidays |
| A1130 | Evaluation of Existing Conditions | 43 | 01-Aug-17 A | 01-Nov-17 A | 01-Aug-17 | 01-Nov-17 | | Standard 5 Day Workweek w holidays |
| A1140 | Establish Site Development Requirements | 85 | 01-Aug-17 A | 11-Jan-18 A | 01-Aug-17 | 11-Jan-18 | | Standard 5 Day Workweek w holidays |
| A1400 | Identify Short List of Alternate Sites if/as required | 85 | 01-Aug-17 A | 12-Dec-17 A | 01-Aug-17 | 12-Dec-17 | | Standard 5 Day Workweek w holidays |
| A1190 | Education Program Refined with Designer Input | 36 | 30-Nov-17 A | 18-Jan-18 A | 30-Nov-17 | 18-Jan-18 | | Standard 5 Day Workweek w holidays |
| A1200 | Final Review & Acceptance of Education Program | 25 | 15-Dec-17 A | 14-Feb-18 A | 15-Dec-17 | 14-Feb-18 | | Standard 5 Day Workweek w holidays |
| A1120 | Draft Initial Space Summary | 6 | 01-Nov-17 A | 30-Nov-17 A | 01-Nov-17 | 30-Nov-17 | | Standard 5 Day Workweek w holidays |
| A1150 | Preliminary Evaluation of Alternatives | 71 | 02-Oct-17 A | 12-Jan-18 A | 02-Oct-17 | 12-Jan-18 | | Standard 5 Day Workweek w holidays |
| A1210 | Cost & Schedule Analysis of PDP Alternatives | 10 | 10-Jan-18 A | 18-Jan-18 A | 10-Jan-18 | 18-Jan-18 | | Standard 5 Day Workweek w holidays |
| A1220 | SBC Review of PDP Alternatives | 3 | 18-Jan-18 A | 23-Jan-18 A | 18-Jan-18 | 23-Jan-18 | | Standard 5 Day Workweek w holidays |
| A1320 | Building Committee Meeting - Vote Approval PDP Alternatives | 0 | | 23-Jan-18 A | | 23-Jan-18 | | Standard 5 Day Workweek w holidays |
| A1160 | Compile & Submit PDP to MSBA (DUE 8 WEEKS PRIOR TO PSR SUBMISSION) | 16 | 24-Jan-18 A | 16-Feb-18 A | 24-Jan-18 | 16-Feb-18 | | Standard 5 Day Workweek w holidays |
| A1170 | MSBA Review Period | 15 | 19-Feb-18 A | 09-Apr-18 A | 19-Feb-18 | 09-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1180 | Respond to MSBA Review Comments | 6 | 10-Apr-18 A | 23-Apr-18 A | 10-Apr-18 | 23-Apr-18 | | Standard 5 Day Workweek w holidays |
| **Preferred Schematic Report (3 Months)** | | | | | | | | |
| A1230 | Evaluation of Existing Conditions (Phase II Exploration) | 34 | 15-Feb-18 A | 27-Apr-18 A | 15-Feb-18 | 27-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1240 | Final Evaluation of Alternatives | 34 | 15-Feb-18 A | 27-Apr-18 A | 15-Feb-18 | 27-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1250 | Analysis, Identification and Development of Preferred Solution | 46 | 15-Feb-18 A | 27-Apr-18 A | 15-Feb-18 | 27-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1260 | Local Actions and Approvals | 55 | 15-Feb-18 A | 02-May-18 A | 15-Feb-18 | 02-May-18 | | Standard 5 Day Workweek w holidays |
| A1410 | Develop System Narratives & Conceptual Bldg Plans/Site Plans | 34 | 15-Feb-18 A | 04-Apr-18 A | 15-Feb-18 | 04-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1420 | Cost Estimate - 3rd Party Estimators | 10 | 05-Apr-18 A | 19-Apr-18 A | 05-Apr-18 | 19-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1430 | Reconciliation of 3rd Party Estimates | 2 | 19-Apr-18 A | 20-Apr-18 A | 19-Apr-18 | 20-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1630 | Executive Committe Meeting / Budget review | 0 | | 24-Apr-18 A | | 24-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1620 | SBC review of Preferred Schematic Report | 5 | 24-Apr-18 A | 30-Apr-18 A | 24-Apr-18 | 30-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1440 | SBC Approval of Preferred Schematic Report | 0 | | 30-Apr-18 A | | 30-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1310 | Compile and Submit PSR | 5 | 01-May-18 A | 09-May-18 A | 01-May-18 | 09-May-18 | | Standard 5 Day Workweek w holidays |
| A1360 | SBC meeting to approve 5/1/18 meeting minutes | 0 | | 08-May-18 A | | 08-May-18 | | Standard 5 Day Workweek w holidays |




Remaining Level of Effort | Remaining Work | ◆ Milestone
Actual Work | Critical Remaining Work



Note: Preliminary Schedule

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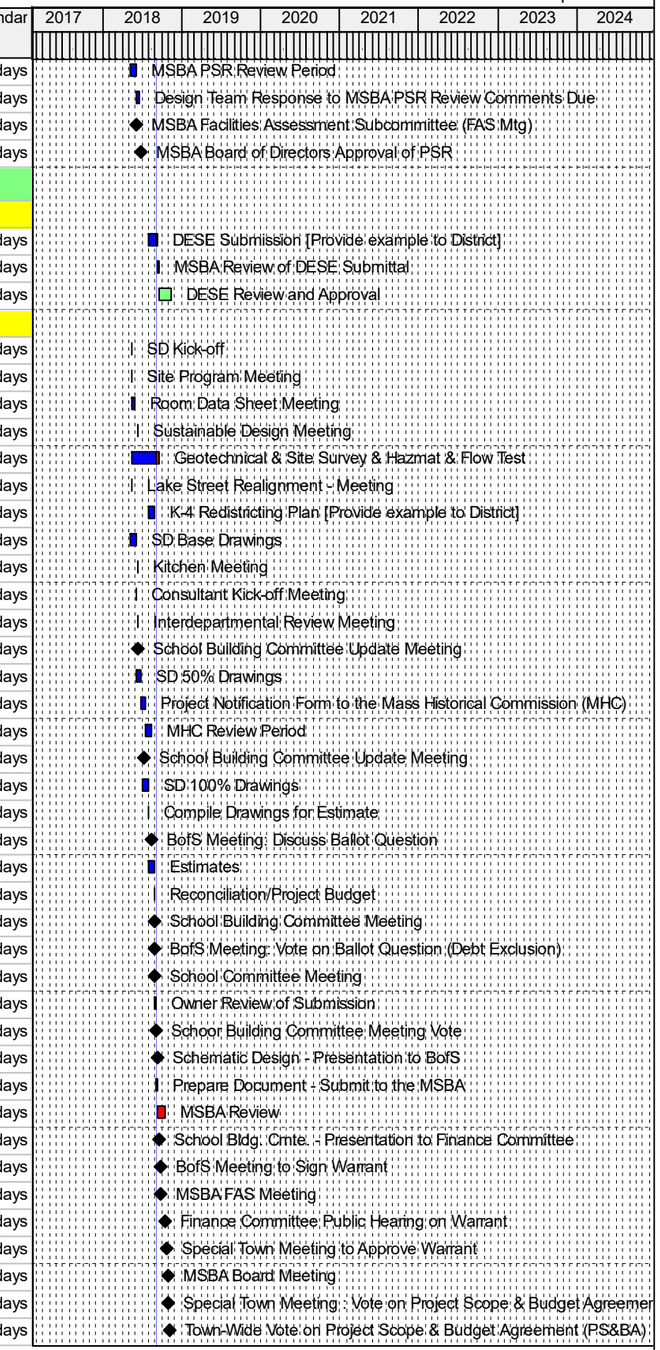
| Activity ID | Activity Name | Original Duration | Start | Finish | Actual Start | Actual Finish | Total Float | Calendar |
|---|---|---|---|---|---|---|---|---|
| A1280 | MSBA PSR Review Period | 15 | 09-May-18 A | 06-Jun-18 A | 09-May-18 | 06-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1300 | Design Team Response to MSBA PSR Review Comments Due | 6 | 07-Jun-18 A | 19-Jun-18 A | 07-Jun-18 | 19-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1290 | MSBA Facilities Assessment Subcommittee (FAS Mtg) | 0 | | 06-Jun-18 A | | 06-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1270 | MSBA Board of Directors Approval of PSR | 0 | | 27-Jun-18 A | | 27-Jun-18 | | Standard 5 Day Workweek w holidays |
| **SCHEMATIC DESIGN (6 Months)** | | | | | | | | |
| **DESE Submittal** | | | | | | | | |
| A1450 | DESE Submission [Provide example to District] | 20 | 03-Aug-18 A | 12-Sep-18 | 03-Aug-18 | | 0 | Standard 5 Day Workweek w holidays |
| A1460 | MSBA Review of DESE Submittal | 5 | 13-Sep-18 | 19-Sep-18 | | | 63 | Standard 5 Day Workweek w holidays |
| A1470 | DESE Review and Approval | 39 | 20-Sep-18 | 14-Nov-18 | | | 63 | Standard 5 Day Workweek w holidays |
| **Schematic Design Submittal** | | | | | | | | |
| A1640 | SD Kick-off | 1 | 15-May-18 A | 15-May-18 A | 15-May-18 | 15-May-18 | | Standard 5 Day Workweek w holidays |
| A1650 | Site Program Meeting | 1 | 16-May-18 A | 16-May-18 A | 16-May-18 | 16-May-18 | | Standard 5 Day Workweek w holidays |
| A1660 | Room Data Sheet Meeting | 9 | 15-May-18 A | 31-May-18 A | 15-May-18 | 31-May-18 | | Standard 5 Day Workweek w holidays |
| A1670 | Sustainable Design Meeting | 5 | 13-Jun-18 A | 13-Jun-18 A | 13-Jun-18 | 13-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1680 | Geotechnical & Site Survey & Hazmat & Flow Test | 14 | 15-May-18 A | 18-Sep-18 | 15-May-18 | | 0 | Standard 5 Day Workweek w holidays |
| A1690 | Lake Street Realignment - Meeting | 16 | 18-May-18 A | 18-May-18 A | 18-May-18 | 18-May-18 | | Standard 5 Day Workweek w holidays |
| A1700 | K-4 Redistricting Plan [Provide example to District] | 20 | 03-Aug-18 A | 30-Aug-18 A | 03-Aug-18 | 30-Aug-18 | | Standard 5 Day Workweek w holidays |
| A1710 | SD Base Drawings | 18 | 09-May-18 A | 09-Jun-18 A | 09-May-18 | 09-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1720 | Kitchen Meeting | 5 | 12-Jun-18 A | 12-Jun-18 A | 12-Jun-18 | 12-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1730 | Consultant Kick-off Meeting | 1 | 05-Jun-18 A | 05-Jun-18 A | 05-Jun-18 | 05-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1740 | Interdepartmental Review Meeting | 5 | 12-Jun-18 A | 12-Jun-18 A | 12-Jun-18 | 12-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1750 | School Building Committee Update Meeting | 0 | | 12-Jun-18 A | | 12-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1760 | SD 50% Drawings | 20 | 04-Jun-18 A | 29-Jun-18 A | 04-Jun-18 | 29-Jun-18 | | Standard 5 Day Workweek w holidays |
| A2130 | Project Notification Form to the Mass Historical Commission (MHC) | 5 | 29-Jun-18 A | 19-Jul-18 A | 29-Jun-18 | 19-Jul-18 | | Standard 5 Day Workweek w holidays |
| A2140 | MHC Review Period | 21 | 20-Jul-18 A | 13-Aug-18 A | 20-Jul-18 | 13-Aug-18 | | Standard 5 Day Workweek w holidays |
| A1770 | School Building Committee Update Meeting | 0 | | 10-Jul-18 A | | 10-Jul-18 | | Standard 5 Day Workweek w holidays |
| A1780 | SD 100% Drawings | 22 | 02-Jul-18 A | 01-Aug-18 A | 02-Jul-18 | 01-Aug-18 | | Standard 5 Day Workweek w holidays |
| A1790 | Compile Drawings for Estimate | 2 | 02-Aug-18 A | 03-Aug-18 A | 02-Aug-18 | 03-Aug-18 | | Standard 5 Day Workweek w holidays |
| A2150 | BofS Meeting: Discuss Ballot Question | 0 | | 14-Aug-18 A | | 14-Aug-18 | | Standard 5 Day Workweek w holidays |
| A1810 | Estimates | 15 | 04-Aug-18 A | 27-Aug-18 A | 04-Aug-18 | 27-Aug-18 | | Standard 5 Day Workweek w holidays |
| A1820 | Reconciliation/Project Budget | 2 | 27-Aug-18 A | 28-Aug-18 A | 27-Aug-18 | 28-Aug-18 | | Standard 5 Day Workweek w holidays |
| A1830 | School Building Committee Meeting | 0 | | 28-Aug-18 A | | 28-Aug-18 | | Standard 5 Day Workweek w holidays |
| A2160 | BofS Meeting: Vote on Ballot Question (Debt Exclusion) | 0 | | 28-Aug-18 A | | 28-Aug-18 | | Standard 5 Day Workweek w holidays |
| A1840 | School Committee Meeting | 0 | | 29-Aug-18 A | | 29-Aug-18 | | Standard 5 Day Workweek w holidays |
| A1850 | Owner Review of Submission | 3 | 30-Aug-18 A | 04-Sep-18 A | 30-Aug-18 | 04-Sep-18 | | Standard 5 Day Workweek w holidays |
| A1860 | Schoor Building Committee Meeting Vote | 0 | | 04-Sep-18 A | | 04-Sep-18 | | Standard 5 Day Workweek w holidays |
| A1960 | Schematic Design - Presentation to BofS | 0 | | 11-Sep-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1870 | Prepare Document - Submit to the MSBA | 6 | 05-Sep-18 | 12-Sep-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1880 | MSBA Review | 23 | 13-Sep-18 | 16-Oct-18 | | | 0 | Standard 5 Day Workweek w holidays |
| A2170 | School Bldg. Cmte. - Presentation to Finance Committee | 0 | | 20-Sep-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1970 | BofS Meeting to Sign Warrant | 0 | | 25-Sep-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1890 | MSBA FAS Meeting | 0 | | 26-Sep-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A2180 | Finance Committee Public Hearing on Warrant | 0 | | 18-Oct-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1980 | Special Town Meeting to Approve Warrant | 0 | | 22-Oct-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1900 | MSBA Board Meeting | 0 | | 31-Oct-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1910 | Special Town Meeting : Vote on Project Scope & Budget Agreement | 0 | | 29-Oct-18 | | | 0 | Standard 5 Day Workweek w holidays |
| A1920 | Town-Wide Vote on Project Scope & Budget Agreement (PS&BA) | 0 | | 06-Nov-18 | | | 0 | Standard 5 Day Workweek w holidays |




