



Cheryl J. Lyman  
Executive Director

Volume 1 of 3

**Construction Document Submission  
For**

**Massillon City Schools District Board  
of Education**

**New Eastside PK-3 Elementary School**

1 Paul E Brown Dr. SE, Massillon, OH 44646

July 12, 2023





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October 21, 2021

Ms. Elizabeth Most  
Project Manager  
Architectural Vision Group, LTD.  
23850 Sperry Drive  
Westlake, Ohio 44145

Re: Draft Report of Geotechnical Services  
Proposed New Elementary School  
Washington High School Site  
1 Paul E Brown Drive Southeast  
Massillon, Stark County, Ohio  
**PSI Project No.: 0142-2428**

Dear Ms. Most:

Per your request, Professional Service Industries, Inc. (PSI) is pleased to submit this Geotechnical Engineering Services Report for the above referenced project. The results of this exploration, together with our recommendations, are to be found in the accompanying report.

After the plans and specifications are complete, PSI should review the final design and specifications in order to verify that the earthwork and recommendations are properly interpreted and implemented. **It is considered imperative that the geotechnical engineer and/or its representative be present during earthwork operations and foundation installations to observe the field conditions with respect to the design assumptions and specifications. PSI will not be held responsible for interpretations and field quality control observations made by others.**

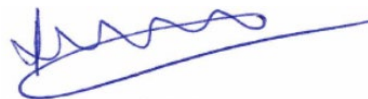
If you have any questions pertaining to this report, please contact our office at (216) 447-1335. PSI would be pleased to continue providing geotechnical services throughout the implementation of the project, and we look forward to working with you and your organization on this and future projects.

Respectfully submitted,

**PROFESSIONAL SERVICE INDUSTRIES, INC.**

A handwritten signature in black ink, appearing to read "Zaineddin Obeid".

Zaineddin Obeid  
Project Engineer

A handwritten signature in blue ink, appearing to read "A. Veeramani".

A. Veeramani, P.E.  
Director/Principal Consultant

**Subsurface Exploration Report**



**For the Proposed**

**New Elementary School  
Washington High School Site  
1 Paul E Brown Drive Southeast  
Massillon, Stark County, Ohio**

A black ink signature of Zaineddin Obeid.

**Zaineddin Obeid  
Project Manager**

**Prepared for**

**Architectural Vision Group, LTD.  
23850 Sperry Drive  
Westlake, Ohio 44145**

**Prepared by**

**Professional Service Industries, Inc.  
5555 Canal Road  
Cleveland, OH 44125**

A blue ink signature of A. Veeramani.

**A. Veeramani, P.E.  
Director/Principal Consultant**

**PSI Project No. 0142-2428**

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## 1 PROJECT INFORMATION

### 1.1 PROJECT AUTHORIZATION

This report presents the results of a geotechnical subsurface exploration and evaluation conducted for Architectural Vision Group, LTD., in connection with the proposed New Elementary School located at 1 Paul E Brown Drive Southeast, in Massillon, Stark County, Ohio. PSI's services for this project were performed in accordance with PSI Proposal No. 0142-354720, dated September 23, 2021. Authorization to perform this exploration and analysis was in the form of a proposal authorization form, signed by Ms. Elizabeth Most, Project Manager, of Architectural Vision Group, LTD., dated September 23, 2021.

### 1.2 PROJECT DESCRIPTION

Based on the provided information, it is understood that the proposed development will include the construction of a new elementary school building to be located east of the existing Washington High School. The proposed building will be one to two-stories, measuring approximately 60,000 to 80,000 square feet in plan area. Additionally, the project includes the construction of paved parking lots and driveways.

No structural loading information was provided at the time of this report. However, PSI has made the following assumptions, the maximum column, wall, and floor loads for the school building will be 150 kips, 7 kips per linear foot, and 100 pounds per square foot (psf), respectively.

Based on the provided topographic plan, the overall site generally slopes downward from northeast to southwest with an elevation difference about 50 feet (1,090' MSL to 1,040' MSL). No grading plan is available at the time of this report. However, it is assumed that the maximum cut and fill operations of about 10 feet will be required for the proposed building area and some cut/fill as required will be anticipated within the proposed pavement area.

***It should be noted that this subsurface exploration has been conducted to provide preliminary geotechnical information relative to the general suitability of the site area for the proposed development. This preliminary exploration is not to be construed as a final definitive study; therefore, a final geotechnical study will be required prior to final design and construction, including additional test borings, laboratory tests, and analysis.***

The geotechnical recommendations presented in this report are based on the available project information, the proposed building location and orientation of the building on the site, and the subsurface materials described in this report. If any of the information we have been given or have assumed is incorrect, please contact us so that we may amend the recommendations presented accordingly. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

### 1.3 PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to explore the subsurface conditions at the site and to prepare recommendations for foundations, floor slab construction, site preparation, and other construction considerations. Our scope for this service included a project site reconnaissance, drilling and sampling fifteen (15) test borings, completing a laboratory testing program, and submitting an engineering analysis and evaluation of the subsurface materials.

The scope of services for the geotechnical exploration did not include an environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors or unusual or suspicious items or conditions are strictly for the information of the client. PSI's scope also did not include any service to investigate or detect the presence of moisture, mold or other biological contaminants in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence or the amplification of the same. The Client should be aware that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. The Client should also be aware that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence or reoccurrence of mold amplification.

## **2 SITE AND SUBSURFACE CONDITIONS**

### **2.1 SITE LOCATION AND DESCRIPTION**

The site for the proposed New Elementary School project is located at located at 1 Paul E Brown Drive Southeast, in Massillon, Stark County, Ohio. Specifically, the proposed New Elementary School will be located immediately east of the existing Washington High School football stadium and baseball field (Lat: 40.792998° & Long: -81.497825°).

The site is currently predominantly covered with an asphalt paved football practice field and school bus parking facility with associated building structure. The rest of the site area is undeveloped, covered with some light brush and gravel. Based on the provided topographic plan, the overall site generally slopes downward from northeast to southwest with an elevation difference about 50 feet (1,090' MSL to 1,040' MSL). Surface drainage was good to fair at the time of the field drilling operations. PSI recommends that any existing utility lines be checked and marked prior to construction activities.

### **2.2 SUBSURFACE CONDITIONS**

The surface and subsurface conditions at the site were explored with a total of eighteen (18) test borings. The test borings were each drilled to a depth of approximately 10 to 20 feet below the existing surface grades. The approximate boring locations are shown on the Boring Location Plan presented in the *Appendix* of this report. The locations for the test borings were selected by PSI and located in the field relative to existing site features and based on site accessibility and the presence of below ground utilities.

The borings were advanced utilizing 3¼ inch inside diameter, hollow-stem auger drilling methods. Soil samples were routinely obtained during the drilling process. Selected soil samples were later tested in the laboratory to obtain soil material properties for the foundation, floor slabs and pavement recommendations. Drilling, sampling, and laboratory testing were accomplished in general accordance with ASTM procedures.

The types of subsurface materials encountered in the test borings have been visually classified. The results of the visual classifications, Standard Penetration tests, moisture contents and water level observations are presented on the boring logs in the *Appendix* of this report. Representative samples of the soils were placed in sample jars and are now stored in the laboratory for further analysis, if requested. Unless notified to the contrary, all samples will be disposed of after 60 days following the date of this report.

The surface of the site at test boring locations B-01, B-03, B-04, B-07, B-10, B-16 and B-17 was covered with a layer of topsoil measuring approximately 1 to 12 inches in thickness. Boring Locations B-02, B-05, B-08, B-11, B-14 and B-15 were covered with a layer of gravel measuring approximately 1 to 2 inches in thickness. Boring locations B-06 and B-13 were covered with a layer of asphalt measuring approximately 2 to 3 inches in thickness, of which B-6 was underlain with a layer of sand and gravel measuring approximately 21 inches in thickness. Boring location B-18 was covered with a layer of sand and gravel measuring approximately 12 inches in thickness. The thickness and composition of the surface and base materials should be expected to be variable throughout site.

Underlying the surface material at test boring locations B-04, B-11, B-15 and B-18, a layer of fill material was encountered, extending to the depths of about 3 to 6 feet below the existing grade. The fill material consisted primarily of sandy silt and lean clay with varying amounts of gravel, cinders, slag, and cobbles. The fill material exhibited moisture contents ranging from 9 to 19 percent. The cohesive fill materials exhibited a soft to stiff consistency, based on the Standard Penetration tests.

The surface and fill materials at all the test boring locations B-01 through B-18 were underlain by natural soils. The natural soils at the test borings location B-16 was extended to the depths about 13.3 feet below the existing surface grades and the natural soils at the test boring locations B-01 through B-15, B-17, and B-18 were encountered to the terminal depth of about 10 to 20 feet below the existing surface grades. The natural soils consisted primarily of lean clay, sandy silt and silty sand with varying amounts of gravel and rock fragments. The natural soils exhibited moisture contents ranging from 5 to 27 percent. The natural cohesive soils exhibited a medium stiff to hard consistency, and the natural granular soils exhibited a loose to medium dense relative density, based on the Standard Penetration tests.

The area's bottommost formation consisted of gray, weathered sandstone bedrock, encountered in test boring B-16.

The subsurface description is of a generalized nature provided to highlight the major strata encountered. The boring logs included in the Appendix should be reviewed for specific information at the individual boring locations. The stratifications shown on the boring logs represent the conditions only at the actual test positions. Variations may occur and should be expected between the boring locations. The stratifications represent the approximate boundary between the subsurface materials, and the transition may be gradual or not clearly defined.

## **2.3 GROUNDWATER LEVEL MEASUREMENTS**

Groundwater was encountered in test boring locations B-16 and B-18 at a depth of 9.5 to 13 feet below existing surface grade during the field drilling operations. Note that groundwater levels fluctuate seasonally as a function of rainfall. During a time of year or weather different from the time of drilling, there may be a considerable change in the water table. Furthermore, the water levels in the boreholes often are not representative of the actual groundwater level, because the boreholes remain open for a relatively short time. Therefore, we recommend that the contractor determine the actual groundwater levels at the time of construction to evaluate groundwater impact on the construction procedures.

### **3 EVALUATION AND RECOMMENDATIONS**

#### **3.1 SITE PREPARATION AND EARTHWORK CONSTRUCTION**

Prior to placing concrete floors or engineered fill on this site, general site area clearing should be carried out. All base, topsoil, grass, roots, excessively wet soils, highly organic soils, and soft/loose or obviously compressible materials, should be completely removed from the proposed construction areas. Depending up on the final grades, the unsuitable fill material, as evidenced at all test boring locations B-04, B-11, B-15 and B-18 should be completely removed from below the proposed building foundation footprint, and to a minimum depth of 12 inches below the proposed pavement subgrade elevations and replaced with compacted engineered fill. The precise extent of required cut and fill should be determined in the field by a representative of PSI following observation of the exposed subgrades and proof rolling operations.

Following the site clearing, stripping and undercutting, and prior to placing engineered fill, the exposed subgrades should be critically proof rolled with a loaded 20-ton tandem-axle dump truck until the grade offers a relatively unyielding surface. Areas of excessive yielding, as observed by a geotechnical engineer's representative, should be excavated and backfilled with compacted engineered fill and/or the unstable soils can be stabilized by choking the exposed bearing surface with crushed limestone or similar coarse aggregate. After the existing subgrade materials are excavated to design grade, proper control of subgrade compaction and the placement and compaction of new fill materials should be observed and tested by a representative of PSI.

It is recommended that the site preparation, proof rolling, and earthwork activities should be performed during a period of dry weather, which can significantly reduce the required extent of soil stabilization, drainage and surface repairs.

During site preparation, fill piles, burn pits, trash pits or other isolated disposal areas may be encountered. All too frequently such buried material occurs in isolated areas outside boring locations. Any such material encountered during site work, or foundation, floor slab or pavement construction should be excavated, removed from the site, and backfilled with compacted structural fill.

#### **3.2 ENGINEERED FILL**

Materials selected for use as engineered fill should not contain more than 5 percent by weight of organic matter, waste construction debris, or other deleterious materials. Fill materials should have a Standard Proctor maximum dry density (ASTM D-698) greater than 110 pounds per cubic foot (pcf), an Atterberg Liquid Limit of less than 40, a Plasticity Index of less than 15, and a maximum particle size of 3 inches or less. Engineered fill materials should consist of non-expansive materials. Pyritic and/or potentially expansive materials, such as mine tailings, shales and slag should not be used as engineered fill material.

Based on the results of the boring explorations, the on-site soils not suitable for reuse as engineered fill. If the on-site soils are used for fill, close moisture content control will be required to achieve the recommended degree of compaction. PSI anticipates that disking and aerating the soils during a warm, dry period may be necessary to lower the moisture content. If engineered fill placement must proceed during a wet or cool time of the year, it may likely be infeasible to re-use the on-site soils as engineered fill and imported fill materials would be required. If wet or cool season earthwork is necessary, we recommend the use of imported fill materials such as ODOT No. 304 or 411 crushed aggregate.

Representative samples of the proposed fill materials should be collected at least one week prior to the start of the filling operations. The samples should be tested to determine the maximum dry density, optimum moisture content, particle size distribution and plasticity characteristics. These tests are needed to determine if the material is acceptable as structural fill and for quality control during the compaction process.

Engineered fill materials should be placed and compacted in individual lifts of 8 inches or less loose measurement. Within small excavations such as in utility trenches, around manholes, or behind retaining walls, we recommend the use of smaller, hand- or remote-guided equipment. Loose lift thicknesses of 4 inches or less are recommended when using such equipment.

We recommend that structural fill be compacted to a minimum of 98 percent of the maximum dry density and within  $\pm 2\%$  of the optimum moisture content, as determined by ASTM D-698. A representative of PSI should observe fill placement operations and perform density tests concurrently to indicate if the specified compaction is being achieved.

### **3.3 FOUNDATION RECOMMENDATIONS**

Based on the test boring results, laboratory test results, and the proposed construction, our analysis indicates that the proposed building structure can be supported on isolated and/or continuous spread-footing foundations, bearing on the existing natural soil or on properly compacted engineered fill, will be suitable to support the proposed building structure. An allowable bearing capacity of 2,500 psf may be utilized for the design of the spread-footing foundations.

All perimeter footings must be placed at a minimum depth of 42 inches below the finished grade in order to protect against frost action. Interior foundations in heated areas may be placed at a depth of at least 18 inches below the floor slab, provided they will be bearing on acceptable natural or compacted engineered fill soils.

Extreme care should be taken to prevent weakening of the foundation bearing materials because of prolonged atmospheric exposure, construction activity disturbance or an increase in moisture content. If an overnight delay in concrete placement is anticipated, the foundation excavations should be cut approximately 6 inches and subsequently excavated to final grade immediately before placement of concrete.

In order to reduce the effects of differential movement that may occur due to variations in the character of the supporting soil and any variations in seasonal moisture contents, it is recommended that all continuous footings be reinforced, as per structural considerations. Foundations supporting individual columns should have a minimum dimension of 24 inches, and continuous wall foundations should have a minimum width of 18 inches.

Based on the assumed structural loads, it is anticipated that total and differential foundation settlements will be less than 1.0-inch and 0.50-inch, respectively. However, actual settlements will be dependent upon the depth of the foundations, column spacing, structural loads and other related factors. The structural and architectural design should include provisions for liberally spaced, vertical control joints to minimize the effects of potential settlement.

Control points should be established within the anticipated fill areas (more than 4 feet) to monitor, during and subsequent to the completion of the fill operations, any and all settlements of the final grade resulting from



consolidation of the area's subsurface materials under the weight of the engineered fill, and from the engineered fill under their own weight. Settlement-time data, thus developed, should be employed to establish the time of placement of the building structure and pavement areas.

PSI should be retained to provide observation and testing of construction activities involved in the foundation, earthwork and related activities of this project. PSI cannot accept responsibility for conditions that deviate from those described in this report, nor for the performance and testing for this project.

Based on table 1615.1.1 of the OBC Building Code, the test boring results, and review of the geology in vicinity to the project area, a **Site Classification of 'C'** can be utilized for the seismic design.

### **3.4 FLOOR SLAB DESIGN AND CONSTRUCTION**

Preparation of floor slab subgrades should be in accordance with the recommendations outlined in the *Site Preparation* and *Engineered Fill* sections of the report. If subsurface materials at the finished subgrade elevations exhibit excessive moisture contents and unstable subgrade conditions, then undercutting and replacement of the objectionable soils should be performed to achieve firm subgrade support. Alternatively, the unstable soils can be stabilized by choking the exposed bearing surface with crushed limestone or similar coarse aggregate.

After the soils in the building area have been prepared as discussed, it is recommended that the subgrade surface be subjected to surface compaction to the extent that a minimum of 24 inches of materials underlying the slab subgrade elevation achieve a minimum in-place density of 98 percent of the maximum laboratory dry density and should be within  $\pm 2\%$  of the optimum moisture content, as determined in general accordance with ASTM D-698.