Remaining Level of Effort | Remaining Work | ◆ Milestone
Actual Work | Critical Remaining Work



Note: Preliminary Schedule

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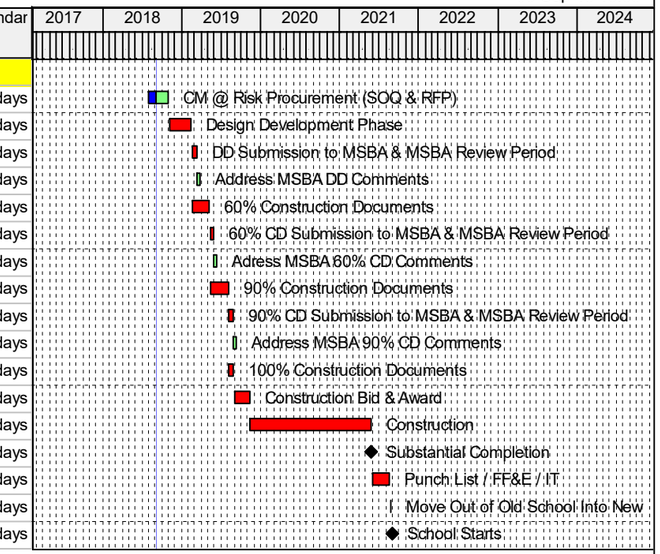
| Activity ID | Activity Name | Original Duration | Start | Finish | Actual Start | Actual Finish | Total Float | Calendar |
|---|---|---|---|---|---|---|---|---|
| **Design Development Submittal & Construction** | | | | | | | | |
| A1930 | CM @ Risk Procurement (SOQ & RFP) | 65 | 01-Aug-18 A | 01-Nov-18 | 01-Aug-18 | | 3 | Standard 5 Day Workweek w holidays |
| A1940 | Design Development Phase | 69 | 07-Nov-18 | 15-Feb-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A1950 | DD Submission to MSBA & MSBA Review Period | 15 | 19-Feb-19 | 11-Mar-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A1990 | Address MSBA DD Comments | 10 | 12-Mar-19 | 25-Mar-19 | | | 615 | Standard 5 Day Workweek w holidays |
| A2000 | 60% Construction Documents | 59 | 19-Feb-19 | 10-May-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A2010 | 60% CD Submission to MSBA & MSBA Review Period | 11 | 13-May-19 | 28-May-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A2020 | Adress MSBA 60% CD Comments | 11 | 28-May-19 | 11-Jun-19 | | | 560 | Standard 5 Day Workweek w holidays |
| A2030 | 90% Construction Documents | 60 | 14-May-19 | 07-Aug-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A2040 | 90% CD Submission to MSBA & MSBA Review Period | 15 | 08-Aug-19 | 28-Aug-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A2050 | Address MSBA 90% CD Comments | 10 | 29-Aug-19 | 12-Sep-19 | | | 495 | Standard 5 Day Workweek w holidays |
| A2060 | 100% Construction Documents | 16 | 09-Aug-19 | 30-Aug-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A2070 | Construction Bid & Award | 49 | 03-Sep-19 | 12-Nov-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A2080 | Construction | 389 | 13-Nov-19 | 28-May-21 | | | 0 | Standard 5 Day Workweek w holidays |
| A2090 | Substantial Completion | 0 | | 28-May-21 | | | 0 | Standard 5 Day Workweek w holidays |
| A2100 | Punch List / FF&E / IT | 59 | 01-Jun-21 | 20-Aug-21 | | | 0 | Standard 5 Day Workweek w holidays |
| A2110 | Move Out of Old School Into New | 5 | 23-Aug-21 | 27-Aug-21 | | | 0 | Standard 5 Day Workweek w holidays |
| A2120 | School Starts | 0 | | 30-Aug-21 | | | 0 | Standard 5 Day Workweek w holidays |




Remaining Level of Effort | Remaining Work | ◆ Milestone
Actual Work | Critical Remaining Work

Data Date: 05-Sep-18


Note: Preliminary Schedule

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JUL 19 2018

MASS. HIST. COMM
RC.04932

950 CMR: OFFICE OF THE SECRETARY OF THE COMMONWEALTH

APPENDIX A
MASSACHUSETTS HISTORICAL COMMISSION
220 MORRISSEY BOULEVARD
BOSTON, MASS. 02125
617-727-8470, FAX: 617-727-5128

**PROJECT NOTIFICATION FORM**

Project Name: Beal Elementary School

Location / Address: 214 Lake Street

City / Town: Shrewsbury, MA

Project Proponent

Name: Lamoureux Pagano Associates, Inc.

Address: 108 Grove Street, Suite 300

City/Town/Zip/Telephone: Worcester, MA 01606, 508-752-2831

Agency license or funding for the project (list all licenses, permits, approvals, grants or other entitlements being sought from state and federal agencies).

| Agency Name | Type of License or funding (specify) |
|---|---|
| Massachusetts School Building Authority | New Construction Funding |

**Project Description (narrative):**
Construction of a new elementary school, parking lots, and play fields on the site of the former Glavin Center Facility. The existing Glavin Center Facility was Constructed in 1971 as a residential facility to serve the mentally and physically disabled. The facility has not been in use for several years.

**Does the project include demolition? If so, specify nature of demolition and describe the building(s) which are proposed for demolition.**
The project would require complete demolition of the existing Glavin Center Buildings. There is ±100,000 GSF of buildings that will be demolished on the west portion of the property with another two smaller out buildings on the eastern portion that may be demolished if road improvements are approved by the town.

**Does the project include rehabilitation of any existing buildings? If so, specify nature of rehabilitation and describe the building(s) which are proposed for rehabilitation.**
No

**Does the project include new construction? If so, describe (attach plans and elevations if necessary).**
Yes, The new elementary school with be ±142,000 GSF and will be constructed on the north west portion of the site where the existing Glavin Center Facility is currently. The project is in the early phases of design.

After review of MHC files and the materials you submitted, it has been determined that this project is unlikely to affect significant historic or archaeological resources.

Linda Santoro 8/13/18
Linda Santoro Date
Preservation Planner
Massachusetts Historical Commission

APPENDIX A (continued)

**To the best of your knowledge, are any historic or archaeological properties known to exist within the project's area of potential impact? If so, specify.**

No

**What is the total acreage of the project area?**

| | | | | | |
|---|---|---|---|---|---|
| Woodland | 45.41 | acres | Productive Resources: | | |
| Wetland | 11.57 | acres | Agriculture | 12.41 | acres |
| Floodplain | | acres | Forestry | | acres |
| Open space | 13.29 | acres | Mining/Extraction | | acres |
| Developed | 41.99 | acres | Total Project Acreage | 98.97 | acres |

**What is the acreage of the proposed new construction?** 20.72 acres

**What is the present land use of the project area?**

The northwest portion that is being designed as the site for the new school and the smaller eastern portion is zoned "Limited Commercial Business". The remainder of the size is zoned "Rural "AA". The southwestern portion is currently used as play fields and the south eastern portion is used as agricultural land.

**Please attach a copy of the section of the USGS quadrangle map which clearly marks the project location.**

See attachment "Marlborough, Mass. 42071-C5-TM-025-1983"

This Project Notification Form has been submitted to the MHC in compliance with 950 CMR 71.00.

Signature of Person submitting this form: _____ Date: 06-29-18

Name: Kathryn Crockett

Address: 108 Grove Street, Suite 300

City/Town/Zip: Worcester, MA, 01605

Telephone: 508-752-2831

REGULATORY AUTHORITY

950 CMR 71.00: M.G.L. c. 9, §§ 26-27C as amended by St. 1988, c. 254.

# 4.1.2 SCHEMATIC DESIGN BINDER

S. Local Actions & Approvals

TELEPHONE: (508) 841-8508
FAX: (508) 842-0587

# TOWN OF SHREWSBURY

**Richard D. Carney Municipal Office Building**
**100 Maple Avenue**
**Shrewsbury, Massachusetts 01545-5338**

September 12, 2018

Ms. Diane Sullivan
Senior Capital Program Manager
40 Broad Street
Boston, MA 02109

Dear Ms. Sullivan:

The Shrewsbury School Building Committee ("SBC") has completed its review of the Schematic Design for the new Beal Elementary School project (the "Project"). On Tuesday, September 4, 2018, the SBC voted to approve and authorize the Owner's Project Manager to submit the Schematic Design to the MSBA for its consideration. A certified copy of the SBC meeting minutes, which includes the specific language of the vote and the number of votes in favor, opposed, and abstained, will be provided once the committee approves the minutes (scheduled for a September 11, 2018 meeting).