A capillary gravel layer (such as AASHTO #57 or ODOT #304) should be provided between the floor slab and the approved subgrade materials. The gravel layer should have a minimum thickness of 6 inches and should be properly compacted. Also, a vapor barrier is recommended below the floor slab as per ACI specifications. We recommend that a subgrade modulus (k) of 80 pci be used in floor slab design calculations.

Careful field control is to be exercised in finish grading operations in order to assure that subgrade tolerances are maintained. It is particularly important that no low sectors or depressions be allowed to exist within these areas, water may accumulate and lead to serious loss of supporting capacity.

The floor slab should be suitably reinforced, as per structural considerations, to make it as rigid as practical. Proper joints should be provided at the junctions of the slab and foundation system so that a small amount of independent movement can occur without causing damage. Large floor areas should be provided with joints at frequent intervals to compensate for concrete volume changes during curing and temperature changes.

### **3.5 PAVEMENT RECOMMENDATIONS**

Pavement design will include proper preparation of subgrade sectors, careful design of the pavement area drainage systems and utilization of an aggregate base course with asphalt concrete or concrete surface course. Preparation of pavement subgrades should be in accordance with the recommendations outlined in the *Site Preparation* and *Engineered Fill* sections of the report. Careful attention will be required in fine grading the subgrade surfaces in order to eliminate undulations and depressions that would tend to collect water.

We recommend that the exposed surface be proof rolled, and any soft areas removed. Compaction of fill soil intended to support pavement should meet or exceed 98% of the maximum dry density as determined by ASTM D698 (Standard Proctor). The moisture content at the time of compaction should be within 2% of the optimum value. Any removed soil should be replaced by compacted structural fill to arrive at the desired grade.

The proposed pavement construction will be primarily for car and bus traffic. No traffic loading information was provided at the time of this report. However, PSI has assumed average daily traffic (ADT) of about 150 cars, 30 buses, and 2 semi-trucks. Based on the anticipated pavement design information, the following pavement design parameters may be utilized for new pavement design:

Design Parameters		
	Flexible Pavement	Rigid Pavement
Light Duty design 18-kip ESAL's	50,000	50,000
Heavy Duty design 18-kip ESAL's	200,000	200,000
Reliability:	80%	80%
Overall Deviation:	0.49	0.39
Design Life (Years):	20	20
Initial Serviceability:	4.5	4.2
Terminal Serviceability:	2.5	2.5
Design CBR	4	--
Subgrade Modulus (k, pci)	--	80

#### Flexible Pavement

The recommended pavement thickness values are shown in Tables 1 and 2. These design thicknesses assume that a properly prepared subgrade has been achieved.

**Table 1: Flexible Pavement Sections (20-Year Design Life)**

	Light-Duty*	Heavy Duty
Surface Course (ODOT #448 Type 1)	1.5 inches	1.5 inches
Intermediate Course (ODOT #448 Type 2)	2.0 inches	3.0 inches
Aggregate Base Course (ODOT #304)	6.0 inches	8.0 inches

*\*Parking spaces only*

For parking stalls that allow free movement through them (i.e., no parking block or curbs), we recommend installing the heavy-duty asphalt section. Allowances for proper drainage and proper material selection of base materials are most important for performance of asphaltic pavements. Ruts and birdbaths in asphalt pavement allow for quick deterioration of the pavement primarily due to saturation of the underlying base and subgrade.

### Rigid Pavement

The use of concrete for paving has become more prevalent in recent years due to the long-term maintenance cost benefits of concrete compared to asphaltic pavements. Should concrete pavement be utilized, the concrete should be properly reinforced and jointed, and should have a 28-day flexural strength of no less than 650 psi and should be air entrained. Expansion joints should be sealed with a polyurethane sealant so that moisture infiltration into the subgrade soils and resultant concrete deterioration at the joints is reduced.

**Table 2: Rigid Pavement Sections**

	Light-Duty*	Heavy Duty
Reinforced Concrete	5.0 inches	7.0 inches
Aggregate Base Course (ODOT #304)	6.0 inches	6.0 inches

*\*Parking spaces only*

The portions of the site where rigid (concrete) pavements are recommended include the entrance/exit driveway aprons and the dumpster pad enclosure area. A heavy-duty pavement section is recommended for lanes designated for delivery trucks. Crushed aggregate base materials should be compacted to at least 98% of the standard Proctor (ASTM D 698) maximum dry density near optimum moisture content. The use of Portland cement concrete (PCC) for paving has become more prevalent in recent years based on material costs for concrete vs. bituminous and the long-term maintenance cost benefits of concrete compared to bituminous pavements. If PCC pavement is utilized, the concrete should be properly jointed, have proper load-transfer mechanisms installed, and should have a minimum 28-day compressive strength of 4,000 psi. Expansion and construction joints should be sealed with a polyurethane sealant so that moisture infiltration into the subgrade soils and resultant concrete deterioration at the joints is minimized. Concrete pavement at least 8 inches thick is recommended for the trash dumpster pad and entrance/exit aprons due to the high wheel and impact loads that these areas experience.

Design for drainage is of the utmost importance to minimize detrimental effects that may shorten the service life of the pavements. The pavement should be crowned or sloped in order to promote effective surface drainage and reduce the risk of water ponding. We recommend a minimum slope of 1.5 percent. In addition, the subgrade should be similarly sloped to promote effective subgrade drainage. We recommend “stub” or “finger” drains be provided around catch-basins and in other low areas of the proposed pavements to limit the accumulation of water on the frost susceptible subgrade soils. Subsurface edge drains should be provided at curbs. Where no curbs are proposed, ditches should be provided, and the pavement base course should be daylighted through the ditch side slope to facilitate drainage of the base course.

If fill material is needed to establish the required pavement grade, fill placement and compaction must be performed in accordance with the procedures outlined in the *Site Preparation* section of this report. The edges of compacted fill should extend a minimum 2 feet beyond the edges of the pavement, or a distance equal to the depth of fill beneath the pavement, whichever is greater.

All materials to be employed and field operations required in connection with the contemplated pavement structures should follow recommendations and procedural details as per the Ohio Department of Transportation, Asphalt Institute, and/or American Concrete Institute.

## **4 CONSTRUCTION CONSIDERATIONS**

### **4.1 GROUNDWATER CONTROL AND DRAINAGE**

Free groundwater was encountered in test boring locations B-16 and B-18 at a depth of 9.5 to 13 feet below existing surface grade during the field drilling operations. However, groundwater and/or seepage could be encountered during foundation excavation and construction. Accordingly, a gravity drainage system, sump pump or other conventional dewatering procedure, as deemed necessary by the field conditions, should be implemented throughout construction such that the groundwater is always controlled and maintained at an elevation of at least 2 feet below the excavation bottom. Every effort should be made to keep the excavations dry if water is encountered.

Water should not be allowed to collect near the foundation or floor slab areas of the building either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, groundwater or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of the building and beneath the floor slab. Overall site area drainage is to be arranged in a manner such that the possibility of water impounding below slab-on-grade areas and over the structural fill is prevented.

### **4.2 EXCAVATIONS**

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, Part 1926, Subpart P." This document was issued to better ensure the safety of workers entering trenches or excavations. It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavations or foundation excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced. If they are not followed closely, the owner and the contractor could be liable for substantial penalties.

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 both the excavation sides and bottom. The contractor's "responsible person" as defined in "CFR Part 1926," should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

We are providing this information solely as a service to our client. PSI is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred. If the excavations are left open and exposed to the elements for a significant length of time, desiccation of the clays may create minute shrinkage cracks which could allow large pieces of clay to collapse or slide into the excavation.

Materials removed from the excavation should not be stockpiled immediately adjacent to the excavation, inasmuch as this load may cause a collapse of the embankment.

### **4.3 WEATHER CONSIDERATIONS**

The soils encountered at this site are known to be sensitive to disturbances caused by construction traffic and to changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. Care should be exercised during the grading operations at the site. Due to the fine-grained nature of the surficial soils, the traffic of heavy equipment, including heavy compaction equipment, may very well create pumping and a general deterioration of those soils in the presence of water. Therefore, the grading should, if possible, be performed during a dry season. A layer of crushed stone may be required to allow the movement of construction traffic over the site during the rainy season. The contractor should maintain positive site drainage and if wet/pumping conditions occur, the contractor will be responsible to over excavate the wet soils and replace them with a properly compacted engineered fill. During wet seasons, limestone stabilization may be required to place engineered fill.

## **5 GEOTECHNICAL RISK**

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. Site exploration identifies actual subsurface conditions only at those points where samples are taken. A geotechnical report is based on conditions that existed at the time of the subsurface exploration. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations presented in the preceding sections constitute PSI's professional estimate of those measures that are necessary for the proposed structure to perform according to the proposed design based on the information generated and referenced during this evaluation, and PSI's experience in working with these conditions.

## **6 REPORT LIMITATIONS**

The recommendations submitted in this report are based on the available subsurface information obtained by PSI and design details furnished by Architectural Vision Group, LTD. If there are any revisions to the plans for the proposed structures, or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be retained to determine if changes in the recommendations are required. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the geotechnical recommendations for the project.

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein, have been presented after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics and engineering geology. No other warranties are implied or expressed.

After the plans and specifications are complete, it is recommended that PSI be provided the opportunity to review the final design and specifications, in order to verify that the earthwork and recommendations are properly interpreted and implemented. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of Architectural Vision Group, LTD., for the specific application to the proposed New Elementary School located at 1 Paul E Brown Drive Southeast, in Massillon, Stark County, Ohio.

## **APPENDIX**

**SOIL BORING LOCATION PLAN**

**FENCE DIAGRAM**

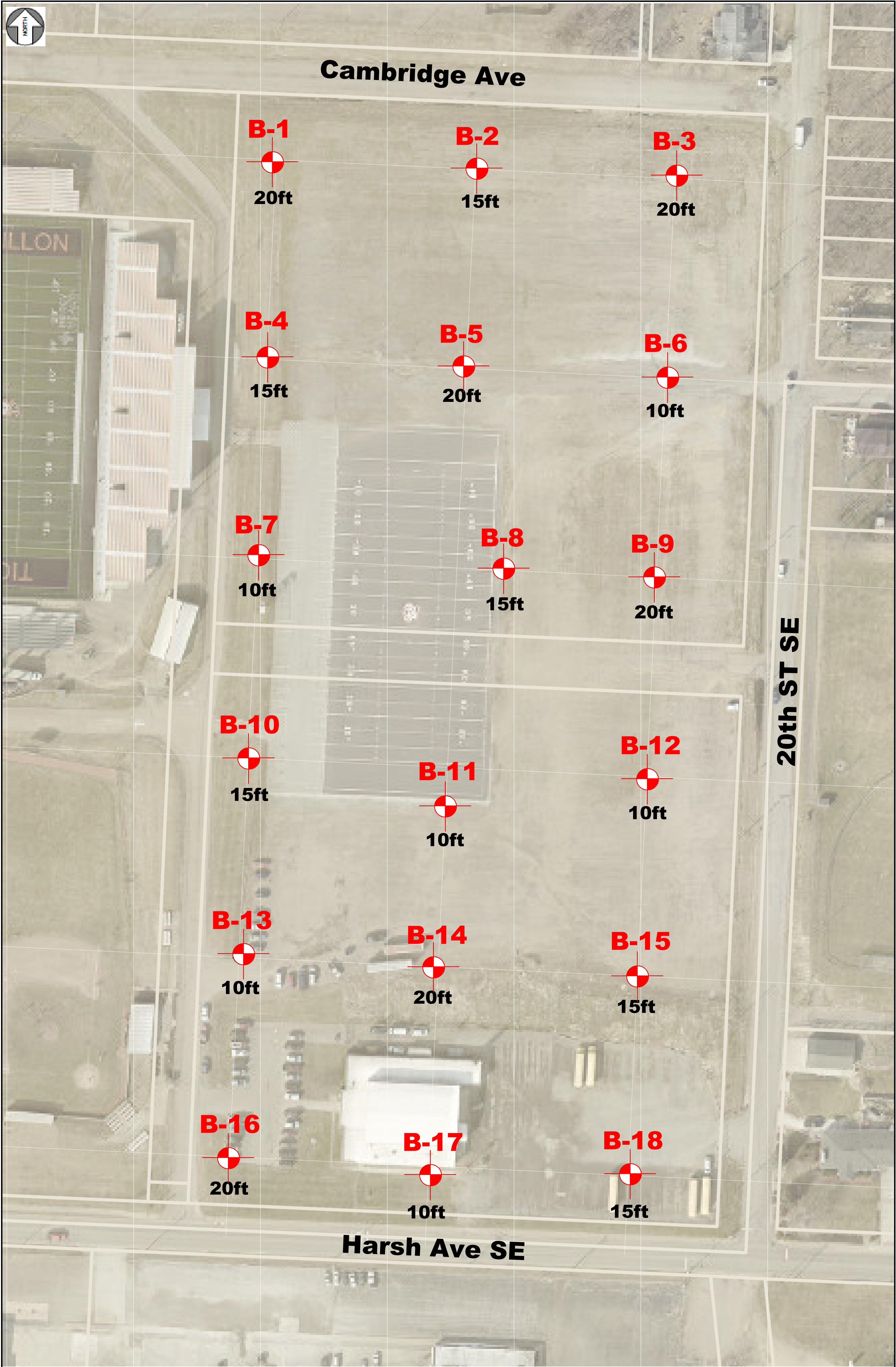
**BORING LOGS**

**GRAIN SIZE GRAPH**

**GENERAL NOTES & USCS SOIL CLASSIFICATION CHART**

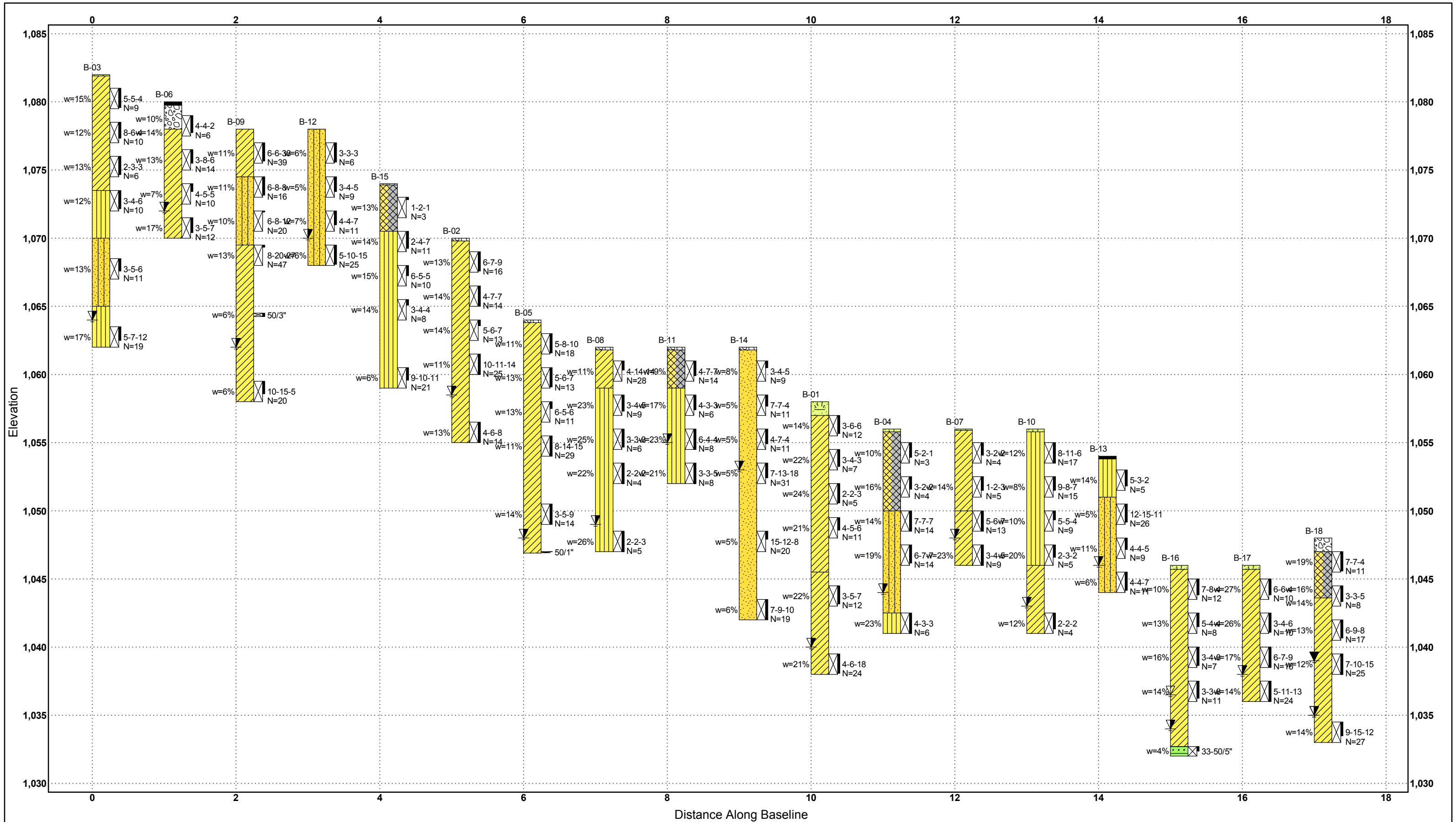


# Boring Location Plan



**New Elementary School**  
**Washington High School Site**  
**1 Paul E Brown Drive Southeast**  
**Massillon, Stark County, Ohio**  
**PSI Project No.: 0142-2428**







<b>DATE STARTED:</b> 10/4/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-01</b>	
<b>DATE COMPLETED:</b> 10/4/21		<b>DRILLER:</b> TS <b>LOGGED BY:</b> ZO			
<b>COMPLETION DEPTH:</b> 20.0 ft		<b>DRILL RIG:</b> ATV CME-55		<b>Water</b> <div style="display: flex; justify-content: space-between;"> <div> <div>▽ While Drilling</div> <div>▼ Upon Completion</div> <div>▽ Caved Depth</div> </div> <div> <div>N/A</div> <div>N/A</div> <div>18 feet</div> </div> </div>	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1058 ft		<b>SAMPLING METHOD:</b> 2-in SS		<b>BORING LOCATION:</b>	
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic			
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					

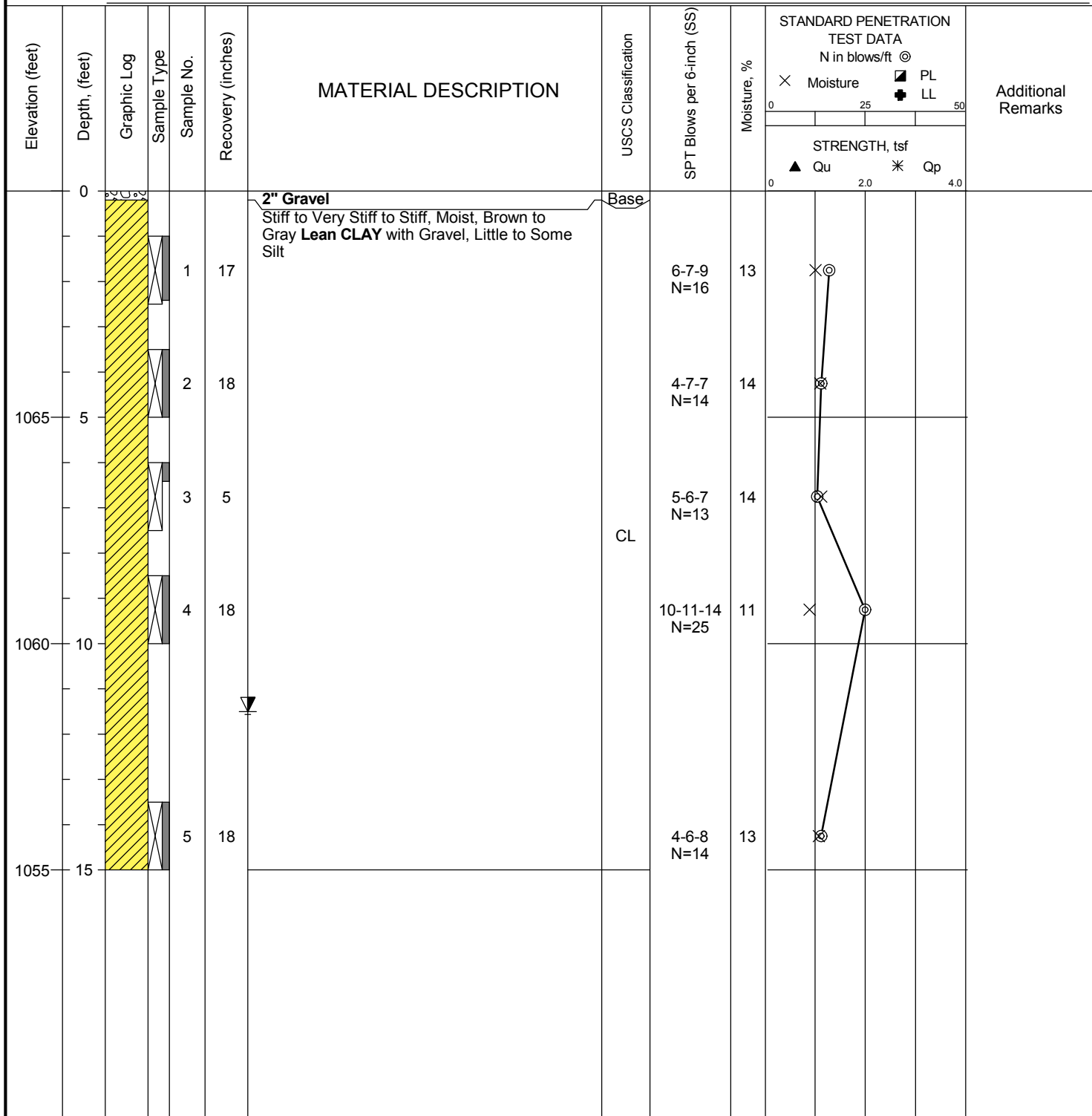
Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ X Moisture    PL LL STRENGTH, tsf ▲ Qu    * Qp	Additional Remarks
0						12" Topsoil	Topsoil				
1055				1	16	Stiff to Medium Stiff to Stiff, Moist, Gray Lean CLAY with Silt, Trace to Little Gravel, Trace Organics		3-6-6 N=12	14		
5				2	15			3-4-3 N=7	22		
1050				3	17		CL	2-2-3 N=5	24		
10				4	11			4-5-6 N=11	21		
1045				5	16	Stiff to Very Stiff, Moist, Brown Lean CLAY, Trace Gravel		3-5-7 N=12	22		
1040				6	17		CL	4-6-18 N=24	21		
20											



Professional Service Industries, Inc.  
5555 Canal Road  
Cleveland, OH 44125  
Telephone: (216) 447-1335

**PROJECT NO.:** 0142-2428  
**PROJECT:** Proposed Elem School - Washington  
**LOCATION:** 1 Paul E Brown Drive, Southeast  
Massillon, Stark County, Ohio

DATE STARTED: 10/1/21		DRILL COMPANY: PSI, Inc.		<b>BORING B-02</b>	
DATE COMPLETED: 10/1/21		DRILLER: JJ LOGGED BY: ZO			
COMPLETION DEPTH: 15.0 ft		DRILL RIG: ATV CME-55		<div style="display: flex; justify-content: space-between;"> <div> <b>Water</b>  ▽ While Drilling N/A  ▽ Upon Completion N/A  ▽ Caved Depth 11.5 feet </div> </div>	
BENCHMARK: N/A		DRILLING METHOD: Hollow Stem Auger		<b>BORING LOCATION:</b>	
ELEVATION: 1070 ft		SAMPLING METHOD: 2-in SS			
LATITUDE:		HAMMER TYPE: Automatic			
LONGITUDE:		EFFICIENCY: 93%			
STATION: N/A OFFSET: N/A		REVIEWED BY: AV			
REMARKS:					



	Professional Service Industries, Inc.	PROJECT NO.: 0142-2428
	5555 Canal Road	PROJECT: Proposed Elem School - Washington
	Cleveland, OH 44125	LOCATION: 1 Paul E Brown Drive, Southeast
	Telephone: (216) 447-1335	Massillon, Stark County, Ohio

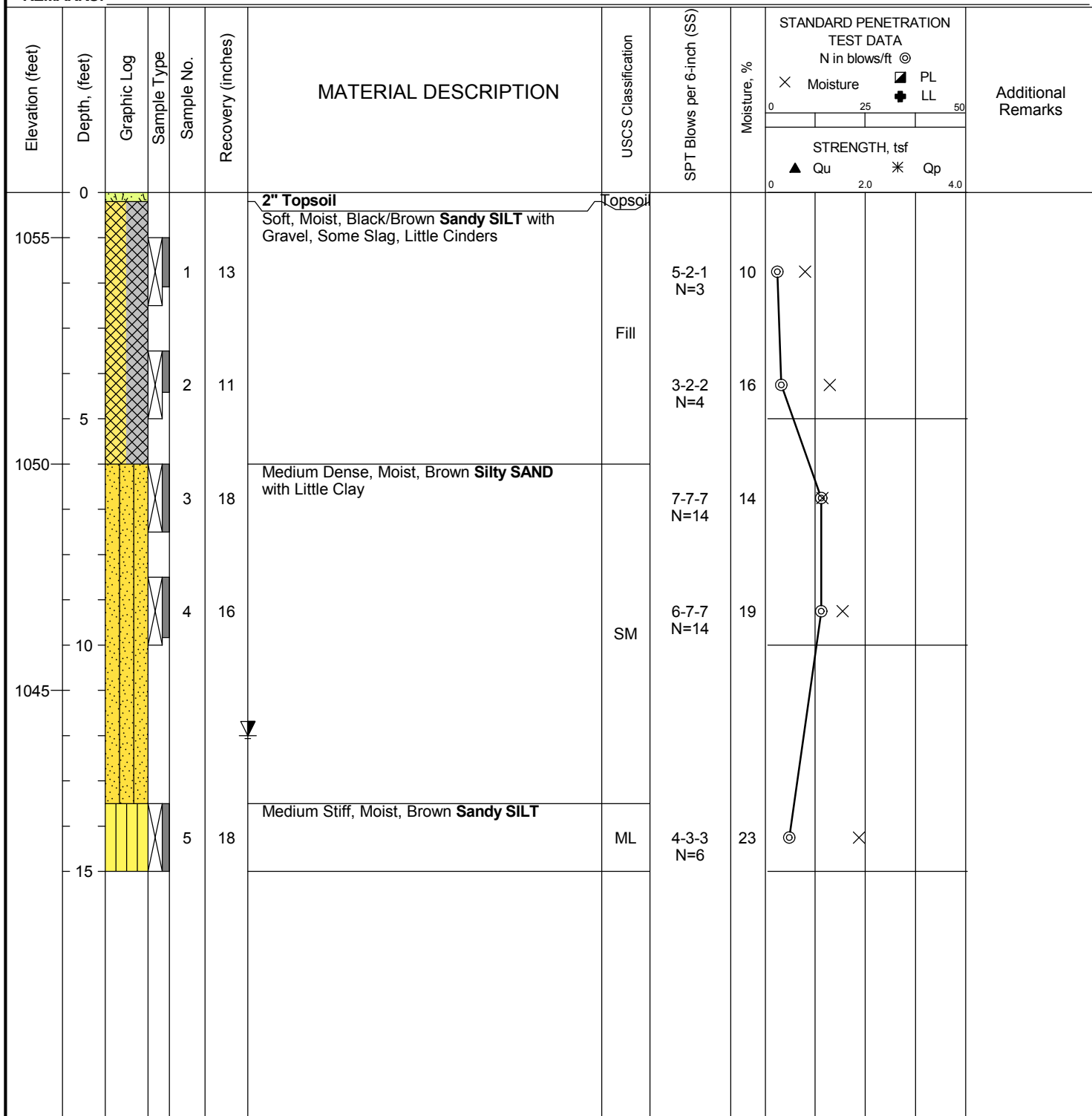
The stratification lines represent approximate boundaries. The transition may be gradual.

<b>DATE STARTED:</b> 9/30/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-03</b>	
<b>DATE COMPLETED:</b> 9/30/21		<b>DRILLER:</b> TS <b>LOGGED BY:</b> ZO			
<b>COMPLETION DEPTH:</b> 20.0 ft		<b>DRILL RIG:</b> ATV CME-55		<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">Water</div> <div style="display: flex; flex-direction: column; gap: 5px;"> <div>▽ While Drilling</div> <div>▼ Upon Completion</div> <div>▽ Caved Depth</div> </div> <div style="margin-left: 10px;"> <div>N/A</div> <div>N/A</div> <div>18 feet</div> </div> </div>	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1082 ft		<b>SAMPLING METHOD:</b> 2-in SS		<b>BORING LOCATION:</b>	
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic			
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ X Moisture    ▣ PL + LL	STRENGTH, tsf ▲ Qu    * Qp	Additional Remarks
	0					<b>1" Topsoil</b> Stiff to Medium Stiff, Moist, Brown <b>Lean CLAY</b> with Sand and Gravel	Topsoil					
1080				1	17			5-5-4 N=9	15	◎ X		
	5			2	14		CL	8-6-4 N=10	12	◎ X		
1075				3	16			2-3-3 N=6	13	◎ X		
	10			4	16	Stiff, Moist, Brown <b>Sandy SILT</b> , Trace Gravel, Some Clay	ML	3-4-6 N=10	12	◎ X		
1070						Medium Dense, Moist, Brown <b>Silty SAND</b> with Gravel, Trace Clay						
	15			5	11		SM	3-5-6 N=11	13	◎ X		
1065						Very Stiff, Moist, Brown <b>Sandy SILT</b> , Trace Gravel	ML					
	20			6	12			5-7-12 N=19	17	X ◎		

	Professional Service Industries, Inc.	<b>PROJECT NO.:</b> 0142-2428
	5555 Canal Road	<b>PROJECT:</b> Proposed Elem School - Washington
	Cleveland, OH 44125	<b>LOCATION:</b> 1 Paul E Brown Drive, Southeast
	Telephone: (216) 447-1335	Massillon, Stark County, Ohio

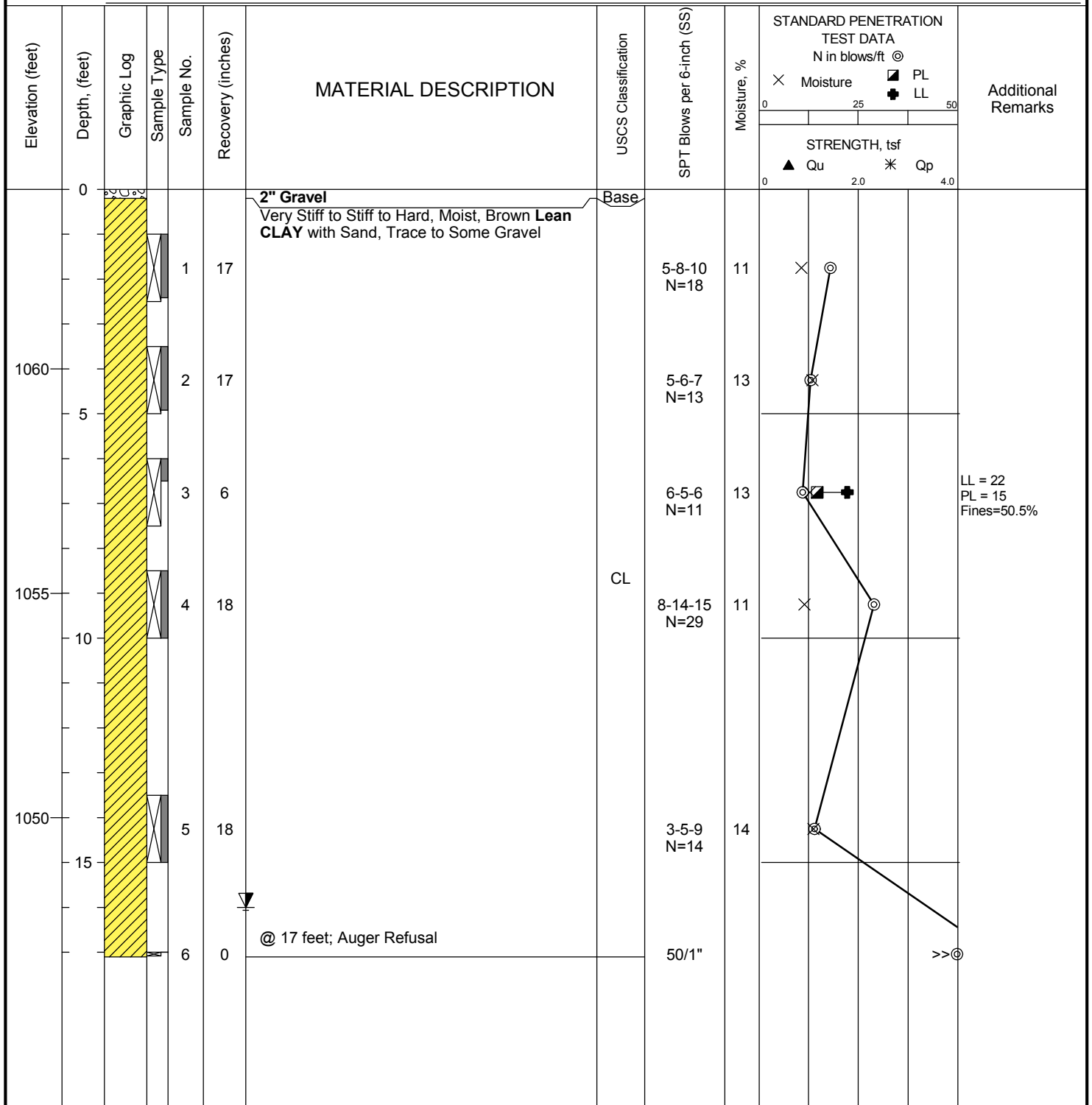
<b>DATE STARTED:</b> 10/4/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-04</b>
<b>DATE COMPLETED:</b> 10/4/21		<b>DRILLER:</b> TS <b>LOGGED BY:</b> ZO		
<b>COMPLETION DEPTH:</b> 15.0 ft		<b>DRILL RIG:</b> ATV CME-55		<b>Water</b> <div style="display: flex; justify-content: space-between;"> <div> <div><span>▽</span> While Drilling</div> <div><span>▽</span> Upon Completion</div> <div><span>▽</span> Caved Depth</div> </div> <div> <div>N/A</div> <div>N/A</div> <div>12 feet</div> </div> </div>
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger		
<b>ELEVATION:</b> 1056 ft		<b>SAMPLING METHOD:</b> 2-in SS		
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic		<b>BORING LOCATION:</b>
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%		
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV		
<b>REMARKS:</b>				



	Professional Service Industries, Inc.	PROJECT NO.: 0142-2428
	5555 Canal Road	PROJECT: Proposed Elem School - Washington
	Cleveland, OH 44125	LOCATION: 1 Paul E Brown Drive, Southeast
	Telephone: (216) 447-1335	Massillon, Stark County, Ohio

The stratification lines represent approximate boundaries. The transition may be gradual.