**Special project note:** On August 3, 2018, Massachusetts Governor Charlie Backer signed legislation "*H.4312, An Act authorizing the Division of Capital Asset Management and Maintenance to convey certain parcels to the town of Shrewsbury*".

A copy of the governor's signed parchment is included as an attachment to this Local Actions & Approvals document.

Since the District's submission to the MSBA of the Preferred Schematic Report on May 9, 2018, the District has held eight (8) meetings regarding the proposed project, or at which the project was a discussion topic, all in compliance with the state Open Meeting Law. These meetings include:

**Beal Early Childhood Center – Building Committee Meetings:**

GENERAL NOTE: All School Building Committee public notices/agendas and meeting minutes are available via the following link:

https://shrewsburyma.gov/AgendaCenter/Beal-Early-Childhood-Center-Building-Com-38

Click the **green check** ✓ to view meeting minutes for the identified meeting date.
Click the "Download" link to view meeting agendas.

NOTE: If there is not a **green check** ✓ associated with a particular meeting date, the minutes are not yet available.

**May 21, 2018: 6:30PM : Municipal Office Building at 100 Maple Avenue, Shrewsbury, MA 01545**

- Meeting notice dated May 17, 2018 posted on the bulletin board outside of the Town Manager's office in the Municipal office building at 100 Maple Avenue, on a bulletin board at the Shrewsbury Police Station, 106 Maple Avenue and on line at the link above.
- The project architect reviewed proposals from their geotechnical/geoenvironmental and environmental subconsultants outlining additional site surveying, testing and investigation at the chosen site of the new Beal ES, 214 Lake Street, Shrewsbury, MA 01545 (Glavin Center Site). This information is required to complete the FFER, Soils Management Plan, etc. to be included in future project documents. **The committee voted unanimously to approve a NTE value of $47,000 for this scope.** (Became LPA Contract Amendment No. 04).
- Next meeting date was scheduled for 6PM: June 12, 2018.

**June 12, 2018 : 6:00PM : Municipal Office Building at 100 Maple Avenue, Shrewsbury, MA 01545**

- Meeting notice dated June 8, 2018 posted on the bulletin board outside of the Town Manager's office in the Municipal office building at 100 Maple Avenue, on a bulletin board at the Shrewsbury Police Station, 106 Maple Avenue and on line at the link above.
- PMA Consultants passed out a budget report. The project is on track to be completed **on** budget. PMA advised the committee that because the Beal project is "grandfathered in", the project will be eligible to receive the 1% incentive point on reimbursement for the use of the Construction Manager at Risk (CMR) delivery method.
- Building Committee Chair noted that the state bill related to the District's acquisition of the Glavin Center site is out of the House and onto the Senate. Legislative approval is expected in July 2018.
- LPA reported that they are working with DCAMM to gain access to the Glavin Center site to perform required hazardous materials surveying (of existing buildings to be razed), land surveying and other geotechnical work, i.e. additional test pits, soil borings {beyond those completed during the FS phase}. It was noted that the Town Engineering Department will also survey the site.
- PMA noted that the project received the MSBA's PSR review comments dated June 6, 2018. They appear to be routine comments that PMA and LPA will address.
- Next meeting dates were scheduled for July 10, August 28, September 4 (to vote approval to submit the SD) and September 11, 2018 all at 6:00PM.

**July 10, 2018 : 6:00PM : Municipal Office Building at 100 Maple Avenue, Shrewsbury, MA 01545**

- Meeting notice dated July 6, 2018 posted on the bulletin board outside of the Town Manager's office in the Municipal office building at 100 Maple Avenue, on a bulletin board at the Shrewsbury Police Station, 106 Maple Avenue and on line at the link above.
- PMA stated that the project continues to trend on schedule and on budget. PMA handed out an updated preliminary Beal ES project schedule.
- LPA stated that they have received a "license" from DCAMM allowing LPA to conduct the site survey. "Licenses" for geotechnical and hazardous materials related engineering/scope are scheduled to be issued 7.16.2018.
- LPA reported that the schematic design documents are approximately 50% complete and the project remains on schedule to issue the estimating SD set on 8.1.2018.
- Various options, arising out of the interdepartmental meetings, to possibly include in the new Beal ES project were discussed, i.e. including a redundant SELCO (Shrewsbury Electric &

Cable) data center (alternate locations subsequently identified), adding a softball field at the new Beal location as the current Beal has one, including irrigation at the proposed multipurpose field. No decisions were made regarding any potential options discussed at the interdepartmental meetings.

- A community member appeared before the committee to discuss some sustainability options as discussed at a sustainability forum held in February 2018. Discussion topics included food delivery options (re-use utensils, trays, etc. versus disposal utensils trays, etc.), solar ready roof, battery storage. No decisions were made regarding the topics included in this discussion.
- The committee chair stated that the Glavin Center acquisition bill is currently in a non-controversial land transfer queue.
- Next meeting dates were scheduled: August 14, 2018 (tentatively scheduled, if required) and August 28, 2018 to review final SD submission.

**The summary of the following meeting minutes, along with the committee-approved minutes, and a certified copy of the September 4, 2018 minutes (which includes the vote to submit the Schematic Design to the MSBA) will be forwarded to the MSBA under separate cover, once received.**

**August 28, 2018 : 6:00PM : Municipal Office Building at 100 Maple Avenue, Shrewsbury, MA 01545**

- Meeting notice dated August 24, 2018 posted on the bulletin board outside of the Town Manager's office in the Municipal office building at 100 Maple Avenue, on a bulletin board at the Shrewsbury Police Station, 106 Maple Avenue and on line at the link above.

**September 4, 2018 : 6:00PM : Municipal Office Building at 100 Maple Avenue, Shrewsbury, MA 01545**

- Meeting notice dated August 30, 2018 posted on the bulletin board outside of the Town Manager's office in the Municipal office building at 100 Maple Avenue, on a bulletin board at the Shrewsbury Police Station, 106 Maple Avenue and on line at the link above.

**September 11, 2018 : 6:00PM : Municipal Office Building at 100 Maple Avenue, Shrewsbury, MA 01545**

- Meeting notice dated September 7, 2018 posted on the bulletin board outside of the Town Manager's office in the Municipal office building at 100 Maple Avenue, on a bulletin board at the Shrewsbury Police Station, 106 Maple Avenue and on line at the link above.

In addition to the SBC meetings listed above, the District held two public meetings at which the Project was discussed. These meetings were posted in compliance with the state Open Meeting Law.

**Beal Early Childhood Center – School Committee Meetings:**

**July 5, 2018 : 7:00PM Taping of an episode of the School Committee's *School Talk***

- Meeting notice dated June 20, 2018 posted on the bulletin board outside of the Town Manager's office in the Municipal office building at 100 Maple Avenue and on a bulletin board at the Shrewsbury Police Station, 106 Maple Avenue.
- See the link here to watch the tapped episode: https://www.youtube.com/watch?v=xMQBQoybZjY
- Meeting notice is attached to this certification.

**August 29, 2018 : 7:00PM : Municipal Office Building at 100 Maple Avenue, Shrewsbury, MA 01545**
**SPECIAL NOTE:** This version of the August 29, 2018 School Committee (SC) Meeting Minutes **HAVE YET TO BE approved by the School Committee**. They are a preliminary/draft copy issued for use with this Local Actions & Approvals document. They are scheduled to be approved by the SC at their regularly scheduled meeting on September 12, 2018.

- Meeting notice dated August 24, 2018 posted on the bulletin board outside of the Town Manager's office in the Municipal office building at 100 Maple Avenue and on a bulletin board at the Shrewsbury Police Station, 106 Maple Avenue.
- Superintendent of Schools informed the committee that the MSBA noted that the Beal Project Educational Plan as authored by Ms. Amy Clouter was one of if not the best that they have received.
- LPA and PMA gave a report to the committee including an overview of the project progress, some history on the project, cost information and next steps in the process.
- Committee members expressed the importance of "right-sizing" the new Beal ES and the thoughtful use of green space(s).
- Superintendent of Schools informed the committee that the feedback he has received from the community is that the Glavin Center site works well as the site for the new school to allow for the most effective/efficient implementation of the educational program and that the new school represents a good value for the community.

To the best of my knowledge and belief, each of the meetings listed above complied with the requirements of the Open Meeting Law, M.G.L. c. 30A, §§ 18-25 and 940 CMR 29 *et seq*.

If you have any questions or require any additional information, please contact the Owner's Project Manager, PMA Consultants, LLC, Deborah Shaer, Associate: dshaer@pmaconsultants.com or 781-519-1067.

By signing this Local Action and Approval Certification, I hereby certify that, to the best of my knowledge and belief, the information supplied by the District in this Certification is true, complete, and accurate.

**By: Kevin J. Mizikar**

**Title: Town Manager**

**Date:** 9/10/18

By signing this Local Action and Approval Certification, I hereby certify that, to the best of my knowledge and belief, the information supplied by the District in this Certification is true, complete, and accurate.

**By: Dr. Joseph Sawyer**

**Title: Superintendent of Schools**

**Date:** 9/7/18

By signing this Local Action and Approval Certification, I hereby certify that, to the best of my knowledge and belief, the information supplied by the District in this Certification is true, complete, and accurate.

**By: Jason Palitsch**

**Title: Chair of the School Committee**

**Date:** 9/10/18

THE GENERAL COURT OF MASSACHUSETTS
STATE HOUSE, BOSTON 02133-1053

August 6, 2018

Shrewsbury Board of Selectmen
Town of Shrewsbury
100 Maple Avenue
Shrewsbury, MA 01545

Dear Selectmen:

We write to notify you of a final update regarding H.4312, *An Act authorizing the Division of Capital Asset Management and Maintenance to convey certain parcels to the town of Shrewsbury*. Governor Baker signed H.4312 into law on the evening of Friday, August 3. The bill is now officially Chapter 173 of the Acts of 2018.

The legislation shall go into effect 30 days after Governor Baker has issued his signature, which is Sunday, September 2. As such, the law is effective well within the necessary timeframe, including prior to the October 22 Special Town Meeting. In light of this news, we are confident that Shrewsbury may complete the remaining processes necessary to secure the establishment of a new K-4 Elementary School in the desired Glavin property location.

Our offices are very pleased to share this news with you. We look forward to further engaging with you as Shrewsbury seeks to finalize the creation of a new K-4 Elementary School. Please do not hesitate to contact either of us if we may be of support in this mission, or if you have any questions or concerns on this matter.

Sincerely,

HANNAH E. KANE
State Representative
11th Worcester District

MICHAEL O. MOORE
State Senator
2nd Worcester District

CC: Shrewsbury School Committee
Shrewsbury Finance Committee
Mr. Kevin Mizikar, Shrewsbury Town Manager
Dr. Joseph Sawyer, Superintendent of Shrewsbury Public Schools
Ms. Kristen Las, Shrewsbury Assistant Town Manager
Mr. Patrick Collins, Assistant Superintendent of Finance and Operations

H 4312

Chapter 173,
of the Acts of 2018

THE COMMONWEALTH OF MASSACHUSETTS

*In the One Hundred and Ninetieth General Court*

*AN ACT* AUTHORIZING THE DIVISION OF CAPITAL ASSET MANAGEMENT AND MAINTENANCE TO CONVEY CERTAIN PARCELS OF LAND IN THE TOWN OF SHREWSBURY.

*Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:*

SECTION 1. Notwithstanding sections 32 to 37, inclusive, of chapter 7C of the General Laws or any other general or special law to the contrary, the commissioner of capital asset management and maintenance may convey approximately 13.48 acres of land located along the westerly side of Lake street in the town of Shrewsbury, shown as Parcel A on a plan on file at the Worcester district registry of deeds in plan book 905, plan 90, to Shrewsbury Youth Soccer Association, Inc., for consideration of $1; provided, however, that the use of the property shall be restricted to public recreational uses. Any instrument conveying the property pursuant to this section shall include such use restriction and shall state that if the property is no longer used by the Shrewsbury Youth Soccer Association, Inc. for public recreational purposes or if Shrewsbury Youth Soccer Association, Inc. ceases to exist, the town of Shrewsbury shall have an enforceable option to purchase the property for $1; provided, however, that the use of the property shall be restricted to public recreational uses; and provided further, that any instrument conveying the property to the town shall include such restriction.

SECTION 2. Notwithstanding sections 32 to 37, inclusive, of chapter 7C of the General Laws or any other general or special law to the contrary, the commissioner of capital asset management and maintenance may convey approximately 49.6 acres of land located on the easterly side of Lake street in the town of Shrewsbury, shown as Parcel B on the plan referenced in section 1, to the town of Shrewsbury for consideration of $1; provided, however, that the use of the property shall be restricted to agricultural and recreational uses. Any instrument conveying the property pursuant to this section shall include such use restriction.

SECTION 3. The commissioner of capital asset management and maintenance shall establish the value of the property described in sections 1 and 2 for both the highest and best use of the property as currently encumbered and for the purposes described in said sections 1 and 2. If the consideration for the parcels conveyed in said sections 1 and 2 shall be less than the fair market value, the commissioner shall place notice in the central register of the

conveyances, the amount of the transaction and the difference between the calculated value and the price received.

SECTION 4. Notwithstanding sections 32 to 37, inclusive, of chapter 7C of the General Laws or any other general or special law to the contrary, the commissioner of capital asset management and maintenance may convey 2 parcels of land, being formerly known as the Irving A. Glavin Regional Center, located at 214 Lake street in the town of Shrewsbury to the town of Shrewsbury; provided, however, that the use of the parcels shall be restricted to general municipal purposes. The first parcel contains approximately 18 acres located on the westerly side of Lake street and is shown on an exhibit plan entitled "Land Owned by the Commonwealth of Massachusetts to be Conveyed to the Town of Shrewsbury and Shrewsbury Youth Soccer" dated December 12, 2017. The second parcel contains approximately 2.38 acres located on the easterly side of Lake street and is shown as "Parcel 2" on a plan on file at the Worcester district registry of deeds in plan book 917, plan 63. The consideration for the conveyance of the parcels shall be the fair market value of the parcels as determined by the commissioner of capital asset management and maintenance based upon an independent professional appraisal report, taking into consideration the restriction on the use of the parcels. The inspector general shall review and approve the appraisal. The inspector general shall prepare a report of such review of the methodology utilized for the appraisal and shall file the report with the commissioner, the house and senate committees on ways and means and the joint committee on state administration and regulatory oversight.

SECTION 5. The commissioner of capital asset management and maintenance may retain or grant right of ways or easements for access, egress, utilities and drainage across the properties described in this act as the commissioner deems necessary and appropriate.

SECTION 6. Notwithstanding any general or special law to the contrary, Shrewsbury Youth Soccer Association, Inc. shall be responsible for all costs and expenses relating to the conveyance of property pursuant to section 1 including, but not limited to, costs associated with any engineering, surveys, historical reviews, appraisals and deed preparation related to the conveyances as such costs may be determined by the commissioner of capital asset management and maintenance.

SECTION 7. Notwithstanding any general or special law to the contrary, the town of Shrewsbury shall be responsible for all costs and expenses relating to the conveyance of property pursuant to sections 2 and 4 including, but not limited to, costs associated with any engineering, surveys, historical reviews, appraisals and deed preparation related to the conveyances as such costs may be determined by the commissioner of capital asset management and maintenance.

H 4312

House of Representatives, July 25, 2018.

Passed to be enacted,

, Speaker.

In Senate, July 25, 2018.

Passed to be enacted,

Harriette L. Chandler

, President.

August 3, 2018.

Approved,

Charles D. Baker

Governor.

## Deborah Shaer

**From:** Valerie Clemmey <vclemmey@shrewsburyma.gov>
**Sent:** Thursday, August 09, 2018 9:52 AM
**Subject:** [BULK] Fwd: Update regarding H.4312 from Representative Kane and Senator Moore

**Importance:** Low

From: **Beliveau, Jessica (HOU)** <Jessica.Beliveau@mahouse.gov>
Date: Mon, Aug 6, 2018 at 3:24 PM
Subject: Update regarding H.4312 from Representative Kane and Senator Moore
To: Selectmen <Selectmen@shrewsburyma.gov>
Cc: schoolcommittee@shrewsbury.k12.ma.us <schoolcommittee@shrewsbury.k12.ma.us>, financecommittee@shrewsburyma.gov <financecommittee@shrewsburyma.gov>, Kevin Mizikar <kmizikar@shrewsburyma.gov>, Joe Sawyer <jsawyer@shrewsbury.k12.ma.us>, Kristen Las <klas@shrewsburyma.gov>, Patrick Collins <pccollins@shrewsbury.k12.ma.us>, Tsetsos, Zachary (SEN) <Zachary.Tsetsos@masenate.gov>, Kane, Hannah - Rep. (HOU) <Hannah.Kane@mahouse.gov>, Moore, Michael O. (SEN) <Michael.Moore@masenate.gov>

Good Afternoon Selectmen:

Attached please find a letter from Representative Kane and Senator Moore regarding H.4312, *An Act authorizing the Division of Capital Asset Management and Maintenance to convey certain parcels to the town of Shrewsbury*. As indicated in said letter, Governor Baker signed this legislation on Friday, August 3rd. The bill is now Chapter 173 of the Acts of 2018.

For your convenience, a copy of the signed parchment is also attached.

Representative Kane and Senator Moore are very pleased to share this update with you, and look forward to further engaging with you as Shrewsbury seeks to finalize the establishment of a new K-4 Elementary School.

Should you have any questions or concerns, please do not hesitate to contact Representative Kane or Senator Moore.

Thank you,

Jessica

*Jessica Beliveau*

*Office of State Representative Hannah Kane*

*11th Worcester District*

*(617) 722-2430*

BEAL EARLY CHILDHOOD
CENTER BUILDING COMMITTEE

TELEPHONE: (508) 841-8508
FAX: (508) 842-0587

# TOWN OF SHREWSBURY

**Richard D. Carney Municipal Office Building**
**100 Maple Avenue**
**Shrewsbury, Massachusetts 01545-5338**

MINUTES
May 21, 2018

**Present:** Mr. Kane, Ms. Boucher, Mr. Girardi, Mr. Cox, Ms. Fryc, Mr. Collins, Dr. Sawyer, Mr. Mizikar
**Absent:** Mr. Masiello

1. **Call to Order**

Mr. Kane called the meeting to order at 6:50 pm

2. **Meeting Minutes of May 8, 2018**

On a motion by Ms. Boucher, seconded by Ms. Fryc, the committee unanimously approved the minutes as written.

3. **Review and act on the following bill schedules and warrants:**

| Vendor/Expense/Item | Amount |
|---|---|
| Lamoureux Pagano | $38,104.00 |
| PMA Consultants | $8,814.74 |

On a motion by Ms. Boucher, seconded by Ms. Fryc, the committee unanimously approved the bill schedules.

4. **Review and approval of proposed additional geotechnical services and hazardous materials testing at the Glavin Center site**

On a motion by Mr. Cox, seconded by Ms. Boucher, the committee unanimously voted to approve the following proposals with the total not to exceed $47,000

· UEC proposal dated 5.11.2018 for hazardous material surveying/testing/investigation of the existing buildings on the Glavin Site: Proposal Total: $12, 400.

· Lord Associates, Inc. estimate dated 5.17.2018 for additional soil testing, characterization and reporting at the Glavin Site: Proposal + UEC 10% Total: $6,290.

· LGCI "email proposal" dated 5.21.2018 for more in-depth test pits and soil borings at the Glavin Site, including a Preliminary Foundation Engineering Report: Proposal Total:$27,485.

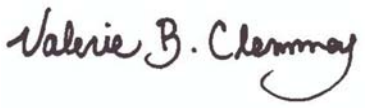
5. **Set date for next meeting**

The next meeting is set for June 12th at 6:00 pm.

6. **Adjourn**

On a motion by Ms. Boucher, seconded by Ms. Fryc, the committee unanimously voted to adjourn at 6:55 pm.

Respectfully Submitted,



Valerie B. Clemmey
Administrative Assistant

**Referenced Materials**

Minutes and Bill Schedules as noted above

BEAL EARLY CHILDHOOD
CENTER BUILDING COMMITTEE

TELEPHONE: (508) 841-8508
FAX: (508) 842-0587

# TOWN OF SHREWSBURY

**Richard D. Carney Municipal Office Building**
**100 Maple Avenue**
**Shrewsbury, Massachusetts 01545-5338**

## MINUTES
## June 12, 2018

**Present:** Mr. Kane, Ms. Boucher, Mr. Girardi, Mr. Cox, Ms. Fryc, Mr. Collins, Dr. Sawyer, Mr. Mizikar
**Absent:** Mr. Masiello, Mr. Cox
**Also Present:** Mr. Paul Queeney and Ms. Deborah Shaer of PMA Consultants, LLC, Ms. Katie Crockett of Lamoureux Pagano & Associates

1. **Call to Order**

Mr. Kane called the meeting to order at 6:03pm

2. **Meeting Minutes of May 21, 2018**

On a motion by Dr.Sawyer, seconded by Mr. Gerrardi, the committee unanimously voted to approve the minutes as written.

3. **Review and act on the following bill schedules and warrants:**

| Vendor/Expense/Item | Amount |
|---|---|
| None | |

4. **Hear reports, review and act on the following matters:**
    a. **Report from the Owner's Project Manager**
        i. **Project Schedule**

Mr. Queeney advised that the project remains on schedule, the PSR was submitted last month, and a design effort on schematic design will begin immediately. The MSBA reviewed the PSR at their meeting last week in Boston with minor comments. The committee is on target to submit schematic design on September 12, 2018.

        ii. **Project Financials**

Ms. Shaer reviewed the budget summary and clarified that amendment 4 has been added. Mr. Queeny stated that the MSBA reviewed incentive points and is eligible for 1 % incentive to use CM at risk as well as other reimbursements resulting in approx. a 54.8% reimbursement.

    b. **Report from the Architect**

### i. Project Update

Ms. Crockett stated that LPA is embarking on schematic design and needs to complete it by August 1, 2018.A number of meetings have been scheduled including interdepartmental meetings with town staff. At a Facilities Assessment Committee meeting in Boston, the MSBA stated that the educational plan was the best that they have seen. The biggest question was about the timeline for Glavin acquisition. Mr. Kane replied that the bill is out of the House and onto the Senate, with one item added for transparency of appraisal of parcels. The legislative approval will not occur until July, then administrative action from voters in November. Ms. Crockett stated that LPA is working with DCAMM to access site for geotechnical work and hazardous materials testing. The Town Engineering department will also survey the site. There are miscellaneous issues arising such as allowing the school to be a site for polling or voting which will be addressed at the next meeting. Dr.Sawyer expressed concerns and also stated that two schools are currently used as polling locations and it should be noted that election days on school days are disruptive to the education process.