<b>DATE STARTED:</b> 10/1/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-05</b>	
<b>DATE COMPLETED:</b> 10/1/21		<b>DRILLER:</b> JJ <b>LOGGED BY:</b> ZO			
<b>COMPLETION DEPTH:</b> 17.1 ft		<b>DRILL RIG:</b> ATV CME-55		<b>Water</b> <div style="display: flex; justify-content: space-between;"> <div> <div>▽ While Drilling</div> <div>▼ Upon Completion</div> <div>▽ Caved Depth</div> </div> <div> <div>N/A</div> <div>N/A</div> <div>16 feet</div> </div> </div>	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1064 ft		<b>SAMPLING METHOD:</b> 2-in SS		<b>BORING LOCATION:</b>	
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic			
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					




	Professional Service Industries, Inc.	PROJECT NO.: 0142-2428
	5555 Canal Road	PROJECT: Proposed Elem School - Washington
	Cleveland, OH 44125	LOCATION: 1 Paul E Brown Drive, Southeast
	Telephone: (216) 447-1335	Massillon, Stark County, Ohio

The stratification lines represent approximate boundaries. The transition may be gradual.

<b>DATE STARTED:</b> 9/30/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-06</b>	
<b>DATE COMPLETED:</b> 9/30/21		<b>DRILLER:</b> TS <b>LOGGED BY:</b> ZO			
<b>COMPLETION DEPTH:</b> 10.0 ft		<b>DRILL RIG:</b> ATV CME-55		<b>Water</b> <div style="display: flex; justify-content: space-between;"> <div> <div>▽ While Drilling</div> <div>▼ Upon Completion</div> <div>▽ Caved Depth</div> </div> <div> <div>N/A</div> <div>N/A</div> <div>8 feet</div> </div> </div>	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1080 ft		<b>SAMPLING METHOD:</b> 2-in SS			
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic		<b>BORING LOCATION:</b>	
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @	Additional Remarks
										<div> <div> <div>×</div> Moisture <div>▲ Qu</div> </div> <div> <div>■ PL</div> <div>✱ Qp</div> </div> <div> <div>⊕ LL</div> </div> </div> <div> <div>02550</div> </div> <div> <div>02.04.0</div> </div>	
	0					3" Asphalt over 21" Black Sand and Gravel Base	Asphalt Base				
				1	15	Medium Stiff to Stiff, Moist, Brown Lean CLAY with Sand and Gravel	Base	4-4-2 N=6	10	14	
				2	12		CL	3-8-6 N=14	13		
1075	5			3	7			4-5-5 N=10	7		
				4	13			3-5-7 N=12	17		
1070	10										

	Professional Service Industries, Inc. 5555 Canal Road Cleveland, OH 44125 Telephone: (216) 447-1335		<b>PROJECT NO.:</b> 0142-2428 <b>PROJECT:</b> Proposed Elem School - Washington <b>LOCATION:</b> 1 Paul E Brown Drive, Southeast Massillon, Stark County, Ohio

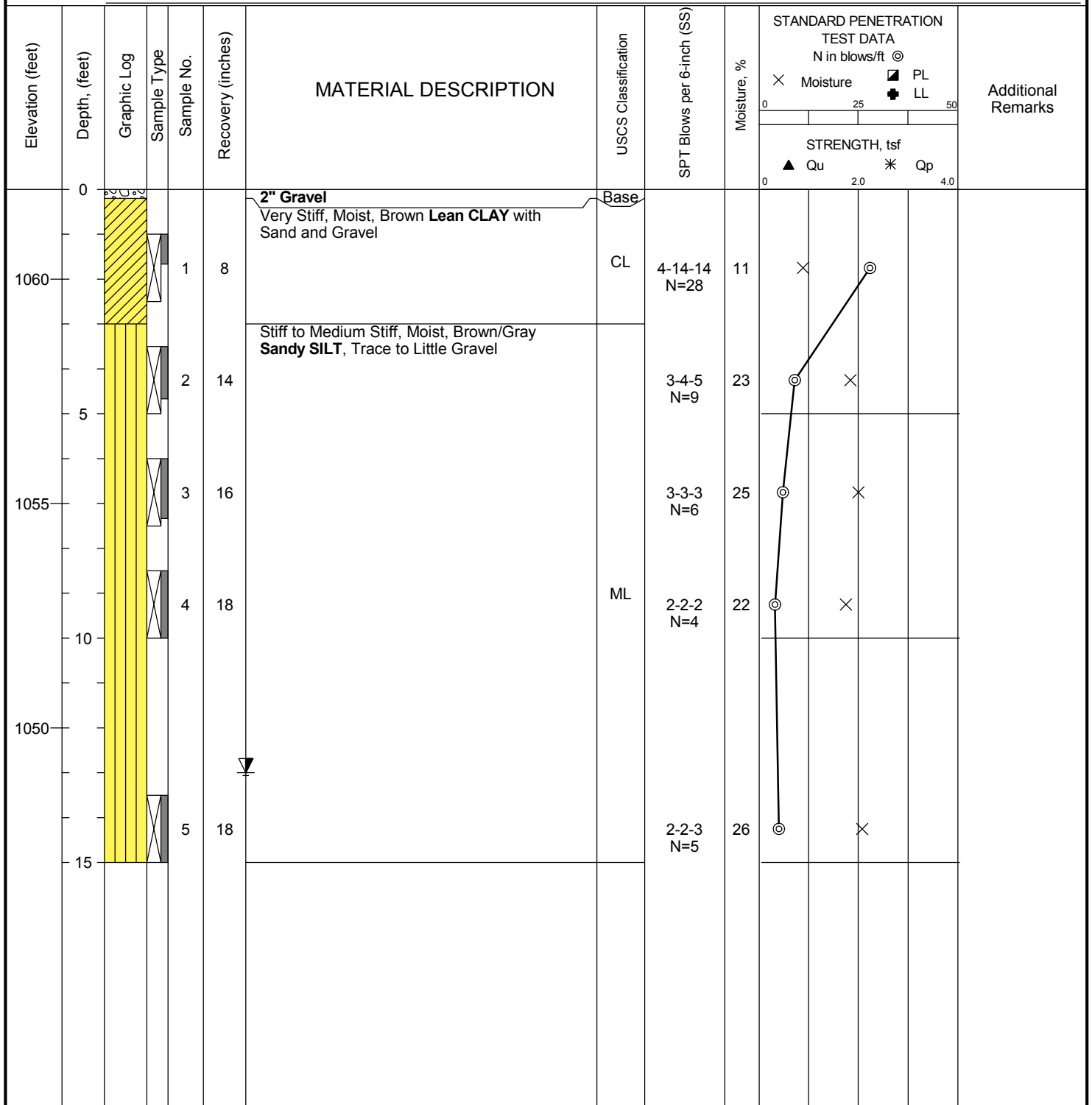
The stratification lines represent approximate boundaries. The transition may be gradual.

<b>DATE STARTED:</b> 10/4/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-07</b>	
<b>DATE COMPLETED:</b> 10/4/21		<b>DRILLER:</b> TS <b>LOGGED BY:</b> ZO			
<b>COMPLETION DEPTH:</b> 10.0 ft		<b>DRILL RIG:</b> ATV CME-55		<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">Water</div> <div style="display: flex; flex-direction: column; gap: 5px;"> <div><span style="font-size: 0.8em;">▽</span> While Drilling    N/A</div> <div><span style="font-size: 0.8em;">▼</span> Upon Completion    N/A</div> <div><span style="font-size: 0.8em;">▽</span> Caved Depth    8 feet</div> </div> </div>	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1056 ft		<b>SAMPLING METHOD:</b> 2-in SS			
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic		<b>BORING LOCATION:</b>	
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @				Additional Remarks
										<div style="display: flex; justify-content: space-between; font-size: 0.8em;"> <span>× Moisture</span> <span>▣ PL</span> </div> <div style="display: flex; justify-content: space-between; font-size: 0.8em;"> <span>▲ Qu</span> <span>* Qp</span> </div>				
	0					<b>1" Topsoil</b>	Topsoil							
1055				1	11	Medium Stiff, Moist, Brown <b>Lean CLAY</b> with Gravel and Rock Fragments (Clean Fill)	CL	3-2-2 N=4						
				2	12			1-2-3 N=5	14		×			
1050	5			3	18	Stiff, Moist, Brown <b>Lean CLAY</b> with Gravel and Rock Fragments	CL	5-6-7 N=13						
				4	18			3-4-5 N=9	23		×			
10	10													

	Professional Service Industries, Inc.	PROJECT NO.: 0142-2428
	5555 Canal Road	PROJECT: Proposed Elem School - Washington
	Cleveland, OH 44125	LOCATION: 1 Paul E Brown Drive, Southeast
	Telephone: (216) 447-1335	Massillon, Stark County, Ohio




<b>DATE STARTED:</b> 10/1/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-08</b>	
<b>DATE COMPLETED:</b> 10/1/21		<b>DRILLER:</b> JJ <b>LOGGED BY:</b> ZO			
<b>COMPLETION DEPTH:</b> 15.0 ft		<b>DRILL RIG:</b> ATV CME-55		<b>Water</b> <div style="display: flex; justify-content: space-between;"> <div> <div></div> While Drilling N/A  <div></div> Upon Completion N/A  <div></div> Caved Depth 13 feet </div> </div>	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1062 ft		<b>SAMPLING METHOD:</b> 2-in SS			
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic		<b>BORING LOCATION:</b>	
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					



	Professional Service Industries, Inc. 5555 Canal Road Cleveland, OH 44125 Telephone: (216) 447-1335		<b>PROJECT NO.:</b> 0142-2428 <b>PROJECT:</b> Proposed Elem School - Washington <b>LOCATION:</b> 1 Paul E Brown Drive, Southeast Massillon, Stark County, Ohio

The stratification lines represent approximate boundaries. The transition may be gradual.



<b>Water</b>		While Drilling	N/A
		Upon Completion	N/A
		Caved Depth	16 feet

STANDARD PENETRATION  
TEST DATA  
N in blows/ft ©

✕ Moisture

■ PL  
⊕ LL

0 25 50

STRENGTH, tsf

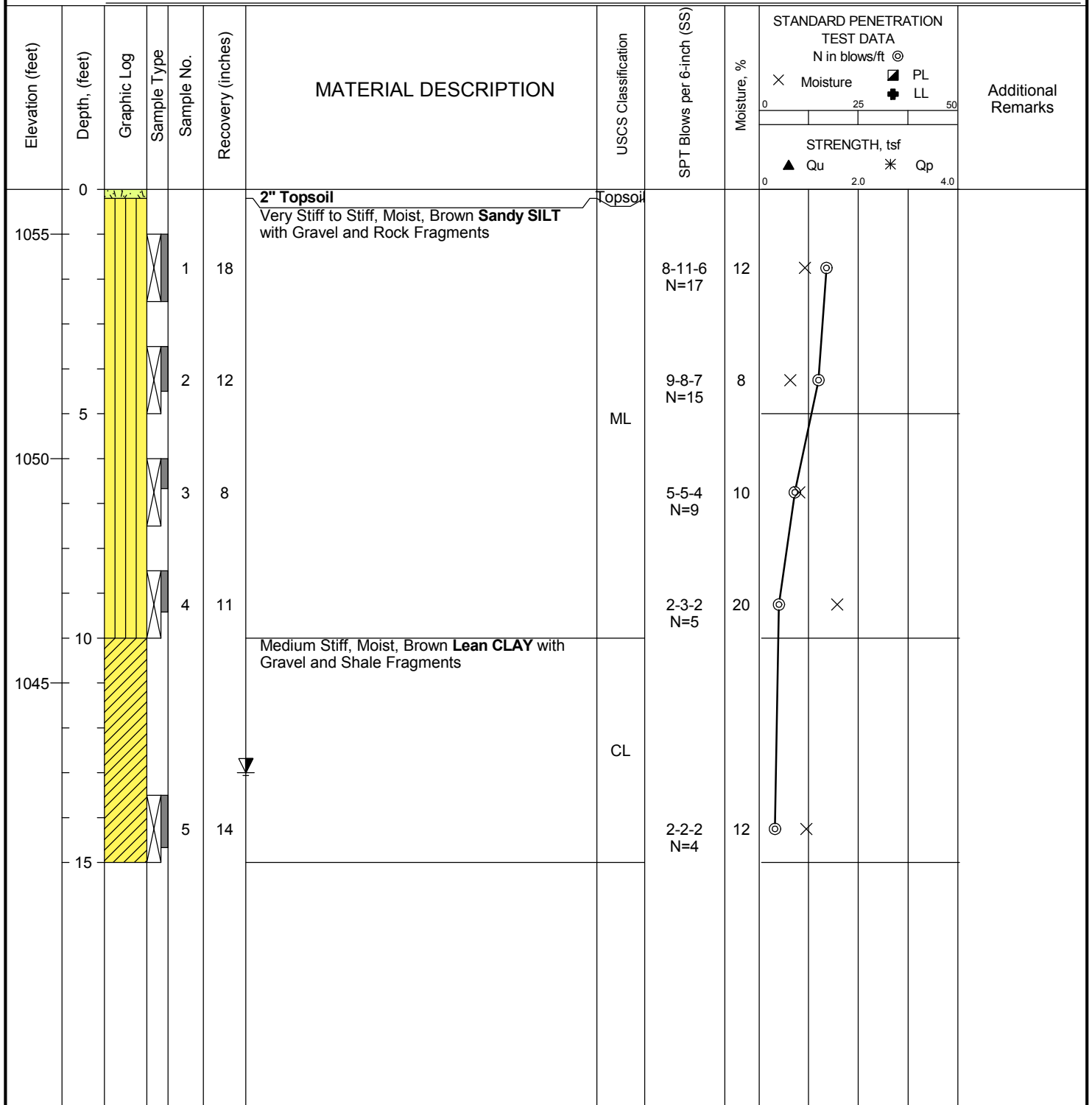
▲ Qu

✱ Qp

0 2.0 4.0

**PROJECT NO.:** 0142-2428  
**PROJECT:** Proposed Elem School - Washington  
**LOCATION:** 1 Paul E Brown Drive, Southeast  
Massillon, Stark County, Ohio

<b>DATE STARTED:</b> 10/4/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-10</b>											
<b>DATE COMPLETED:</b> 10/4/21		<b>DRILLER:</b> TS <b>LOGGED BY:</b> ZO													
<b>COMPLETION DEPTH:</b> 15.0 ft		<b>DRILL RIG:</b> ATV CME-55		<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td rowspan="3" style="width: 30px; text-align: center; vertical-align: middle;"><b>Water</b></td> <td style="text-align: center;">▽</td> <td>While Drilling</td> <td style="text-align: right;">N/A</td> </tr> <tr> <td style="text-align: center;">▼</td> <td>Upon Completion</td> <td style="text-align: right;">N/A</td> </tr> <tr> <td style="text-align: center;">▽</td> <td>Caved Depth</td> <td style="text-align: right;">13 feet</td> </tr> </table>		<b>Water</b>	▽	While Drilling	N/A	▼	Upon Completion	N/A	▽	Caved Depth	13 feet
<b>Water</b>	▽	While Drilling	N/A												
	▼	Upon Completion	N/A												
	▽	Caved Depth	13 feet												
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger		<b>BORING LOCATION:</b>											
<b>ELEVATION:</b> 1056 ft		<b>SAMPLING METHOD:</b> 2-in SS													
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic													
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%													
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV													
<b>REMARKS:</b>															



	<b>Professional Service Industries, Inc.</b> 5555 Canal Road Cleveland, OH 44125 Telephone: (216) 447-1335		<b>PROJECT NO.:</b> 0142-2428 <b>PROJECT:</b> Proposed Elem School - Washington <b>LOCATION:</b> 1 Paul E Brown Drive, Southeast Massillon, Stark County, Ohio

<b>DATE STARTED:</b> 10/1/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-11</b>	
<b>DATE COMPLETED:</b> 10/1/21		<b>DRILLER:</b> JJ <b>LOGGED BY:</b> ZO			
<b>COMPLETION DEPTH:</b> 10.0 ft		<b>DRILL RIG:</b> ATV CME-55		<b>Water</b> <div style="display: flex; justify-content: space-between;"> <div> <div>▽ While Drilling</div> <div>▼ Upon Completion</div> <div>▽ Caved Depth</div> </div> <div> <div>N/A</div> <div>N/A</div> <div>7 feet</div> </div> </div>	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1062 ft		<b>SAMPLING METHOD:</b> 2-in SS			
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic		<b>BORING LOCATION:</b>	
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @				Additional Remarks
										<div> <div>×</div> Moisture <div>▣</div> PL <div>+</div> LL </div> <div> <div>▲</div> Qu <div>✱</div> Qp </div>				
	0					<b>2" Gravel</b> Stiff, Moist, Brown/Black <b>Lean CLAY</b> with Silt, Gravel and Cobbles, Trace Slag	Base							
1060				1	13		Fill	4-7-7 N=14	9		×	⊙		
				2	13	Medium Stiff to Stiff, Moist, Brown <b>Sandy SILT</b> , Trace Gravel, Trace Clay		4-3-3 N=6	17		⊙	×		
5														
1055				3	18		ML	6-4-4 N=8	23		⊙	×		
				4	18			3-3-5 N=8	21		⊙	×		
10														

	Professional Service Industries, Inc.	PROJECT NO.: 0142-2428
	5555 Canal Road	PROJECT: Proposed Elem School - Washington
	Cleveland, OH 44125	LOCATION: 1 Paul E Brown Drive, Southeast
	Telephone: (216) 447-1335	Massillon, Stark County, Ohio

<b>DATE STARTED:</b> 9/30/21 <b>DATE COMPLETED:</b> 9/30/21 <b>COMPLETION DEPTH:</b> 10.0 ft <b>BENCHMARK:</b> N/A <b>ELEVATION:</b> 1078 ft <b>LATITUDE:</b> <b>LONGITUDE:</b> <b>STATION:</b> N/A <b>OFFSET:</b> N/A <b>REMARKS:</b>	<b>DRILL COMPANY:</b> PSI, Inc. <b>DRILLER:</b> TS <b>LOGGED BY:</b> ZO <b>DRILL RIG:</b> ATV CME-55 <b>DRILLING METHOD:</b> Hollow Stem Auger <b>SAMPLING METHOD:</b> 2-in SS <b>HAMMER TYPE:</b> Automatic <b>EFFICIENCY:</b> 93% <b>REVIEWED BY:</b> AV	<div style="text-align: center; font-weight: bold; font-size: 1.2em;">BORING B-12</div> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td rowspan="3" style="width:5%; text-align: center; font-weight: bold;">Water</td> <td style="width:5%; text-align: center;">▽</td> <td style="width:70%;">While Drilling</td> <td style="width:20%; text-align: right;">N/A</td> </tr> <tr> <td style="text-align: center;">▼</td> <td>Upon Completion</td> <td style="text-align: right;">N/A</td> </tr> <tr> <td style="text-align: center;">▽</td> <td>Caved Depth</td> <td style="text-align: right;">8 feet</td> </tr> </table> <b>BORING LOCATION:</b>	Water	▽	While Drilling	N/A	▼	Upon Completion	N/A	▽	Caved Depth	8 feet
Water	▽	While Drilling		N/A								
	▼	Upon Completion		N/A								
	▽	Caved Depth	8 feet									

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ☉				Additional Remarks
										<div>×</div> Moisture <div>■</div> PL <div>+</div> LL				
										<div>STRENGTH, tsf</div> <div>▲ Qu    *</div> Qp				
										0	25	50		
										0	2.0	4.0		
	0					Loose to Medium Dense, Moist, Brown <b>Silty SAND</b> with Gravel								
				1	17			3-3-3 N=6	6					
1075				2	13			3-4-5 N=9	5					
5				3	12			4-4-7 N=11	7					
1070				4	17			5-10-15 N=25	6					
10														

	Professional Service Industries, Inc. 5555 Canal Road Cleveland, OH 44125 Telephone: (216) 447-1335	<b>PROJECT NO.:</b> 0142-2428 <b>PROJECT:</b> Proposed Elem School - Washington <b>LOCATION:</b> 1 Paul E Brown Drive, Southeast Massillon, Stark County, Ohio
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<b>DATE STARTED:</b> 10/4/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-13</b>	
<b>DATE COMPLETED:</b> 10/4/21		<b>DRILLER:</b> JJ <b>LOGGED BY:</b> ZO			
<b>COMPLETION DEPTH:</b> 10.0 ft		<b>DRILL RIG:</b> Truck D-50		<b>Water</b> <div style="display: flex; justify-content: space-between;"> <div> <div></div> While Drilling N/A  <div></div> Upon Completion N/A  <div></div> Caved Depth 8 feet </div> </div>	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1054 ft		<b>SAMPLING METHOD:</b> 2-in SS			
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic		<b>BORING LOCATION:</b>	
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 94%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @	Additional Remarks
	0					<b>2" Asphalt</b> Medium Stiff, Moist, Brown <b>Sandy SILT</b> with Gravel	Asphalt				
				1	14		ML	5-3-2 N=5	14		
1050				2	16	Medium Dense to Loose to Medium Dense, Moist, Brown <b>Silty SAND</b> with Gravel		12-15-11 N=26	5		
5				3	10		SM	4-4-5 N=9	11		
1045				4	16			4-4-7 N=11	6		
10											

	Professional Service Industries, Inc.	PROJECT NO.: 0142-2428
	5555 Canal Road	PROJECT: Proposed Elem School - Washington
	Cleveland, OH 44125	LOCATION: 1 Paul E Brown Drive, Southeast
	Telephone: (216) 447-1335	Massillon, Stark County, Ohio

The stratification lines represent approximate boundaries. The transition may be gradual.

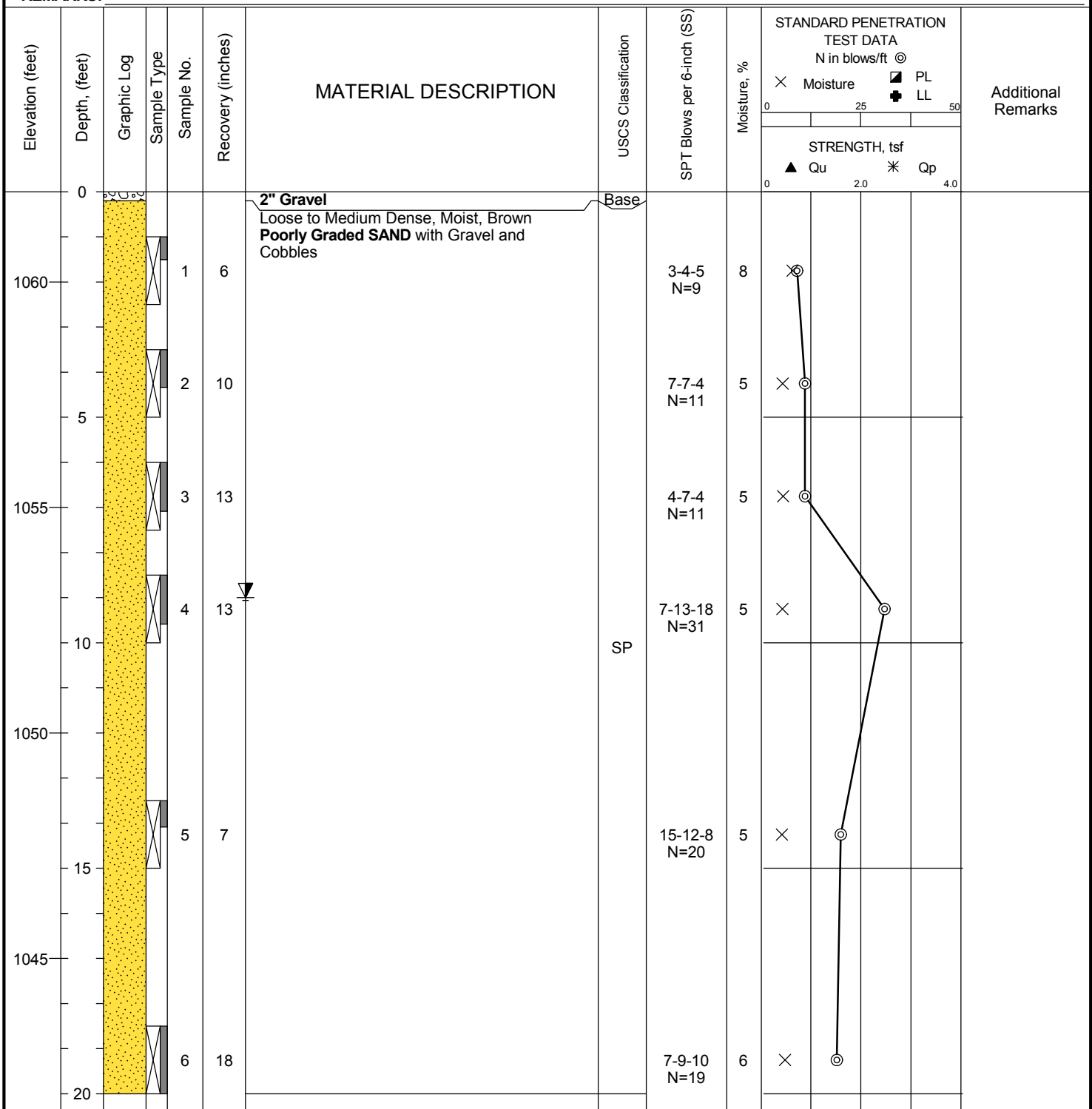
DATE STARTED: 10/1/21  
 DATE COMPLETED: 10/1/21  
 COMPLETION DEPTH: 20.0 ft  
 BENCHMARK: N/A  
 ELEVATION: 1062 ft  
 LATITUDE:  
 LONGITUDE:  
 STATION: N/A OFFSET: N/A  
 REMARKS:

DRILL COMPANY: PSI, Inc.  
 DRILLER: JJ LOGGED BY: ZO  
 DRILL RIG: ATV CME-55  
 DRILLING METHOD: Hollow Stem Auger  
 SAMPLING METHOD: 2-in SS  
 HAMMER TYPE: Automatic  
 EFFICIENCY: 93%  
 REVIEWED BY: AV

## BORING B-14

**Water**  
 ∇ While Drilling N/A  
 ▼ Upon Completion N/A  
 ∇ Caved Depth 9 feet

BORING LOCATION:



Professional Service Industries, Inc.  
 5555 Canal Road  
 Cleveland, OH 44125  
 Telephone: (216) 447-1335

PROJECT NO.: 0142-2428  
 PROJECT: Proposed Elem School - Washington  
 LOCATION: 1 Paul E Brown Drive, Southeast  
 Massillon, Stark County, Ohio

DATE STARTED: 10/1/21		DRILL COMPANY: PSI, Inc.		<b>BORING B-15</b>	
DATE COMPLETED: 10/1/21		DRILLER: TS      LOGGED BY: ZO			
COMPLETION DEPTH: 15.0 ft		DRILL RIG: ATV CME-55		<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">Water</div> <div style="display: flex; flex-direction: column; gap: 5px;"> <div><span style="font-size: 0.8em;">▽</span> While Drilling</div> <div><span style="font-size: 0.8em;">▼</span> Upon Completion</div> <div><span style="font-size: 0.8em;">▽</span> Caved Depth</div> </div> <div style="margin-left: 10px;">N/A N/A N/A</div> </div>	
BENCHMARK: N/A		DRILLING METHOD: Hollow Stem Auger		BORING LOCATION:	
ELEVATION: 1074 ft		SAMPLING METHOD: 2-in SS			
LATITUDE:		HAMMER TYPE: Automatic			
LONGITUDE:		EFFICIENCY: 93%			
STATION: N/A      OFFSET: N/A		REVIEWED BY: AV			
REMARKS:					

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @				Additional Remarks
										<div style="display: flex; justify-content: space-between;"> <div>           X Moisture            ▲ Qu         </div> <div>           PL            LL            * Qp         </div> </div>				
	0					1" Gravel Soft, Moist, Brown/Black Lean CLAY with Silt, Gravel and Cobbles, Trace Organics	Base							
				1	2		Fill	1-2-1 N=3	13					
1070				2	15	Soft to Very Stiff, Moist, Brown Sandy SILT with Gravel, Trace Clay		2-4-7 N=11	14					
	5			3	9			6-5-5 N=10	15					
1065				4	5		ML	3-4-4 N=8	14					
	10													
1060				5	11			9-10-11 N=21	6					
	15													

	Professional Service Industries, Inc.	PROJECT NO.: 0142-2428
	5555 Canal Road	PROJECT: Proposed Elem School - Washington
	Cleveland, OH 44125	LOCATION: 1 Paul E Brown Drive, Southeast
	Telephone: (216) 447-1335	Massillon, Stark County, Ohio

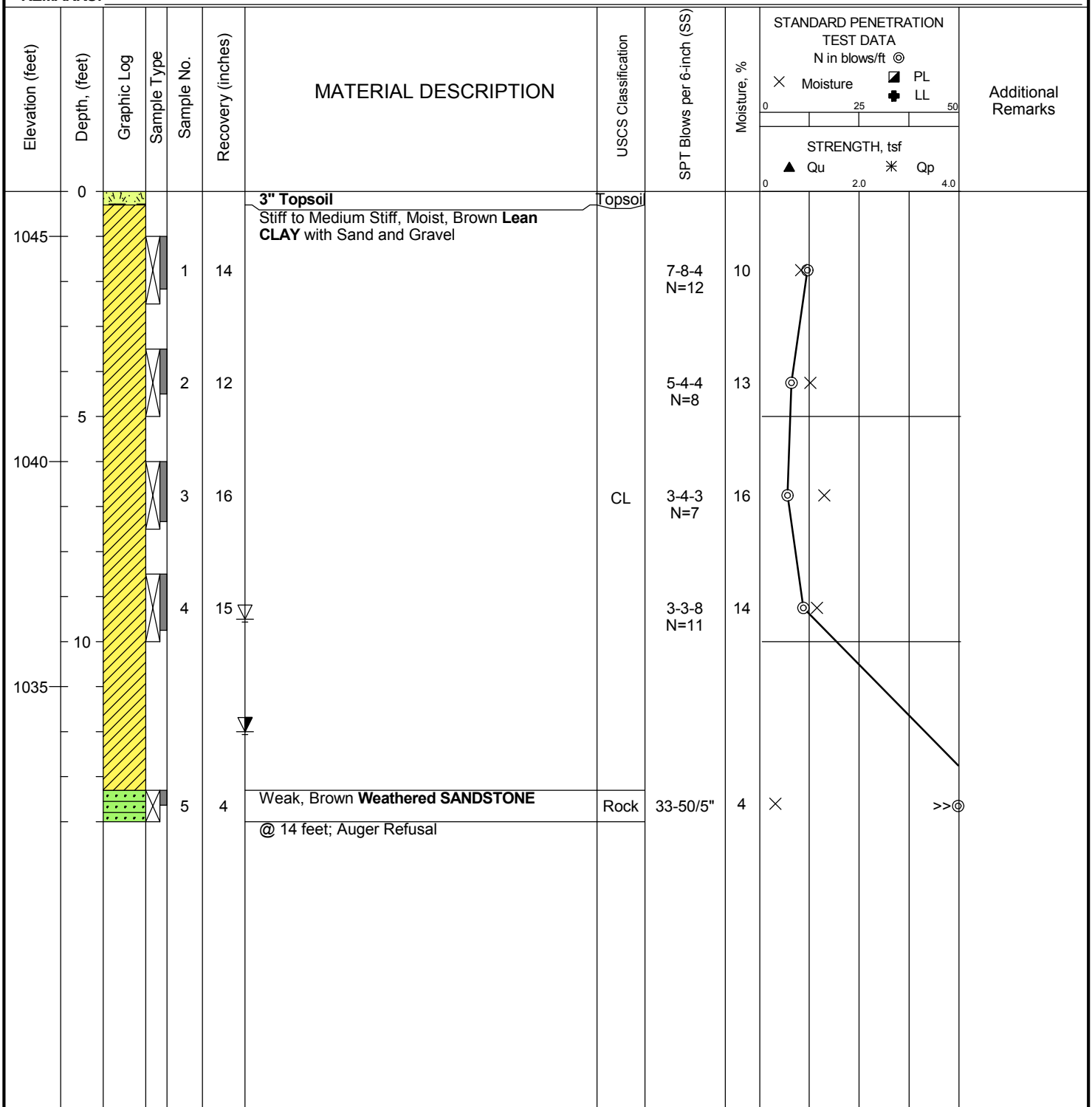
DATE STARTED: 10/4/21  
 DATE COMPLETED: 10/4/21  
 COMPLETION DEPTH: 14.0 ft  
 BENCHMARK: N/A  
 ELEVATION: 1046 ft  
 LATITUDE:  
 LONGITUDE:  
 STATION: N/A OFFSET: N/A  
 REMARKS:

DRILL COMPANY: PSI, Inc.  
 DRILLER: JJ LOGGED BY: ZO  
 DRILL RIG: Truck D-50  
 DRILLING METHOD: Hollow Stem Auger  
 SAMPLING METHOD: 2-in SS  
 HAMMER TYPE: Automatic  
 EFFICIENCY: 94%  
 REVIEWED BY: AV