### c. Correspondence:

i. Letter, dated June 6, 2018, from Mary Pichetti, MSBA, re: comments for the Module 3 Feasibility Study PSR

Mr. Queeney stated that the comments are routine and PMA and LPA will address comments.

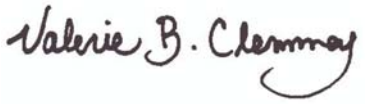
## 5. Set date for next meeting

The next meeting will be scheduled for July 10, 2018 at 6:00 pm to address various issues as a result of inter-department meetings, August 28 at 6:00pm, September 4 for the final vote on schematic design, and September 11 to present an update to the Board of Selectmen.

## 6. Adjourn

On a motion by Ms.Fryc, seconded by Ms. Boucher, the committee unanimously voted to adjourn at 6:22 pm.

Respectfully Submitted,



Valerie B. Clemmey
Administrative Assistant

**<u>Referenced Materials</u>**

Minutes and Bill Schedules as noted above
Budget Summary

BEAL EARLY CHILDHOOD
CENTER BUILDING COMMITTEE

TELEPHONE: (508) 841-8508
FAX: (508) 842-0587

# TOWN OF SHREWSBURY

**Richard D. Carney Municipal Office Building**
**100 Maple Avenue**
**Shrewsbury, Massachusetts 01545-5338**

## MINUTES
## July 10, 2018

**Present:** Mr. Kane, Ms. Boucher, Mr. Girardi, Mr. Masiello, Mr. Cox, Mr. Collins, Dr. Sawyer, Mr. Mizikar
**Absent:** Ms. Fryc
**Also Present:** Ms. Deborah Shaer of PMA Consultants, LLC, Ms. Katie Crockett of Lamoureux Pagano & Associates

1. **Call to Order**

Mr. Kane called the meeting to order at 6:02 pm

2. **Meeting Minutes of June 12, 2018**

On a motion Masiello, seconded by Mr. Gerardi, the Committee unanimously voted to approve the minutes as written.

3. **Review and act on the following bill schedules and warrants:**

| Vendor/Expense/Item | Amount |
|---|---|
| PMA Consultants, Inc. (Inv. # 04110-13) | $11,949.03 |
| Lamoureux Pagano Associates (Inv. # 1717-1806) | $75,600.00 |

On a motion by Mr. Masiello, seconded by Dr. Sawyer, the Committee unanimously approved the bill schedules.

4. **Hear reports, review and act on the following matters:**

   a. **Report from the Owner's Project Manager**

      i. **Project Schedule**

Ms. Shaer stated that the project is trending on schedule. Ms. Crockett stated that we received a license from DCAMM to do a site survey. Geotechnical and hazardous materials licenses are set to be issued on July 16, with geotechnical beginning on Thursday. Ms. Shaer handed out a design schedule for the Beal Building project.

      ii. **Project Financials**

Ms. Shaer stated there was nothing to report on the budget summary, the total is increased by invoices approved today.

**b. Report from the Architect**

**i. Project Update**

Ms. Crockett stated the schematic design is about 50% complete with a deadline of August 1st and reviewed a PowerPoint that detailed the site plan. Mr. Masiello asked if there was a conversation with Mass DOT regarding storm water drainage from the Lake Street improvements. Ms. Crockett stated that she would speak with Mr. Howland regarding that matter. Ms. Crockett stated that so far they have been able to maintain the gross square footage of the school. Members from the School Department expressed their pleasure with the progress of the building.

**ii. Review various issues as a result of inter-departmental meetings with Shrewsbury Town Staff**

Ms. Crockett reviewed some issues as a result of interdepartmental meetings which included the potential to develop a redundant SELCO data center, subsequent to that they have pinpointed other locations. Another feature was a review of options to add a softball site because the existing Beal school has one. One option is to put it across the street however the grading on that land is challenging. Another option is an overlay on the existing field. There was in interest in irrigation for the multipurpose field, in this case that means inserting a well with the committees approval. The committee discussed leaving that option out at the moment given the approximate $150k cost.

**c. Correspondence:**

**i. Email, dated June 12, 2018, from Bryan Moss, 16 Ruthen Circle, re: Beal Sustainability Items**

Bryan Moss appeared before the committee. Mr. Moss reminded the Committee of the sustainability forum that was held in February. Mr. Moss expressed concerns regarding reusable options in the cafeteria rather than styrofoam or plastic, "real" food being served, and climate change. Mr. Kane reminded the committee that the Beal Building is being built with LEED4 standards. Mr. Moss also discussed the options of solar panels and battery storage. Mr. Kane discussed the progress of Green Communities and future sustainability options that could fall under the program. Ms. Crockett responded that LPA is planning to design a dish wash area with an opening to the cafeteria for student drop-off, food preparation is a district decision however there is more prep areas and adequate space in the design to develop that type of program. The building would also have a solar-ready flat roof. SELCO stated that they would also provide electricity from their solar farm. Battery storage is not allocated at this point. There was discussion on using Beal as an emergency shelter. There are no current plans to install showers in the facility, however there is adequate emergency power systems so it could be used as a warming or cooling shelter. Mr. Mizikar does not believe there is a need to add to scope to make this location an emergency shelter due to the numerous facilities already existing in Town. There was also discussion to use the Beal Building as a voting facility. Mr. Kane expressed that the Town's desire is to not use schools as a voting facility. Mr. Crockett stated that they are investigating using the material from the demo of the existing Glavin Building for fill which may be a benefit to the project.

**ii. Letter, dated June 27, 2018, from John McCarthy, Executive Director of MSBA, re: Shrewsbury Preferred Schematic Board Action Letter**

Mr. Kane spoke to Senator Moore, the Glavin Bill is in a non-controversial land transfer queue.

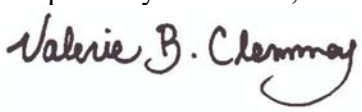
5. **Set date for next meeting**

August 14th is a tentative meeting if there are any matters to be addressed. August 28th is scheduled for the final review of the PSR.

6. **Adjourn**

On a motion by Mr. Masiello, seconded by Ms. Boucher, the committee unanimously voted to adjourn at 7:05 pm.

Respectfully Submitted,

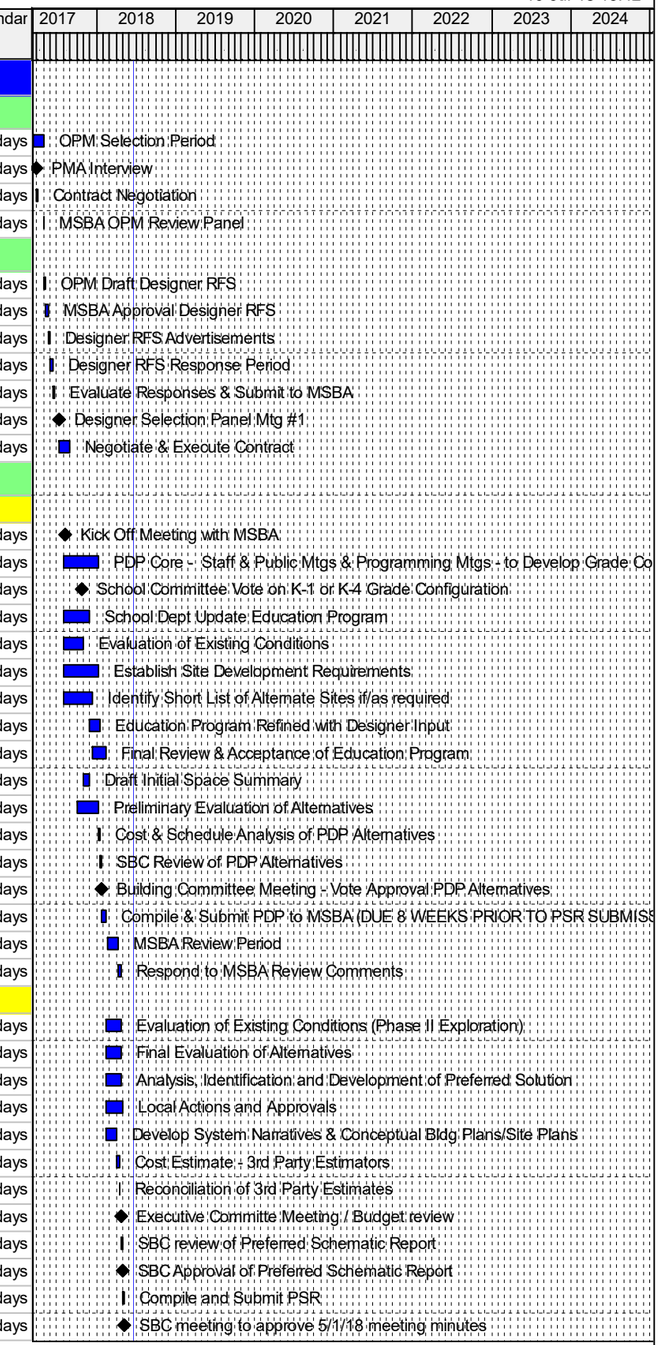


Valerie B. Clemmey
Administrative Assistant

Referenced Materials

Minutes and Bill Schedules as noted above
Budget Summary
Powerpoint Presentation by LPA 07-10-2018
Beal Project Timeline

| Activity ID | Activity Name | Original Duration | Start | Finish | Actual Start | Actual Finish | Total Float | Calendar |
|---|---|---|---|---|---|---|---|---|
| **Update 8 Beal Early Childhood Center (ES) Project - MSBA FS/SD Schedule** | | | | | | | | |
| **OPM Selection** | | | | | | | | |
| A1010 | OPM Selection Period | 33 | 15-Mar-17 A | 01-May-17 A | 15-Mar-17 | 01-May-17 | | Standard 5 Day Workweek w holidays |
| A1000 | PMA Interview | 0 | | 30-Mar-17 A | | 30-Mar-17 | | Standard 5 Day Workweek w holidays |
| A1020 | Contract Negotiation | 4 | 31-Mar-17 A | 06-Apr-17 A | 31-Mar-17 | 06-Apr-17 | | Standard 5 Day Workweek w holidays |
| A1380 | MSBA OPM Review Panel | 2 | 01-May-17 A | 03-May-17 A | 01-May-17 | 03-May-17 | | Standard 5 Day Workweek w holidays |
| **Designer Selection** | | | | | | | | |
| A1030 | OPM Draft Designer RFS | 6 | 04-May-17 A | 12-May-17 A | 04-May-17 | 12-May-17 | | Standard 5 Day Workweek w holidays |
| A1040 | MSBA Approval Designer RFS | 10 | 12-May-17 A | 26-May-17 A | 12-May-17 | 26-May-17 | | Standard 5 Day Workweek w holidays |
| A1060 | Designer RFS Advertisements | 3 | 24-May-17 A | 29-May-17 A | 24-May-17 | 29-May-17 | | Standard 5 Day Workweek w holidays |
| A1050 | Designer RFS Response Period | 13 | 29-May-17 A | 16-Jun-17 A | 29-May-17 | 16-Jun-17 | | Standard 5 Day Workweek w holidays |
| A1070 | Evaluate Responses & Submit to MSBA | 4 | 17-Jun-17 A | 23-Jun-17 A | 17-Jun-17 | 23-Jun-17 | | Standard 5 Day Workweek w holidays |
| A1080 | Designer Selection Panel Mtg #1 | 0 | | 11-Jul-17 A | | 11-Jul-17 | | Standard 5 Day Workweek w holidays |
| A1100 | Negotiate & Execute Contract | 27 | 12-Jul-17 A | 30-Aug-17 A | 12-Jul-17 | 30-Aug-17 | | Standard 5 Day Workweek w holidays |
| **FEASIBILITY STUDY - 9 MONTHS** | | | | | | | | |
| **Preliminary Design Program (6 Months)** | | | | | | | | |
| A1390 | Kick Off Meeting with MSBA | 0 | | 11-Aug-17 A | | 11-Aug-17 | | Standard 5 Day Workweek w holidays |
| A1560 | PDP Core - Staff & Public Mtgs & Programming Mtgs - to Develop Grade Configuration | 59 | 01-Aug-17 A | 11-Jan-18 A | 01-Aug-17 | 11-Jan-18 | | Standard 5 Day Workweek w holidays |
| A1570 | School Committee Vote on K-1 or K-4 Grade Configuration | 0 | | 25-Oct-17 A | | 25-Oct-17 | | Standard 5 Day Workweek w holidays |
| A1110 | School Dept Update Education Program | 85 | 01-Aug-17 A | 01-Dec-17 A | 01-Aug-17 | 01-Dec-17 | | Standard 5 Day Workweek w holidays |
| A1130 | Evaluation of Existing Conditions | 43 | 01-Aug-17 A | 01-Nov-17 A | 01-Aug-17 | 01-Nov-17 | | Standard 5 Day Workweek w holidays |
| A1140 | Establish Site Development Requirements | 85 | 01-Aug-17 A | 11-Jan-18 A | 01-Aug-17 | 11-Jan-18 | | Standard 5 Day Workweek w holidays |
| A1400 | Identify Short List of Alternate Sites if/as required | 85 | 01-Aug-17 A | 12-Dec-17 A | 01-Aug-17 | 12-Dec-17 | | Standard 5 Day Workweek w holidays |
| A1190 | Education Program Refined with Designer Input | 36 | 30-Nov-17 A | 18-Jan-18 A | 30-Nov-17 | 18-Jan-18 | | Standard 5 Day Workweek w holidays |
| A1200 | Final Review & Acceptance of Education Program | 25 | 15-Dec-17 A | 14-Feb-18 A | 15-Dec-17 | 14-Feb-18 | | Standard 5 Day Workweek w holidays |
| A1120 | Draft Initial Space Summary | 6 | 01-Nov-17 A | 30-Nov-17 A | 01-Nov-17 | 30-Nov-17 | | Standard 5 Day Workweek w holidays |
| A1150 | Preliminary Evaluation of Alternatives | 71 | 02-Oct-17 A | 12-Jan-18 A | 02-Oct-17 | 12-Jan-18 | | Standard 5 Day Workweek w holidays |
| A1210 | Cost & Schedule Analysis of PDP Alternatives | 10 | 10-Jan-18 A | 18-Jan-18 A | 10-Jan-18 | 18-Jan-18 | | Standard 5 Day Workweek w holidays |
| A1220 | SBC Review of PDP Alternatives | 3 | 18-Jan-18 A | 23-Jan-18 A | 18-Jan-18 | 23-Jan-18 | | Standard 5 Day Workweek w holidays |
| A1320 | Building Committee Meeting - Vote Approval PDP Alternatives | 0 | | 23-Jan-18 A | | 23-Jan-18 | | Standard 5 Day Workweek w holidays |
| A1160 | Compile & Submit PDP to MSBA (DUE 8 WEEKS PRIOR TO PSR SUBMISSION) | 16 | 24-Jan-18 A | 16-Feb-18 A | 24-Jan-18 | 16-Feb-18 | | Standard 5 Day Workweek w holidays |
| A1170 | MSBA Review Period | 15 | 19-Feb-18 A | 09-Apr-18 A | 19-Feb-18 | 09-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1180 | Respond to MSBA Review Comments | 6 | 10-Apr-18 A | 23-Apr-18 A | 10-Apr-18 | 23-Apr-18 | | Standard 5 Day Workweek w holidays |
| **Preferred Schematic Report (3 Months)** | | | | | | | | |
| A1230 | Evaluation of Existing Conditions (Phase II Exploration) | 34 | 15-Feb-18 A | 27-Apr-18 A | 15-Feb-18 | 27-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1240 | Final Evaluation of Alternatives | 34 | 15-Feb-18 A | 27-Apr-18 A | 15-Feb-18 | 27-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1250 | Analysis, Identification and Development of Preferred Solution | 46 | 15-Feb-18 A | 27-Apr-18 A | 15-Feb-18 | 27-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1260 | Local Actions and Approvals | 55 | 15-Feb-18 A | 02-May-18 A | 15-Feb-18 | 02-May-18 | | Standard 5 Day Workweek w holidays |
| A1410 | Develop System Narratives & Conceptual Bldg Plans/Site Plans | 34 | 15-Feb-18 A | 04-Apr-18 A | 15-Feb-18 | 04-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1420 | Cost Estimate - 3rd Party Estimators | 10 | 05-Apr-18 A | 19-Apr-18 A | 05-Apr-18 | 19-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1430 | Reconciliation of 3rd Party Estimates | 2 | 19-Apr-18 A | 20-Apr-18 A | 19-Apr-18 | 20-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1630 | Executive Committe Meeting / Budget review | 0 | | 24-Apr-18 A | | 24-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1620 | SBC review of Preferred Schematic Report | 5 | 24-Apr-18 A | 30-Apr-18 A | 24-Apr-18 | 30-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1440 | SBC Approval of Preferred Schematic Report | 0 | | 30-Apr-18 A | | 30-Apr-18 | | Standard 5 Day Workweek w holidays |
| A1310 | Compile and Submit PSR | 5 | 01-May-18 A | 09-May-18 A | 01-May-18 | 09-May-18 | | Standard 5 Day Workweek w holidays |
| A1360 | SBC meeting to approve 5/1/18 meeting minutes | 0 | | 08-May-18 A | | 08-May-18 | | Standard 5 Day Workweek w holidays |



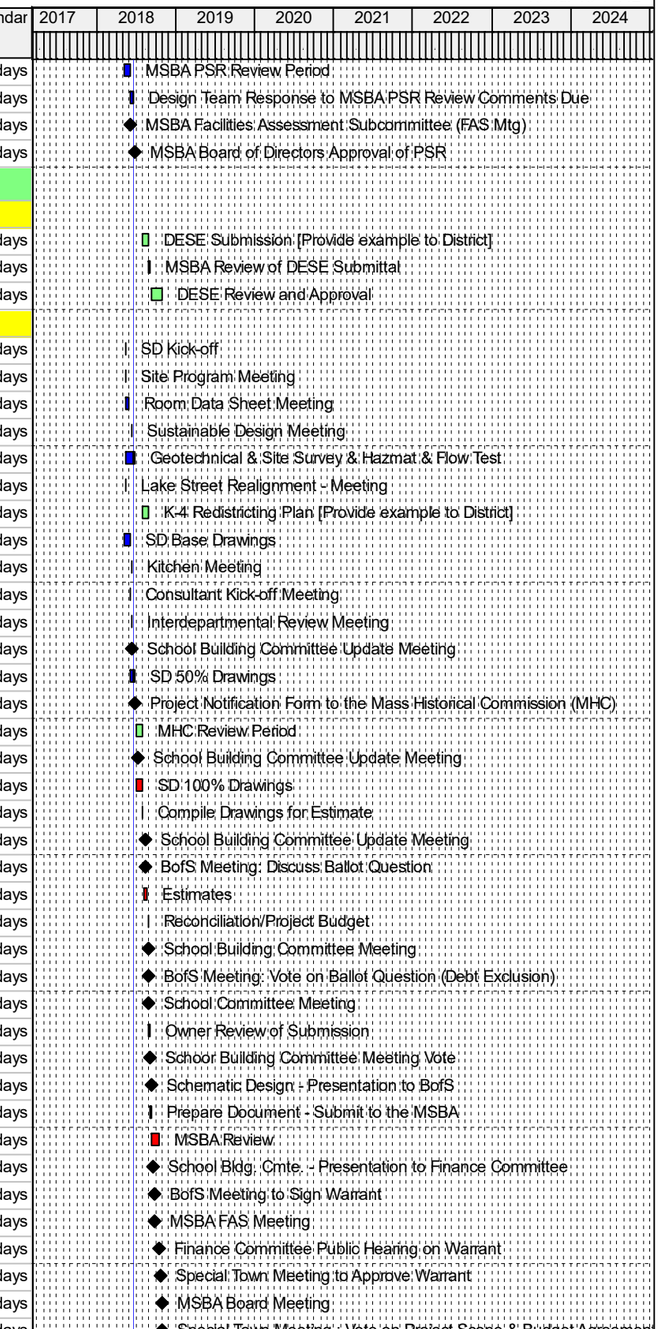

Remaining Level of Effort | Remaining Work | ◆ Milestone
Actual Work | Critical Remaining Work