## BORING B-16

**Water**  
 ▽ While Drilling 9.5 feet  
 ▼ Upon Completion N/A  
 ▼ Caved Depth 12 feet

BORING LOCATION:



Professional Service Industries, Inc.  
 5555 Canal Road  
 Cleveland, OH 44125  
 Telephone: (216) 447-1335

PROJECT NO.: 0142-2428  
 PROJECT: Proposed Elem School - Washington  
 LOCATION: 1 Paul E Brown Drive, Southeast  
 Massillon, Stark County, Ohio

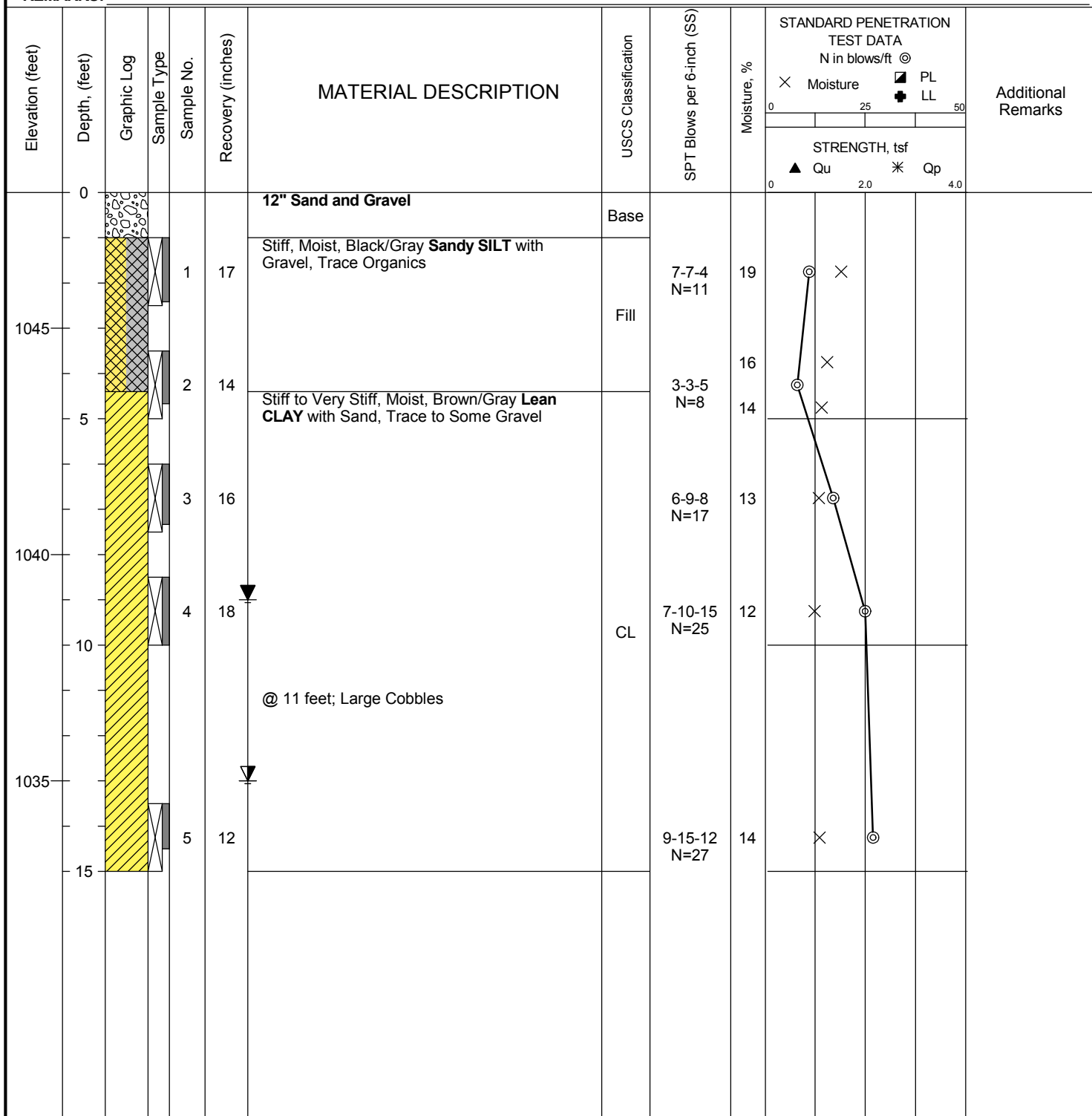


<b>DATE STARTED:</b> 10/4/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-17</b>											
<b>DATE COMPLETED:</b> 10/4/21		<b>DRILLER:</b> JJ <b>LOGGED BY:</b> ZO													
<b>COMPLETION DEPTH:</b> 10.0 ft		<b>DRILL RIG:</b> Truck D-50		<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td rowspan="3" style="width: 30px; text-align: center; vertical-align: middle;"><b>Water</b></td> <td style="text-align: center;">▽</td> <td>While Drilling</td> <td style="text-align: right;">N/A</td> </tr> <tr> <td style="text-align: center;">▼</td> <td>Upon Completion</td> <td style="text-align: right;">N/A</td> </tr> <tr> <td style="text-align: center;">▽</td> <td>Caved Depth</td> <td style="text-align: right;">8 feet</td> </tr> </table>		<b>Water</b>	▽	While Drilling	N/A	▼	Upon Completion	N/A	▽	Caved Depth	8 feet
<b>Water</b>	▽	While Drilling	N/A												
	▼	Upon Completion	N/A												
	▽	Caved Depth	8 feet												
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger		<b>BORING LOCATION:</b>											
<b>ELEVATION:</b> 1046 ft		<b>SAMPLING METHOD:</b> 2-in SS													
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic													
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 94%													
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV													
<b>REMARKS:</b>															

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @				Additional Remarks
										<div> <div> X Moisture PL LL </div> <div> 0 25 50 </div> </div> <div> <div> ▲ Qu * Qp </div> <div> 0 2.0 4.0 </div> </div>				
	0					3" Topsoil	Topsoil							
1045				1	14	Stiff to Very Stiff, Moist, Brown/Gray Lean CLAY with Sand and Gravel		6-6-4 N=10	27					
				2	17		CL	3-4-6 N=10	26					
1040	5			3	18			6-7-9 N=16	17					
				4	18			5-11-13 N=24	14					
10	10													

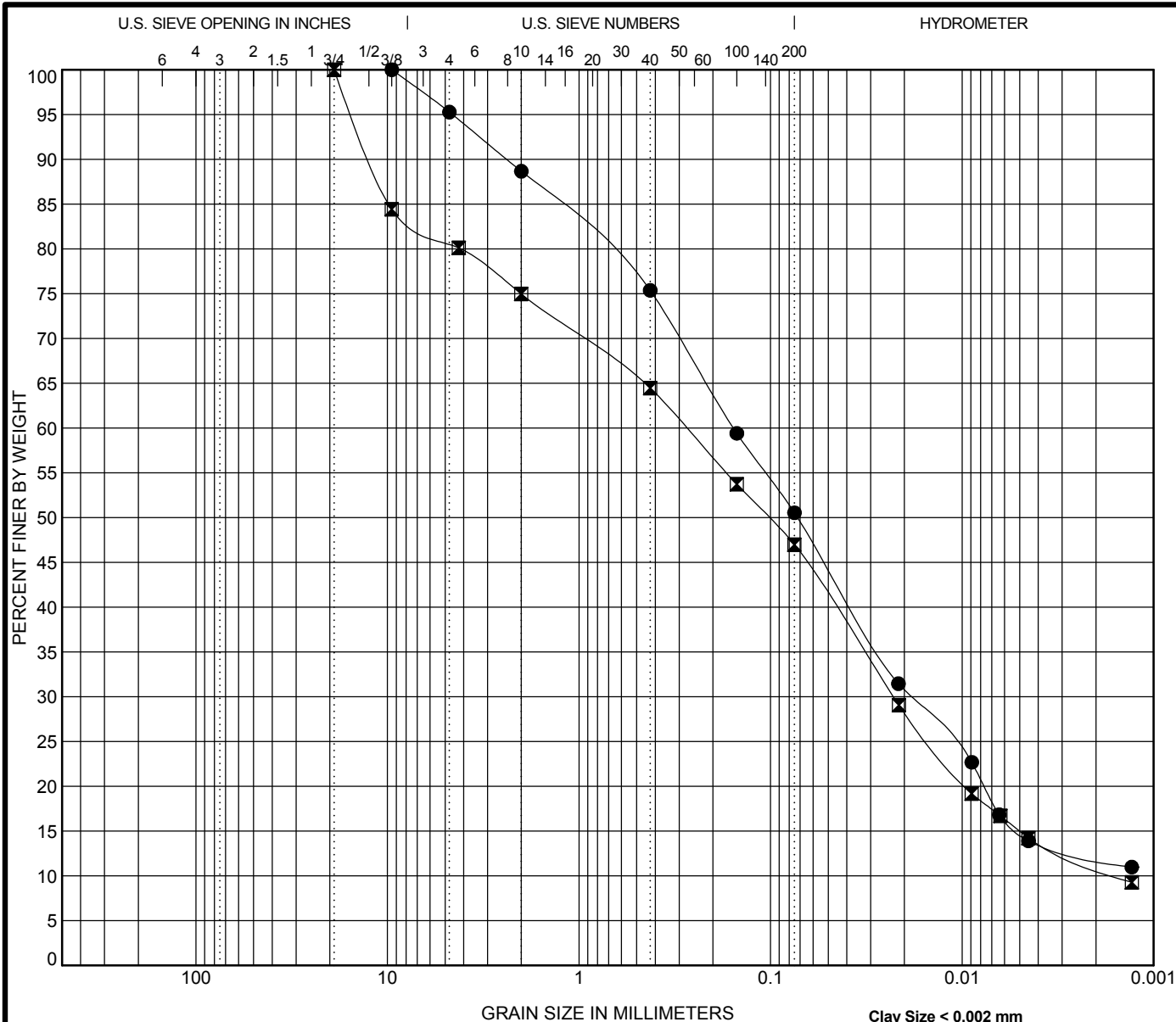
	Professional Service Industries, Inc. 5555 Canal Road Cleveland, OH 44125 Telephone: (216) 447-1335		<b>PROJECT NO.:</b> 0142-2428 <b>PROJECT:</b> Proposed Elem School - Washington <b>LOCATION:</b> 1 Paul E Brown Drive, Southeast Massillon, Stark County, Ohio

<b>DATE STARTED:</b> 10/4/21 <b>DATE COMPLETED:</b> 10/4/21 <b>COMPLETION DEPTH:</b> 15.0 ft <b>BENCHMARK:</b> N/A <b>ELEVATION:</b> 1048 ft <b>LATITUDE:</b> <b>LONGITUDE:</b> <b>STATION:</b> N/A <b>OFFSET:</b> N/A <b>REMARKS:</b>	<b>DRILL COMPANY:</b> PSI, Inc. <b>DRILLER:</b> JJ <b>LOGGED BY:</b> ZO <b>DRILL RIG:</b> Truck D-50 <b>DRILLING METHOD:</b> Hollow Stem Auger <b>SAMPLING METHOD:</b> 2-in SS <b>HAMMER TYPE:</b> Automatic <b>EFFICIENCY:</b> 94% <b>REVIEWED BY:</b> AV	<div style="text-align: center; font-weight: bold; font-size: 1.2em;">BORING B-18</div> <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td rowspan="3" style="width:5%; text-align: center; font-weight: bold;">Water</td> <td style="width:10%; text-align: center;">▽</td> <td style="width:75%;">While Drilling</td> <td style="width:10%; text-align: right;">13 feet</td> </tr> <tr> <td style="text-align: center;">▼</td> <td>Upon Completion</td> <td style="text-align: right;">9 feet</td> </tr> <tr> <td style="text-align: center;">▽</td> <td>Caved Depth</td> <td style="text-align: right;">13 feet</td> </tr> </table> <b>BORING LOCATION:</b>	Water	▽	While Drilling	13 feet	▼	Upon Completion	9 feet	▽	Caved Depth	13 feet
Water	▽	While Drilling		13 feet								
	▼	Upon Completion		9 feet								
	▽	Caved Depth	13 feet									



	Professional Service Industries, Inc. 5555 Canal Road Cleveland, OH 44125 Telephone: (216) 447-1335	<b>PROJECT NO.:</b> 0142-2428 <b>PROJECT:</b> Proposed Elem School - Washington <b>LOCATION:</b> 1 Paul E Brown Drive, Southeast Massillon, Stark County, Ohio
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The stratification lines represent approximate boundaries. The transition may be gradual.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification			LL	PL	PI	Cc	Cu
●	B-5	6.8	Lean CLAY (CL)			22	15	7		
⊠	B-9	4.3	Silty SAND (SM)			23	16	7	1.21	176.84

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-5	6.8	9.5	0.156	0.019	4.7	44.7	38.6	12.0
⊠	B-9	4.3	19	0.276	0.023	0.002	19.3	33.7	36.0



Professional Service Industries, Inc.  
5555 Canal Road  
Cleveland, OH 44125  
Telephone: (216) 447-1335  
Fax: (216) 642-7008

## GRAIN SIZE DISTRIBUTION

Project: Washington High School  
PSI Job No.: 0142-2428  
Location: 1 Paul E Brown Drive, Southeast  
Massillon, Stark County, Ohio



## GENERAL NOTES

### SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

### DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.	SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
HSA: Hollow Stem Auger - typically 3 1/4" or 4 1/4" I.D. openings, except where noted.	ST: Shelby Tube - 3" O.D., except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry	BS: Bulk Sample
R.C.: Diamond Bit Core Sampler	PM: Pressuremeter
H.A.: Hand Auger	CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings
P.A.: Power Auger - Handheld motorized auger	

### SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N <sub>60</sub> : A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q <sub>u</sub> : Unconfined compressive strength, TSF
Q <sub>p</sub> : Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL), %
DD: Dry unit weight, pcf
▽, ▽, ▿: Apparent groundwater level at time noted

### RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

### ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

### GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (3/4 in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to 3/4 in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.0075 mm to 0.075 mm
Clay:	<0.0075 mm (< 3/16 mm)

### PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

### RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%



## GENERAL NOTES

(Continued)

### CONSISTENCY OF FINE-GRAINED SOILS

<u>Q<sub>u</sub> - TSF</u>	<u>N - Blows/foot</u>	<u>Consistency</u>
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

### MOISTURE CONDITION DESCRIPTION

<u>Description</u>	<u>Criteria</u>
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

### RELATIVE PROPORTIONS OF SAND AND GRAVEL

<u>Descriptive Term</u>	<u>% Dry Weight</u>
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

### STRUCTURE DESCRIPTION

<u>Description</u>	<u>Criteria</u>	<u>Description</u>	<u>Criteria</u>
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick	Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick	Lensed:	Inclusion of small pockets of different soils
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing	Layer:	Inclusion greater than 3 inches thick (75 mm)
Slickensided:	Fracture planes appear polished or glossy, sometimes striated	Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
		Parting:	Inclusion less than 1/8-inch (3 mm) thick

### SCALE OF RELATIVE ROCK HARDNESS

<u>Q<sub>u</sub> - TSF</u>	<u>Consistency</u>
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

### ROCK BEDDING THICKNESSES

<u>Description</u>	<u>Criteria</u>
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

### ROCK VOIDS

<u>Voids</u>	<u>Void Diameter</u>
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

### GRAIN-SIZED TERMINOLOGY

<u>(Typically Sedimentary Rock)</u>	
<u>Component</u>	<u>Size Range</u>
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

### ROCK QUALITY DESCRIPTION



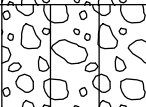


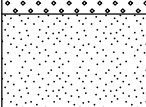
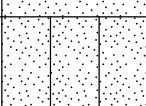
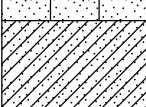
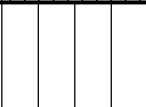
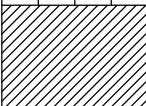
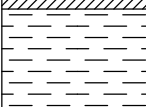
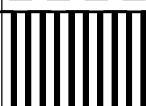
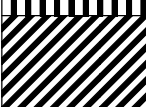
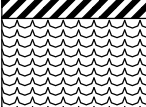
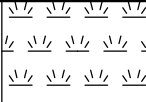
<u>Rock Mass Description</u>	<u>RQD Value</u>
Excellent	90 - 100
Good	75 - 90
Fair	50 - 75
Poor	25 - 50
Very Poor	Less than 25

### DEGREE OF WEATHERING

Slightly Weathered:	Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.
Weathered:	Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
Highly Weathered:	Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

# SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS  MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS  MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS  (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS  MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS  (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS  MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS  LIQUID LIMIT LESS THAN 50			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS  LIQUID LIMIT GREATER THAN 50			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS



October 21, 2021 (Revised: July 29, 2022)

Ms. Elizabeth Most  
Project Manager  
Architectural Vision Group, LTD.  
23850 Sperry Drive  
Westlake, Ohio 44145

Re: Report of Supplemental Geotechnical Services  
Proposed New Elementary School  
Washington High School Site  
1 Paul E Brown Drive Southeast  
Massillon, Stark County, Ohio  
**PSI Project No.: 0142-2590**

Dear Ms. Most:

Per your request, Professional Service Industries, Inc. (PSI) is pleased to submit this Geotechnical Engineering Services Report for the above referenced project. The results of this exploration, together with our recommendations, are to be found in the accompanying report.