Note: Preliminary Schedule

Â© Oracle Corporation

| Activity ID | Activity Name | Original Duration | Start | Finish | Actual Start | Actual Finish | Total Float | Calendar |
|---|---|---|---|---|---|---|---|---|
| A1280 | MSBA PSR Review Period | 15 | 09-May-18 A | 06-Jun-18 A | 09-May-18 | 06-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1300 | Design Team Response to MSBA PSR Review Comments Due | 6 | 07-Jun-18 A | 22-Jun-18 | 07-Jun-18 | | 3 | Standard 5 Day Workweek w holidays |
| A1290 | MSBA Facilities Assessment Subcommittee (FAS Mtg) | 0 | | 06-Jun-18 A | | 06-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1270 | MSBA Board of Directors Approval of PSR | 0 | | 27-Jun-18* | | | 0 | Standard 5 Day Workweek w holidays |
| **SCHEMATIC DESIGN (6 Months)** | | | | | | | | |
| **DESE Submittal** | | | | | | | | |
| A1450 | DESE Submission [Provide example to District] | 20 | 03-Aug-18 | 30-Aug-18 | | | 2 | Standard 5 Day Workweek w holidays |
| A1460 | MSBA Review of DESE Submittal | 5 | 31-Aug-18 | 07-Sep-18 | | | 2 | Standard 5 Day Workweek w holidays |
| A1470 | DESE Review and Approval | 39 | 10-Sep-18 | 02-Nov-18 | | | 2 | Standard 5 Day Workweek w holidays |
| **Schematic Design Submittal** | | | | | | | | |
| A1640 | SD Kick-off | 1 | 15-May-18 A | 15-May-18 A | 15-May-18 | 15-May-18 | | Standard 5 Day Workweek w holidays |
| A1650 | Site Program Meeting | 1 | 16-May-18 A | 16-May-18 A | 16-May-18 | 16-May-18 | | Standard 5 Day Workweek w holidays |
| A1660 | Room Data Sheet Meeting | 9 | 15-May-18 A | 31-May-18 A | 15-May-18 | 31-May-18 | | Standard 5 Day Workweek w holidays |
| A1670 | Sustainable Design Meeting | 5 | 13-Jun-18 A | 13-Jun-18 A | 13-Jun-18 | 13-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1680 | Geotechnical & Site Survey & Hazmat & Flow Test | 14 | 15-May-18 A | 29-Jun-18 | 15-May-18 | | 0 | Standard 5 Day Workweek w holidays |
| A1690 | Lake Street Realignment - Meeting | 16 | 18-May-18 A | 18-May-18 A | 18-May-18 | 18-May-18 | | Standard 5 Day Workweek w holidays |
| A1700 | K-4 Redistricting Plan [Provide example to District] | 20 | 03-Aug-18 | 30-Aug-18 | | | 2 | Standard 5 Day Workweek w holidays |
| A1710 | SD Base Drawings | 18 | 09-May-18 A | 09-Jun-18 A | 09-May-18 | 09-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1720 | Kitchen Meeting | 5 | 12-Jun-18 A | 12-Jun-18 A | 12-Jun-18 | 12-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1730 | Consultant Kick-off Meeting | 1 | 05-Jun-18 A | 05-Jun-18 A | 05-Jun-18 | 05-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1740 | Interdepartmental Review Meeting | 5 | 12-Jun-18 A | 12-Jun-18 A | 12-Jun-18 | 12-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1750 | School Building Committee Update Meeting | 0 | | 12-Jun-18 A | | 12-Jun-18 | | Standard 5 Day Workweek w holidays |
| A1760 | SD 50% Drawings | 20 | 04-Jun-18 A | 29-Jun-18 | 04-Jun-18 | | 0 | Standard 5 Day Workweek w holidays |
| A2130 | Project Notification Form to the Mass Historical Commission (MHC) | 0 | | 29-Jun-18 | | | 1 | Standard 5 Day Workweek w holidays |
| A2140 | MHC Review Period | 21 | 02-Jul-18 | 31-Jul-18 | | | 1 | Standard 5 Day Workweek w holidays |
| A1770 | School Building Committee Update Meeting | 0 | | 10-Jul-18 | | | 16 | Standard 5 Day Workweek w holidays |
| A1780 | SD 100% Drawings | 22 | 02-Jul-18 | 01-Aug-18 | | | 0 | Standard 5 Day Workweek w holidays |
| A1790 | Compile Drawings for Estimate | 2 | 02-Aug-18 | 03-Aug-18 | | | 0 | Standard 5 Day Workweek w holidays |
| A1800 | School Building Committee Update Meeting | 0 | | 14-Aug-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A2150 | BofS Meeting: Discuss Ballot Question | 0 | | 14-Aug-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1810 | Estimates | 15 | 06-Aug-18 | 24-Aug-18 | | | 0 | Standard 5 Day Workweek w holidays |
| A1820 | Reconciliation/Project Budget | 2 | 27-Aug-18 | 28-Aug-18 | | | 0 | Standard 5 Day Workweek w holidays |
| A1830 | School Building Committee Meeting | 0 | | 28-Aug-18 | | | 0 | Standard 5 Day Workweek w holidays |
| A2160 | BofS Meeting: Vote on Ballot Question (Debt Exclusion) | 0 | | 28-Aug-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1840 | School Committee Meeting | 0 | | 29-Aug-18 | | | 0 | Standard 5 Day Workweek w holidays |
| A1850 | Owner Review of Submission | 3 | 30-Aug-18 | 04-Sep-18 | | | 0 | Standard 5 Day Workweek w holidays |
| A1860 | Schoor Building Committee Meeting Vote | 0 | | 04-Sep-18 | | | 0 | Standard 5 Day Workweek w holidays |
| A1960 | Schematic Design - Presentation to BofS | 0 | | 11-Sep-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1870 | Prepare Document - Submit to the MSBA | 6 | 05-Sep-18 | 12-Sep-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1880 | MSBA Review | 23 | 13-Sep-18 | 16-Oct-18 | | | 0 | Standard 5 Day Workweek w holidays |
| A2170 | School Bldg. Cmte. - Presentation to Finance Committee | 0 | | 20-Sep-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1970 | BofS Meeting to Sign Warrant | 0 | | 25-Sep-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1890 | MSBA FAS Meeting | 0 | | 26-Sep-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A2180 | Finance Committee Public Hearing on Warrant | 0 | | 18-Oct-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1980 | Special Town Meeting to Approve Warrant | 0 | | 22-Oct-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1900 | MSBA Board Meeting | 0 | | 31-Oct-18* | | | 0 | Standard 5 Day Workweek w holidays |
| A1910 | Special Town Meeting : Vote on Project Scope & Budget Agreement | 0 | | 29-Oct-18 | | | 0 | Standard 5 Day Workweek w holidays |




Remaining Level of Effort | Remaining Work | ◆ Milestone
Actual Work | Critical Remaining Work



Note: Preliminary Schedule

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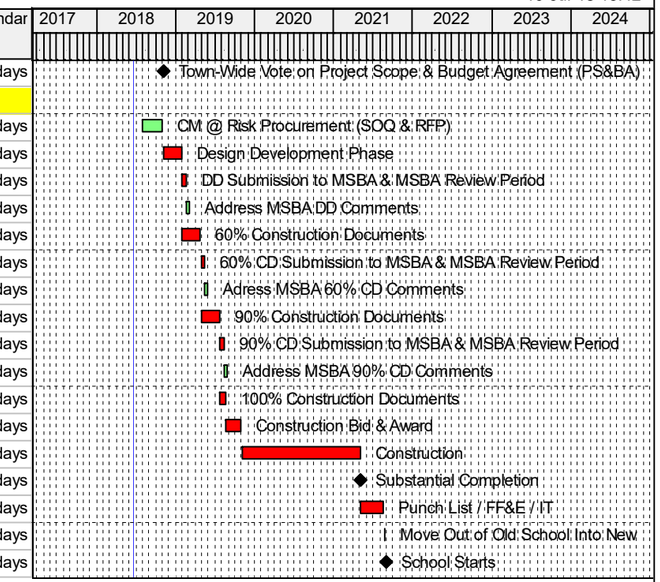
| Activity ID | Activity Name | Original Duration | Start | Finish | Actual Start | Actual Finish | Total Float | Calendar |
|---|---|---|---|---|---|---|---|---|
| A1920 | Town-Wide Vote on Project Scope & Budget Agreement (PS&BA) | 0 | | 06-Nov-18 | | | 0 | Standard 5 Day Workweek w holidays |
| **Design Development Submittal & Construction** | | | | | | | | |
| A1930 | CM @ Risk Procurement (SOQ & RFP) | 65 | 01-Aug-18 | 01-Nov-18 | | | 3 | Standard 5 Day Workweek w holidays |
| A1940 | Design Development Phase | 57 | 07-Nov-18 | 30-Jan-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A1950 | DD Submission to MSBA & MSBA Review Period | 15 | 31-Jan-19 | 21-Feb-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A1990 | Address MSBA DD Comments | 10 | 22-Feb-19 | 07-Mar-19 | | | 640 | Standard 5 Day Workweek w holidays |
| A2000 | 60% Construction Documents | 59 | 01-Feb-19 | 26-Apr-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A2010 | 60% CD Submission to MSBA & MSBA Review Period | 11 | 29-Apr-19 | 13-May-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A2020 | Adress MSBA 60% CD Comments | 11 | 13-May-19 | 27-May-19 | | | 584 | Standard 5 Day Workweek w holidays |
| A2030 | 90% Construction Documents | 60 | 30-Apr-19 | 23-Jul-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A2040 | 90% CD Submission to MSBA & MSBA Review Period | 15 | 24-Jul-19 | 13-Aug-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A2050 | Address MSBA 90% CD Comments | 10 | 14-Aug-19 | 27-Aug-19 | | | 519 | Standard 5 Day Workweek w holidays |
| A2060 | 100% Construction Documents | 21 | 25-Jul-19 | 22-Aug-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A2070 | Construction Bid & Award | 49 | 23-Aug-19 | 01-Nov-19 | | | 0 | Standard 5 Day Workweek w holidays |
| A2080 | Construction | 389 | 04-Nov-19 | 04-May-21 | | | 0 | Standard 5 Day Workweek w holidays |
| A2090 | Substantial Completion | 0 | | 04-May-21 | | | 0 | Standard 5 Day Workweek w holidays |
| A2100 | Punch List / FF&E / IT | 78 | 05-May-21 | 20-Aug-21 | | | 0 | Standard 5 Day Workweek w holidays |
| A2110 | Move Out of Old School Into New | 5 | 23-Aug-21 | 27-Aug-21 | | | 0 | Standard 5 Day Workweek w holidays |
| A2120 | School Starts | 0 | | 30-Aug-21 | | | 0 | Standard 5 Day Workweek w holidays |




Remaining Level of Effort | Remaining Work | ◆ Milestone
Actual Work | Critical Remaining Work



Note: Preliminary Schedule

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# Shrewsbury Public Schools

School Committee – Television Show Taping
Thursday, July 5, 2018 at 7:00 pm
Shrewsbury Media Connection Studio – 15 Parker Road

Members of the School Committee will record an episode of the *School Talk* television show on this date and time. While no formal actions will be taken, the Committee will discuss issues pertaining to the School Department, including the Beal School project.

RECEIVED
TOWN CLERK'S OFFICE
2018 JUN 20 AM 9:00
SHREWSBURY, MASS

*The Shrewsbury Public Schools, in partnership with the community, will provide students with the skills and knowledge for the 21st century, an appreciation of our democratic tradition, and the desire to continue to learn throughout life.*

9.12.2018 OPM Note (Local Actions & Approvals - SD Submission : New Beal ES Project)
DRAFT Version
School Committee vote to approve minutes scheduled for the regular 9.12.2018 meeting.

# SHREWSBURY PUBLIC SCHOOLS
# 100 MAPLE AVENUE
# SHREWSBURY, MASSACHUSETTS

## MINUTES OF SCHOOL COMMITTEE MEETING

## Wednesday, August 29, 2018

Present: Mr. Jason Palitsch, Chairperson; Ms. Erin Canzano, Vice Chairperson; Ms. Sandy Fryc, Secretary; Mr. Jon Wensky; Mr. Patrick Collins, Assistant Superintendent for Finance and Operations; Ms. Amy B. Clouter, Assistant Superintendent for Curriculum & Instruction; and Dr. Joseph Sawyer, Superintendent of Schools.
Not present: Dr. B. Dale Magee, School Committee Member; Ms. Barb Malone, Director of Human Resources.

A complete audio/visual recording of this meeting is available on the Shrewsbury Public Schools website.

The meeting was convened by Mr. Palitsch at 7:00 pm.

**Special Opening**

The Shrewsbury High School (SHS) A Cappella Choir, under the direction of Music Teacher Michael Lapomardo, performed "The Star Spangled Banner." Dr. Sawyer congratulated Mr. Lapomardo on being recognized earlier in the week with a Superintendent's Award at Opening Day for Staff at Shrewsbury Public Schools (SPS).

**I. Public Participation**
None.

**II. Chairperson's Report & Members' Reports**
None.

**III. Superintendent's Report**

Dr. Sawyer recognized the other winners of Superintendent's Awards at Opening Day for staff: Jennifer DiFrancesca, Director of Social Sciences, Shrewsbury High School (Jayne M. Wilkin Award); Chris Girardi, Principal, Beal Early Childhood Center (Thomas M. Kennedy Award); Robert Cox, Superintendent of Public Buildings, Town of Shrewsbury; Norma Chico, Physics Teacher, Shrewsbury High School; Greg Marceau, Video Technician/Telecommunications Specialist, Shrewsbury High School; Kelly Sutton, ABA Technician, Spring Street School; Kristen Minio, Adjustment Counselor, Oak Middle School; Bryant Clark, Music Teacher,

Sherwood and Oak Middle Schools; Karin Freeman, Secretary, Beal Early Childhood Center.