After the plans and specifications are complete, PSI should review the final design and specifications in order to verify that the earthwork and recommendations are properly interpreted and implemented. **It is considered imperative that the geotechnical engineer and/or its representative be present during earthwork operations and foundation installations to observe the field conditions with respect to the design assumptions and specifications. PSI will not be held responsible for interpretations and field quality control observations made by others.**

If you have any questions pertaining to this report, please contact our office at (216) 447-1335. PSI would be pleased to continue providing geotechnical services throughout the implementation of the project, and we look forward to working with you and your organization on this and future projects.

Respectfully submitted,

**PROFESSIONAL SERVICE INDUSTRIES, INC.**

A handwritten signature in blue ink, appearing to read "St. A. Pell".

Stephanie A. Pell, E.I.  
Geotechnical Project Engineer

A handwritten signature in blue ink, appearing to read "Alagaiya Veeramani".

Alagaiya Veeramani, P.E.  
Principal Consultant

**Subsurface Exploration Report**



**For the Proposed**

**New Elementary School  
Washington High School Site  
1 Paul E Brown Drive Southeast  
Massillon, Stark County, Ohio**

A handwritten signature in blue ink, appearing to read 'St. A. Pell'.

Stephanie A. Pell, E.I.  
Geotechnical Project Engineer

**Prepared for**

**Architectural Vision Group, LTD.  
23850 Sperry Drive  
Westlake, Ohio 44145**

**Prepared by**

**Professional Service Industries, Inc.  
5555 Canal Road  
Cleveland, OH 44125**

A handwritten signature in blue ink, appearing to read 'Alagaiya Veeramani'.

Alagaiya Veeramani, P.E.  
Principal Consultant

**PSI Project No. 0142-2590**



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## **1 PROJECT INFORMATION**

### **1.1 PROJECT AUTHORIZATION**

This report presents the results of a geotechnical subsurface exploration and evaluation conducted for Architectural Vision Group, LTD., in connection with the proposed New Elementary School located at 1 Paul E Brown Drive Southeast, in Massillon, Stark County, Ohio. PSI's services for this project were performed in accordance with PSI Proposal No. 0142-377342, dated June 29, 2022. Authorization to perform this exploration and analysis was in the form of a proposal authorization form, signed by Ms. Elizabeth Most, Project Manager, of Architectural Vision Group, LTD., dated June 30, 2022.

### **1.2 PROJECT DESCRIPTION**

Based on the provided information, it is understood that the proposed development will include the construction of a new elementary school building to be located east of the existing Washington High School. The proposed building will be one to two-stories, measuring approximately 62,600 square feet in plan area. Additionally, the project includes the construction of paved parking lots and driveways.

No structural loading information was provided at the time of this report. However, PSI has made the following assumptions for the proposed construction.

The maximum column, wall, and floor loads for the school building will be 100 kips, 5 kips per linear foot, and 100 pounds per square foot (psf), respectively.

Based on the provided topographic plan, the overall site generally slopes downward from northeast to southwest with an elevation difference about 42 feet (1,084' MSL to 1,042' MSL) and about 16 feet within the proposed building footprint. No grading plan is available at the time of this report. However, it is assumed that the maximum cut and fill operations of less than 8 feet will be required for the proposed building area and some cut/fill as required will be anticipated within the proposed pavement area.

The geotechnical recommendations presented in this report are based on the available project information, the proposed building location and orientation of the building on the site, and the subsurface materials described in this report. If any of the information we have been given or have assumed is incorrect, please contact us so that we may amend the recommendations presented accordingly. PSI will not be responsible for the implementation of its recommendations when it is not notified of changes in the project.

### **1.3 PURPOSE AND SCOPE OF SERVICES**

The purpose of this study was to explore the subsurface conditions at the site and to prepare recommendations for foundations, floor slab construction, site preparation, and other construction considerations. Our scope for this service included a project site reconnaissance, drilling and sampling eighteen preliminary (18) and six supplemental (6) test borings, completing a laboratory testing program, and submitting an engineering analysis and evaluation of the subsurface materials.

The scope of services for the geotechnical exploration did not include an environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors or unusual or suspicious

items or conditions are strictly for the information of the client. PSI's scope also did not include any service to investigate or detect the presence of moisture, mold or other biological contaminants in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence or the amplification of the same. The Client should be aware that mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. The Client should also be aware that site conditions are outside of PSI's control, and that mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible for the occurrence or reoccurrence of mold amplification.

## **2 SITE AND SUBSURFACE CONDITIONS**

### **2.1 SITE LOCATION AND DESCRIPTION**

The site for the proposed New Elementary School project is located at located at 1 Paul E Brown Drive Southeast, in Massillon, Stark County, Ohio. Specifically, the proposed New Elementary School will be located immediately east of the existing Washington High School football stadium and baseball field (Lat: 40.792998° & Long: -81.497825°).

The site is currently predominantly covered with an asphalt paved football practice field and school bus parking facility with associated building structure. The rest of the site area is undeveloped, covered with some light brush and gravel. Based on the provided topographic plan, the overall site generally slopes downward from northeast to southwest with an elevation difference about 42 feet (1,084' MSL to 1,042' MSL). Surface drainage was good to fair at the time of the field drilling operations. PSI recommends that any existing utility lines be checked and marked prior to construction activities.

### **2.2 SUBSURFACE CONDITIONS**

The surface and subsurface conditions at the site were explored with a total of eighteen preliminary (18) and six supplemental (6) test borings. The test borings were each drilled to a depth of approximately 10 to 20 feet below the existing surface grades. The approximate boring locations are shown on the Boring Location Plan presented in the *Appendix* of this report. The locations for the test borings were selected by PSI and located in the field relative to existing site features and based on site accessibility and the presence of below ground utilities.

The borings were advanced utilizing 3¼ inch inside diameter, hollow-stem auger drilling methods. Soil samples were routinely obtained during the drilling process. Selected soil samples were later tested in the laboratory to obtain soil material properties for the foundation, floor slabs and pavement recommendations. Drilling, sampling, and laboratory testing were accomplished in general accordance with ASTM procedures.

The types of subsurface materials encountered in the test borings have been visually classified. The results of the visual classifications, Standard Penetration tests, moisture contents and water level observations are presented on the boring logs in the *Appendix* of this report. Representative samples of the soils were placed in sample jars and are now stored in the laboratory for further analysis, if requested. Unless notified to the contrary, all samples will be disposed of after 60 days following the date of this report.

The surface of the site at test boring locations B-01, B-03, B-04, B-07, B-10, B-16, B-17, and B-22 was covered with a layer of topsoil measuring approximately 1 to 12 inches in thickness. Boring Locations B-02, B-05, B-08, B-11, B-14, B-15, and B-24 were covered with a layer of gravel measuring approximately 1 to 4 inches in thickness. Boring

locations B-06, B-13, B-19 through B-21, and B-23 were covered with a layer of asphalt measuring approximately 1 to 6 inches in thickness, of which B-6, B-20 and B-23 was underlain with a layer of sand and gravel measuring approximately 2 to 21 inches in thickness. Boring location B-18 was covered with a layer of sand and gravel measuring approximately 12 inches in thickness. The thickness and composition of the surface and base materials should be expected to be variable throughout site.

Underlying the surface material at test boring locations B-04, B-11, B-15, B-18, B-19, and B-23 a layer of fill material was encountered, extending to the depths of about 3 to 6 feet below the existing grade. The fill material consisted primarily of sandy silt and lean clay with varying amounts of gravel, cinders, slag, and cobbles. The fill material exhibited moisture contents ranging from 9 to 19 percent. The cohesive fill materials exhibited a soft to stiff consistency, based on the Standard Penetration tests.

The surface and fill materials at all the test boring locations B-01 through B-24 were underlain by natural soils. The natural soils at the test borings location B-16 was extended to the depths about 13.3 feet below the existing surface grades and the natural soils at the test boring locations B-01 through B-15, and B-17 through B-24 were encountered to the terminal depth of about 10 to 20 feet below the existing surface grades. The natural soils consisted primarily of lean clay, sandy silt and silty sand with varying amounts of gravel and rock fragments. The natural soils exhibited moisture contents ranging from 5 to 27 percent. The natural cohesive soils exhibited a medium stiff to hard consistency, and the natural granular soils exhibited a loose to medium dense relative density, based on the Standard Penetration tests.

The area's bottommost formation consisted of gray, weathered sandstone bedrock, encountered in test boring B-16.

The subsurface description is of a generalized nature provided to highlight the major strata encountered. The boring logs included in the *Appendix* should be reviewed for specific information at the individual boring locations. The stratifications shown on the boring logs represent the conditions only at the actual test positions. Variations may occur and should be expected between the boring locations. The stratifications represent the approximate boundary between the subsurface materials, and the transition may be gradual or not clearly defined.

## **2.3 GROUNDWATER LEVEL MEASUREMENTS**

Groundwater was encountered in test boring locations B-16 and B-18 at a depth of 9.5 to 13 feet below existing surface grade during the field drilling operations. Note that groundwater levels fluctuate seasonally as a function of rainfall. During a time of year or weather different from the time of drilling, there may be a considerable change in the water table. Furthermore, the water levels in the boreholes often are not representative of the actual groundwater level, because the boreholes remain open for a relatively short time. Therefore, we recommend that the contractor determine the actual groundwater levels at the time of construction to evaluate groundwater impact on the construction procedures.

### **3 EVALUATION AND RECOMMENDATIONS**

#### **3.1 SITE PREPARATION AND EARTHWORK CONSTRUCTION**

Prior to placing concrete floors or engineered fill on this site, general site area clearing should be carried out. All base, topsoil, grass, roots, excessively wet soils, highly organic soils, and soft/loose or obviously compressible materials, should be completely removed from the proposed construction areas. Depending up on the final grades, the unsuitable fill material, as evidenced at all test boring locations B-04, B-11, B-15, B-18, B-19, and B-23 should be completely removed from below the proposed building foundation footprint, and to a minimum depth of 12 inches below the proposed pavement subgrade elevations and replaced with compacted engineered fill. The precise extent of required cut and fill should be determined in the field by a representative of PSI following observation of the exposed subgrades and proof rolling operations.

Following the site clearing, stripping and undercutting, and prior to placing engineered fill, the exposed subgrades should be critically proof rolled with a loaded 20-ton tandem-axle dump truck until the grade offers a relatively unyielding surface. Areas of excessive yielding, as observed by a geotechnical engineer's representative, should be excavated and backfilled with compacted engineered fill and/or the unstable soils can be stabilized by choking the exposed bearing surface with crushed limestone or similar coarse aggregate. After the existing subgrade materials are excavated to design grade, proper control of subgrade compaction and the placement and compaction of new fill materials should be observed and tested by a representative of PSI.

It is recommended that the site preparation, proof rolling, and earthwork activities should be performed during a period of dry weather, which can significantly reduce the required extent of soil stabilization, drainage and surface repairs.

During site preparation, fill piles, burn pits, trash pits or other isolated disposal areas may be encountered. All too frequently such buried material occurs in isolated areas outside boring locations. Any such material encountered during site work, or foundation, floor slab or pavement construction should be excavated, removed from the site, and backfilled with compacted structural fill.

#### **3.2 ENGINEERED FILL**

Materials selected for use as engineered fill should not contain more than 5 percent by weight of organic matter, waste construction debris, or other deleterious materials. Fill materials should have a Standard Proctor maximum dry density (ASTM D-698) greater than 110 pounds per cubic foot (pcf), an Atterberg Liquid Limit of less than 40, a Plasticity Index of less than 15, and a maximum particle size of 3 inches or less. Engineered fill materials should consist of non-expansive materials. Pyritic and/or potentially expansive materials, such as mine tailings, shales and slag should not be used as engineered fill material.

Based on the results of the boring explorations, the on-site soils not suitable for reuse as engineered fill. If the on-site soils are used for fill, close moisture content control will be required to achieve the recommended degree of compaction. PSI anticipates that disking and aerating the soils during a warm, dry period may be necessary to lower the moisture content. If engineered fill placement must proceed during a wet or cool time of the year, it may likely be infeasible to re-use the on-site soils as engineered fill and imported fill materials would be required. If wet or cool season earthwork is necessary, we recommend the use of imported fill materials such as ODOT No. 304 or 411 crushed aggregate.

Representative samples of the proposed fill materials should be collected at least one week prior to the start of the filling operations. The samples should be tested to determine the maximum dry density, optimum moisture content, particle size distribution and plasticity characteristics. These tests are needed to determine if the material is acceptable as structural fill and for quality control during the compaction process.

Engineered fill materials should be placed and compacted in individual lifts of 8 inches or less loose measurement. Within small excavations such as in utility trenches, around manholes, or behind retaining walls, we recommend the use of smaller, hand- or remote-guided equipment. Loose lift thicknesses of 4 inches or less are recommended when using such equipment.

We recommend that structural fill be compacted to a minimum of 98 percent of the maximum dry density and within  $\pm 2\%$  of the optimum moisture content, as determined by ASTM D-698. A representative of PSI should observe fill placement operations and perform density tests concurrently to indicate if the specified compaction is being achieved.

### 3.3 FOUNDATION RECOMMENDATIONS

Based on the test boring results, laboratory test results, and the proposed construction, our analysis indicates that the proposed building structure can be supported on isolated and/or continuous spread-footing foundations, bearing on the existing natural soil or on properly compacted engineered fill, will be suitable to support the proposed building structure. An allowable bearing capacity of 2,500 psf may be utilized for the design of the spread-footing foundations.

All perimeter footings must be placed at a minimum depth of 42 inches below the finished grade in order to protect against frost action. Interior foundations in heated areas may be placed at a depth of at least 18 inches below the floor slab, provided they will be bearing on acceptable natural or compacted engineered fill soils.

Extreme care should be taken to prevent weakening of the foundation bearing materials because of prolonged atmospheric exposure, construction activity disturbance or an increase in moisture content. If an overnight delay in concrete placement is anticipated, the foundation excavations should be cut approximately 6 inches and subsequently excavated to final grade immediately before placement of concrete.

In order to reduce the effects of differential movement that may occur due to variations in the character of the supporting soil and any variations in seasonal moisture contents, it is recommended that all continuous footings be reinforced, as per structural considerations. Foundations supporting individual columns should have a minimum dimension of 24 inches, and continuous wall foundations should have a minimum width of 18 inches.

Based on the assumed structural loads, it is anticipated that total and differential foundation settlements will be less than 1.0-inch and 0.50-inch, respectively. However, actual settlements will be dependent upon the depth of the foundations, column spacing, structural loads and other related factors. The structural and architectural design should include provisions for liberally spaced, vertical control joints to minimize the effects of potential settlement.

**Control points should be established within the anticipated fill areas (more than 4 feet) to monitor, during and subsequent to the completion of the fill operations, any and all settlements of the final grade resulting from**

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**consolidation of the area's subsurface materials under the weight of the engineered fill, and from the engineered fill under their own weight. Settlement-time data, thus developed, should be employed to establish the time of placement of the building structure and pavement areas.**

PSI should be retained to provide observation and testing of construction activities involved in the foundation, earthwork and related activities of this project. PSI cannot accept responsibility for conditions that deviate from those described in this report, nor for the performance and testing for this project.

Based on table 1615.1.1 of the OBC Building Code, the test boring results, and review of the geology in vicinity to the project area, a **Site Classification of 'C'** can be utilized for the seismic design.

### **3.4 FLOOR SLAB DESIGN AND CONSTRUCTION**

Preparation of floor slab subgrades should be in accordance with the recommendations outlined in the *Site Preparation* and *Engineered Fill* sections of the report. If subsurface materials at the finished subgrade elevations exhibit excessive moisture contents and unstable subgrade conditions, then undercutting and replacement of the objectionable soils should be performed to achieve firm subgrade support. Alternatively, the unstable soils can be stabilized by choking the exposed bearing surface with crushed limestone or similar coarse aggregate.

After the soils in the building area have been prepared as discussed, it is recommended that the subgrade surface be subjected to surface compaction to the extent that a minimum of 24 inches of materials underlying the slab subgrade elevation achieve a minimum in-place density of 98 percent of the maximum laboratory dry density and should be within  $\pm 2\%$  of the optimum moisture content, as determined in general accordance with ASTM D-698.

A capillary gravel layer (such as AASHTO #57 or ODOT #304) should be provided between the floor slab and the approved subgrade materials. The gravel layer should have a minimum thickness of 6 inches and should be properly compacted. Also, a vapor barrier is recommended below the floor slab as per ACI specifications. We recommend that a subgrade modulus (k) of 80 pci be used in floor slab design calculations.

Careful field control is to be exercised in finish grading operations in order to assure that subgrade tolerances are maintained. It is particularly important that no low sectors or depressions be allowed to exist within these areas, water may accumulate and lead to serious loss of supporting capacity.