Dr. Sawyer announced that he received permission from the School Committee to rename Ms. Meg Belsito's position in the district to *Assistant Superintendent for Student Services* to better reflect the breadth, scope, and responsibilities of the role.

Dr. Sawyer advised that SPS enjoyed an outstanding opening to the start of the school year even while high heat and humidity made the physical environment difficult in the many classrooms and spaces in the district without climate control to address those conditions. Dr. Sawyer advised that, in addition to the new Beal Building Project, existing infrastructure over time needs to move to a place that will provide appropriate conditions during increasingly frequent, and dramatic, heat-related weather events.

**IV. Time Scheduled Appointments:**
**A. Beal Early Childhood Center Building Project: Report & Discussion**

Ms. Kathryn Crockett, President, Lamoureux Pagano Associates; Mr. Sean Brennan, Architect, Lamoureux Pagano Associates; and Mr. Paul Queeney, Owner's Project Manager, PMA Associates, gave a report to the Committee on the status of the Beal Early Childhood Center (BECC) project that incorporated an overview, history, cost information, next steps, and detailed information on the Schematic Design phase (size, design, layout). The team, Dr. Sawyer, and Mr. Collins addressed clarifying questions from the Committee on MSBA reimbursement, baseline costs, differences between proposed and MSBA gross square footage (GSF) and shared space usage.

Mr. Palitsch requested feedback on this phase of the project for Ms. Fryc (who represents the School Committee on the BECC Building Committee). Committee members noted the importance of "right-sizing" the new school and addressing issues at other schools; appreciated thoughtful use of green spaces; and felt cost information was thoroughly explained and were supportive of the schematic design as presented. Dr. Sawyer noted that he has received feedback that the Glavin Center site works well for a school and that the educational program plan for the building authored by Ms. Clouter was cited by the MSBA as one of the best they have received, and added that the new school was much needed and represented good value for the community.

**V. Curriculum**
None.

**VI. Policy**
**A. Adoption of Town Policies for Energy Reduction & Fuel Efficient Vehicles: Discussion**

Dr. Sawyer advised that in order for the Town of Shrewsbury to be designated a "Green Community" through the Commonwealth of Massachusetts Green Community Designation & Grant Program, the school district must adopt the town's Energy Reduction Plan and the Fuel Efficient Vehicle Policy. Dr. Sawyer and Mr. Collins noted that presently the fuel policy

only applies to one SPS vehicle since buses are not included, and advised that since SPS buildings are maintained by the Public Buildings Department, much of the energy reduction plan falls under their purview.
Mr. Palitsch noted he would be happy to see SPS participate, and advised that the Committee would vote at their September 12, 2018, meeting.

**VII.Finance & Operations**
**A. SHS Athletic Facilities Project & Summer School Maintenance: Report**

In his report, Mr. Collins provided an update on track and field construction, as well as related projects, at Shrewsbury High School; gave a budget status (noting that the athletic facility project is "on budget" as of August 20, 2018); described the impact of the project on athletic schedules; and discussed other summer facility projects at SPS. The Committee asked about the timeframes of related turf projects and thanked Mr. Collins and the fundraising team for their work on the Campaign for Shrewsbury Athletic Fields.

**B. Campaign for Shrewsbury Athletic Fields: Vote to Accept Gifts**

On a motion by Mr. Wensky, seconded by Ms. Fryc, the Committee voted unanimously to accept gifts of $5,000 each from Flint Pond Village, Lamoreaux Pagano & Associates, Tom & Barbara Peters/Mid State Kitchens, and David & Andrea Lowy, for the Campaign for Shrewsbury Athletic Fields.

**C. Fiscal Year 2019 State Aid: Report**

Mr. Collins's report compared prior estimates and charges for state aid for FY19 to actual amounts finalized in the state budget process. He listed General Fund (Town) receipts and charges by category, and School Department receipts by category, noting that actual FY19 state aid and charges amounts budgeted by the Town Manager and School Department were very close to the actuals/updated estimates published at the completion of the state budget process.

**D. Fiscal Year 2019 Grants: Report & Vote to Accept**

In his report, Mr. Collins listed federal and state grants for FY19, compared these to FY18 (SPS will receive $183,056 less, primarily due to a reduction in Title I funding), and provided a five year history. It was noted that many entitlement grants are noncompetitive and based on need. In response to questioning from the Committee, Ms. Clouter provided additional information on Title I funding, and Dr. Sawyer noted the loss of Full Day Kindergarten (FDK) grant funding for the past three years due to the state discontinuing this grant as the vast majority of school districts in Massachusetts now offer full day kindergarten to all students, and that space limitations prevent Shrewsbury from offering it to all interested students.

On a motion by Mr. Wensky, seconded by Ms. Fryc, the Committee voted unanimously to accept all FY19 grant funds noted in the enclosed chart and use such funds for their intended purpose.

**VIII. Old Business**
None.

**IX. New Business**
None.

**X. Approval of Minutes**

Without objections from the Committee, the minutes from the School Committee Workshop held on August 22, 2018 were accepted as distributed.

**XI. Executive Session**
None.

**XII. Adjournment**

On a motion by Mr. Wensky, seconded by Ms. Fryc, the committee unanimously agreed to adjourn the meeting at 8:58 pm. Roll call votes were as follows: Mr. Wensky, yes; Ms. Fryc, yes; Ms. Canzano, yes; Mr. Palitsch, yes.

Respectfully submitted,

Elizabeth McCollum, Clerk

Documents referenced:

1. Beal Early Childhood Center Project Report
2. Town of Shrewsbury Fuel Efficient Vehicle Policy
3. Town of Shrewsbury Energy Reduction Plan Draft
4. FY19 State Aid Status Update Report
5. FY19 State Aid Status Update Slide Presentation
6. FY19 Grant Acceptances Report
7. Turf and Summer Project Update Slides
8. Set(s) of Minutes as Referenced Above

# 4.1.3 SCHEMATIC DESIGN PROJECT MANUAL

A. List of Specifications Sections
B. Proprietary Items

# 4.1.3 SCHEMATIC DESIGN PROJECT MANUAL

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*Note: Sections in red italic to be included in future phases*

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*Document 00 21 13 Instructions to Bidders*
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*BidDocs ONLINE Form for Sub-Bid*
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Section 01 78 36 Warranties
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- LEED v4 Materials Reporting Form
- LEED for Schools v4 Project Scorecard

Section 01 81 19 Indoor Air Quality Requirements
*Section 01 91 13 Commissioning Requirements-Provided by Commissioning Agent*

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*Appendix B Boring Logs and Locations*
*Appendix C Double Ring Infiltrometer Tests*
*Appendix D Soils Management Letter*
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Section 26 05 33 Raceway and Boxes for Electrical Systems
Section 26 05 48 Vibration and Seismic Controls for Electrical Systems
Section 26 05 53 Identification for Electrical Systems
Section 26 05 73 Overcurrent Protective Device Coordination Study
Section 26 09 13 Electrical Power Monitoring and Control
Section 26 09 36 Dimming Controls
Section 26 09 43 Network Lighting Controls
Section 26 22 00 Low-Voltage Transformers
Section 26 24 13 Switchboards
Section 26 24 16 Panelboards
Section 26 24 19 Motor Controls
Section 26 27 26 Wiring Devices
Section 26 27 29 Electrical Vehicle Charging Station
Section 26 28 13 Fuses
Section 26 28 16 Enclosed Switches and Circuit Breakers
Section 26 32 13 Engine Generators
Section 26 36 00 Transfer Switches
Section 26 41 13 Lightning Protection for Structures
Section 26 51 00 Interior Lighting
Section 26 56 00 Exterior Lighting

**DIVISION 27 — COMMUNICATIONS**
Section 27 11 00 Communications Equipment Room Fittings
Section 27 13 00 Communications Backbone Cabling
Section 27 15 00 Communications Horizontal Cabling
Section 27 17 10 Testing of Fiber Infrastructure
Section 27 17 20 Testing of Balanced Twist Pair Infrastructure
Section 27 21 00 Data Communications Network Equipment
Section 27 31 00 Voice Communications Equipment
Section 27 41 00 Audio-Video Communications
Section 27 41 20 Speech Reinforcement System
Section 27 51 16 Public Address System
Section 27 53 19 Public Safety Radio Distributed Antenna System

**DIVISION 28 — ELECTRONIC SAFETY AND SECURITY**
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Section 28 31 11 Addressable Fire-Alarm System

**DIVISION 31 — EARTHWORK**
Section 31 10 00 Site Clearing
Section 31 20 00 Earth Moving
Section 31 25 00 Erosion and Sedimentation Controls

**DIVISION 32 — EXTERIOR IMPROVEMENTS**
Section 32 12 16 Asphalt Paving
Section 32 13 13 Pedestrian Concrete Paving
Section 32 14 13 Concrete Unit Paving
Section 32 14 40 Granite Pavement
Section 32 15 43 Stabilized Aggregate Paving
Section 32 18 16.12 Rubber Safety Surfacing
Section 32 31 13 Chain Link Fence and Gate
Section 32 31 15 Metal Fence and Gate
Section 32 32 23 Segmental Retaining Walls

Section 32 80 00 Irrigation System
Section 32 91 13.16 Mulch
Section 32 91 19 Landscape Grading
Section 32 92 00 Lawns and Grasses
Section 32 93 00 Trees, Plants and Groundcovers
Section 32 94 00 Bioretention

**DIVISION 33 — UTILITIES**
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Section 33 20 00 Drilled Well for Irrigation System
Section 33 30 00 Sanitary Sewerage Utilities
Section 33 40 00 Storm Drainage Utilities

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# 4.1.3 SCHEMATIC DESIGN PROJECT MANUAL

## B. Proprietary Items

The following is a list of proposed proprietary items for the Beal Elementary project. All of the items are used throughout the District and for maintenance, training, and system continuity reasons are desired for the new facility.

1. Sloan Flushometers
2. Sargent Locksets
3. Epson short throw projector
4. Aerohive Wifi
5. Cisco Network
6. Rawlings with Telecenter lockdown security
7. Brivo Access Controls

A formal vote of approval by the required Shrewsbury entities will take place during the Design Development phase of the project.

# 4.1.4 SCHEMATIC DESIGN DRAWINGS

A. Drawing List

# 4.1.4 SCHEMATIC DESIGN DRAWINGS

A. Drawing List

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L1.2 Grading
L1.3 Grading
L2.0 Materials & Lighting Drawing Key
L2.1 Materials & Lighting
L2.2 Materials & Lighting
L2.3 Materials & Lighting
L3.0 Planting Drawing Key
L3.1 Planting
L3.2 Planting
L3.3 Planting

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C3.0 Site Preparation Plan
C3.1 Site Preparation Plan
C3.2 Site Preparation Plan
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C5.1 Roadway Layout and Materials Plan
C5.2 Roadway Layout and Materials Plan
C8.0 Site Utility Plan
C8.1 Site Utility Plan
C8.2 Site Utility Plan
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C11.1 Civil Detail Sheet
C11.2 Civil Detail Sheet
C11.3 Civil Detail Sheet
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EX1.1 Existing Conditions Plan
EX1.2 Existing Conditions Plan

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A5.1 Exterior Elevations
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