The floor slab should be suitably reinforced, as per structural considerations, to make it as rigid as practical. Proper joints should be provided at the junctions of the slab and foundation system so that a small amount of independent movement can occur without causing damage. Large floor areas should be provided with joints at frequent intervals to compensate for concrete volume changes during curing and temperature changes.

### **3.5 PAVEMENT RECOMMENDATIONS**

Pavement design will include proper preparation of subgrade sectors, careful design of the pavement area drainage systems and utilization of an aggregate base course with asphalt concrete or concrete surface course. Preparation of pavement subgrades should be in accordance with the recommendations outlined in the *Site Preparation* and *Engineered Fill* sections of the report. Careful attention will be required in fine grading the subgrade surfaces in order to eliminate undulations and depressions that would tend to collect water.

We recommend that the exposed surface be proof rolled, and any soft areas removed. Compaction of fill soil intended to support pavement should meet or exceed 98% of the maximum dry density as determined by ASTM D698 (Standard Proctor). The moisture content at the time of compaction should be within 2% of the optimum value. Any removed soil should be replaced by compacted structural fill to arrive at the desired grade.

The proposed pavement construction will be primarily for car and bus traffic. No traffic information was provided at the time of this report. However, PSI has assumed average daily traffic (ADT) of about 150 cars, 30 buses, and 2 semi-trucks. Based on the anticipated pavement design information, the following pavement design parameters may be utilized for new pavement design:

Design Parameters		
	Flexible Pavement	Rigid Pavement
Light Duty design 18-kip ESAL's	50,000	50,000
Heavy Duty design 18-kip ESAL's	200,000	200,000
Reliability:	80%	80%
Overall Deviation:	0.49	0.39
Design Life (Years):	20	20
Initial Serviceability:	4.5	4.2
Terminal Serviceability:	2.5	2.5
Design CBR	4	--
Subgrade Modulus (k, pci)	--	80

### Flexible Pavement

The recommended pavement thickness values are shown in Tables 1 and 2. These design thicknesses assume that a properly prepared subgrade has been achieved.

**Table 1: Flexible Pavement Sections (20-Year Design Life)**

	Light-Duty*	Heavy Duty
Surface Course (ODOT #448 Type 1)	1.5 inches	1.5 inches
Intermediate Course (ODOT #448 Type 2)	2.5 inches	3.5 inches
Aggregate Base Course (ODOT #304)	6.0 inches	8.0 inches

*\*Parking spaces only*

For parking stalls that allow free movement through them (i.e., no parking block or curbs), we recommend installing the heavy-duty asphalt section. Allowances for proper drainage and proper material selection of base materials are most important for performance of asphaltic pavements. Ruts and birdbaths in asphalt pavement allow for quick deterioration of the pavement primarily due to saturation of the underlying base and subgrade.

### Rigid Pavement

The use of concrete for paving has become more prevalent in recent years due to the long-term maintenance cost benefits of concrete compared to asphaltic pavements. Should concrete pavement be utilized, the concrete should be properly reinforced and jointed, and should have a 28-day flexural strength of no less than 650 psi and



should be air entrained. Expansion joints should be sealed with a polyurethane sealant so that moisture infiltration into the subgrade soils and resultant concrete deterioration at the joints is reduced.

**Table 2: Rigid Pavement Sections**

	<b>Light-Duty*</b>	<b>Heavy Duty</b>
Reinforced Concrete	5.0 inches	6.0 inches
Aggregate Base Course (ODOT #304)	4.0 inches	6.0 inches

*\*Parking spaces only*

The portions of the site where rigid (concrete) pavements are recommended include the entrance/exit driveway aprons and the dumpster pad enclosure area. A heavy-duty pavement section is recommended for lanes designated for delivery trucks. Crushed aggregate base materials should be compacted to at least 98% of the standard Proctor (ASTM D 698) maximum dry density near optimum moisture content. The use of Portland cement concrete (PCC) for paving has become more prevalent in recent years based on material costs for concrete vs. bituminous and the long-term maintenance cost benefits of concrete compared to bituminous pavements. If PCC pavement is utilized, the concrete should be properly jointed, have proper load-transfer mechanisms installed, and should have a minimum 28-day compressive strength of 4,000 psi. Expansion and construction joints should be sealed with a polyurethane sealant so that moisture infiltration into the subgrade soils and resultant concrete deterioration at the joints is minimized. Concrete pavement at least 8 inches thick is recommended for the trash dumpster pad and entrance/exit aprons due to the high wheel and impact loads that these areas experience.

Design for drainage is of the utmost importance to minimize detrimental effects that may shorten the service life of the pavements. The pavement should be crowned or sloped in order to promote effective surface drainage and reduce the risk of water ponding. We recommend a minimum slope of 1.5 percent. In addition, the subgrade should be similarly sloped to promote effective subgrade drainage. We recommend “stub” or “finger” drains be provided around catch-basins and in other low areas of the proposed pavements to limit the accumulation of water on the frost susceptible subgrade soils. Subsurface edge drains should be provided at curbs. Where no curbs are proposed, ditches should be provided, and the pavement base course should be daylighted through the ditch side slope to facilitate drainage of the base course.

If fill material is needed to establish the required pavement grade, fill placement and compaction must be performed in accordance with the procedures outlined in the *Site Preparation* section of this report. The edges of compacted fill should extend a minimum 2 feet beyond the edges of the pavement, or a distance equal to the depth of fill beneath the pavement, whichever is greater.

All materials to be employed and field operations required in connection with the contemplated pavement structures should follow recommendations and procedural details as per the Ohio Department of Transportation, Asphalt Institute, and/or American Concrete Institute.

## 4 CONSTRUCTION CONSIDERATIONS

### 4.1 GROUNDWATER CONTROL AND DRAINAGE

Free groundwater was encountered in test boring locations B-16 and B-18 at a depth of 9.5 to 13 feet below existing surface grade during the field drilling operations. However, groundwater and/or seepage could be encountered during foundation excavation and construction. Accordingly, a gravity drainage system, sump

pump or other conventional dewatering procedure, as deemed necessary by the field conditions, should be implemented throughout construction such that the groundwater is always controlled and maintained at an elevation of at least 2 feet below the excavation bottom. Every effort should be made to keep the excavations dry if water is encountered.

Water should not be allowed to collect near the foundation or floor slab areas of the building either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, groundwater or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of the building and beneath the floor slab. Overall site area drainage is to be arranged in a manner such that the possibility of water impounding below slab-on-grade areas and over the structural fill is prevented.

## **4.2 EXCAVATIONS**

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, Part 1926, Subpart P." This document was issued to better ensure the safety of workers entering trenches or excavations. It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavations or foundation excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced. If they are not followed closely, the owner and the contractor could be liable for substantial penalties.

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 both the excavation sides and bottom. The contractor's "responsible person" as defined in "CFR Part 1926," should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

We are providing this information solely as a service to our client. PSI is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred. If the excavations are left open and exposed to the elements for a significant length of time, desiccation of the clays may create minute shrinkage cracks which could allow large pieces of clay to collapse or slide into the excavation.

Materials removed from the excavation should not be stockpiled immediately adjacent to the excavation, inasmuch as this load may cause a collapse of the embankment.

## **4.3 WEATHER CONSIDERATIONS**

The soils encountered at this site are known to be sensitive to disturbances caused by construction traffic and to changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. Care should be exercised during the grading operations at the site. Due to the fine-grained nature of the surficial soils, the traffic of heavy equipment, including heavy compaction equipment, may very well create pumping and a general deterioration of those soils in the presence of water. Therefore, the grading should, if possible, be performed during a dry season. A layer of crushed stone may be required to allow the movement of construction traffic over the site during the rainy season. The

contractor should maintain positive site drainage and if wet/pumping conditions occur, the contractor will be responsible to over excavate the wet soils and replace them with a properly compacted engineered fill. During wet seasons, limestone stabilization may be required to place engineered fill.

## **5 GEOTECHNICAL RISK**

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. Site exploration identifies actual subsurface conditions only at those points where samples are taken. A geotechnical report is based on conditions that existed at the time of the subsurface exploration. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations presented in the preceding sections constitute PSI's professional estimate of those measures that are necessary for the proposed structure to perform according to the proposed design based on the information generated and referenced during this evaluation, and PSI's experience in working with these conditions.

## **6 REPORT LIMITATIONS**

The recommendations submitted in this report are based on the available subsurface information obtained by PSI and design details furnished by Architectural Vision Group, LTD. If there are any revisions to the plans for the proposed structures, or if deviations from the subsurface conditions noted in this report are encountered during construction, PSI should be retained to determine if changes in the recommendations are required. If PSI is not retained to perform these functions, PSI will not be responsible for the impact of those conditions on the geotechnical recommendations for the project.

The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein, have been presented after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics and engineering geology. No other warranties are implied or expressed.

After the plans and specifications are complete, it is recommended that PSI be provided the opportunity to review the final design and specifications, in order to verify that the earthwork and recommendations are properly interpreted and implemented. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of Architectural Vision Group, LTD., for the specific application to the proposed New Elementary School located at 1 Paul E Brown Drive Southeast, in Massillon, Stark County, Ohio.

## **APPENDIX**

**SOIL BORING LOCATION PLANS**

**FENCE DIAGRAMS**

**BORING LOGS**

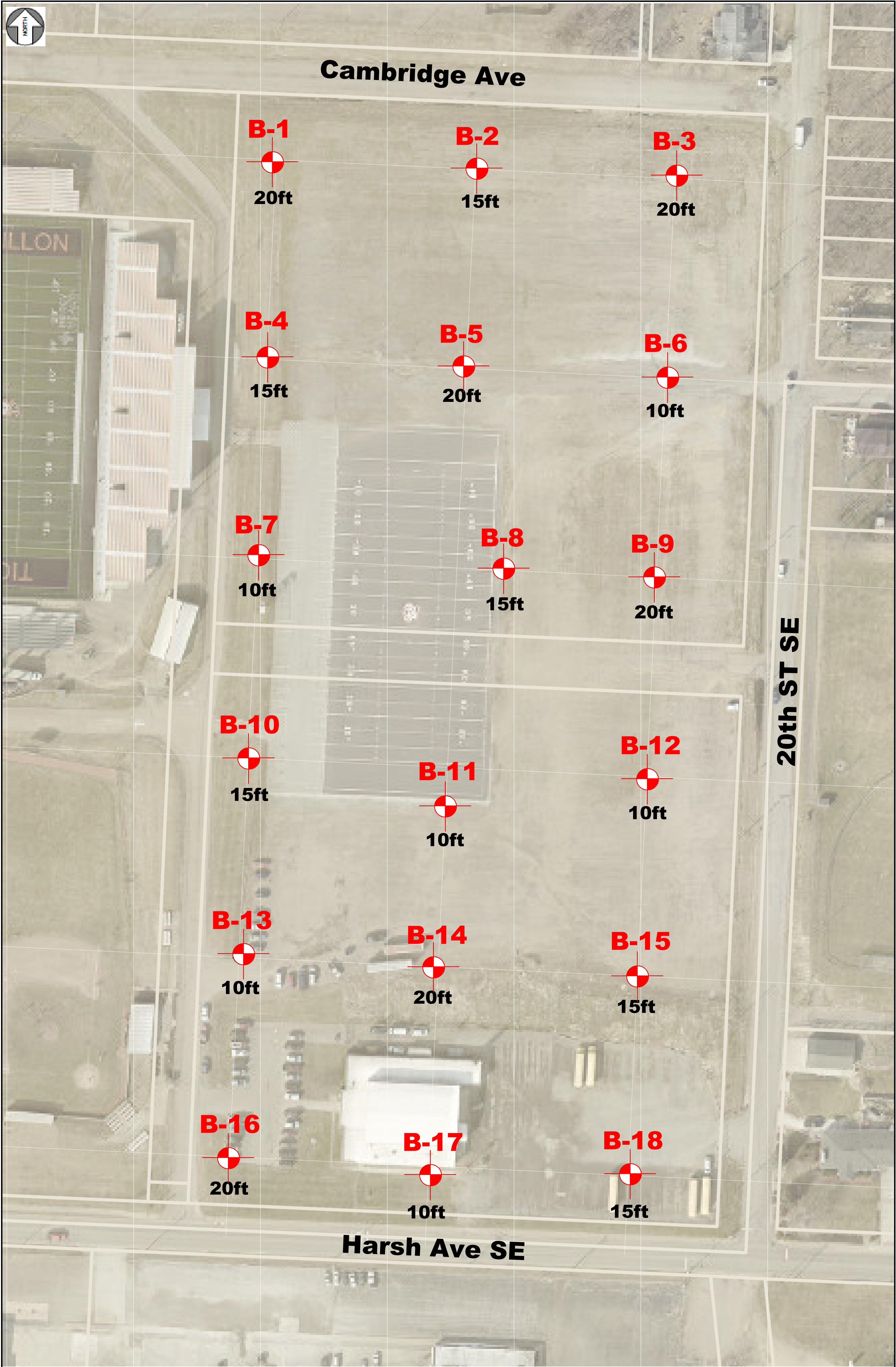
**GRAIN SIZE GRAPHS**

**ATTERBERG LIMIT RESULTS**

**GENERAL NOTES & USCS SOIL CLASSIFICATION CHART**



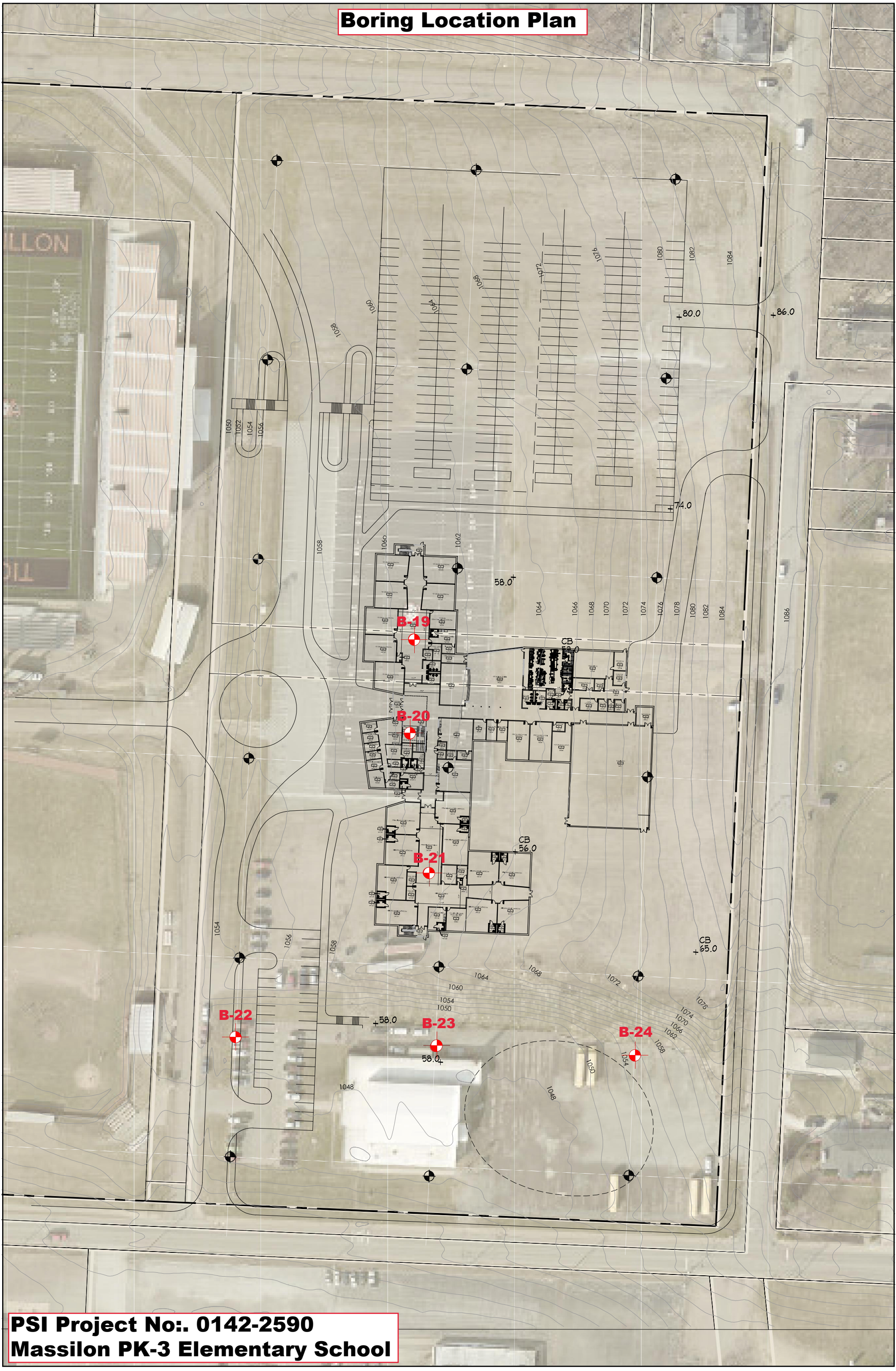
# Boring Location Plan



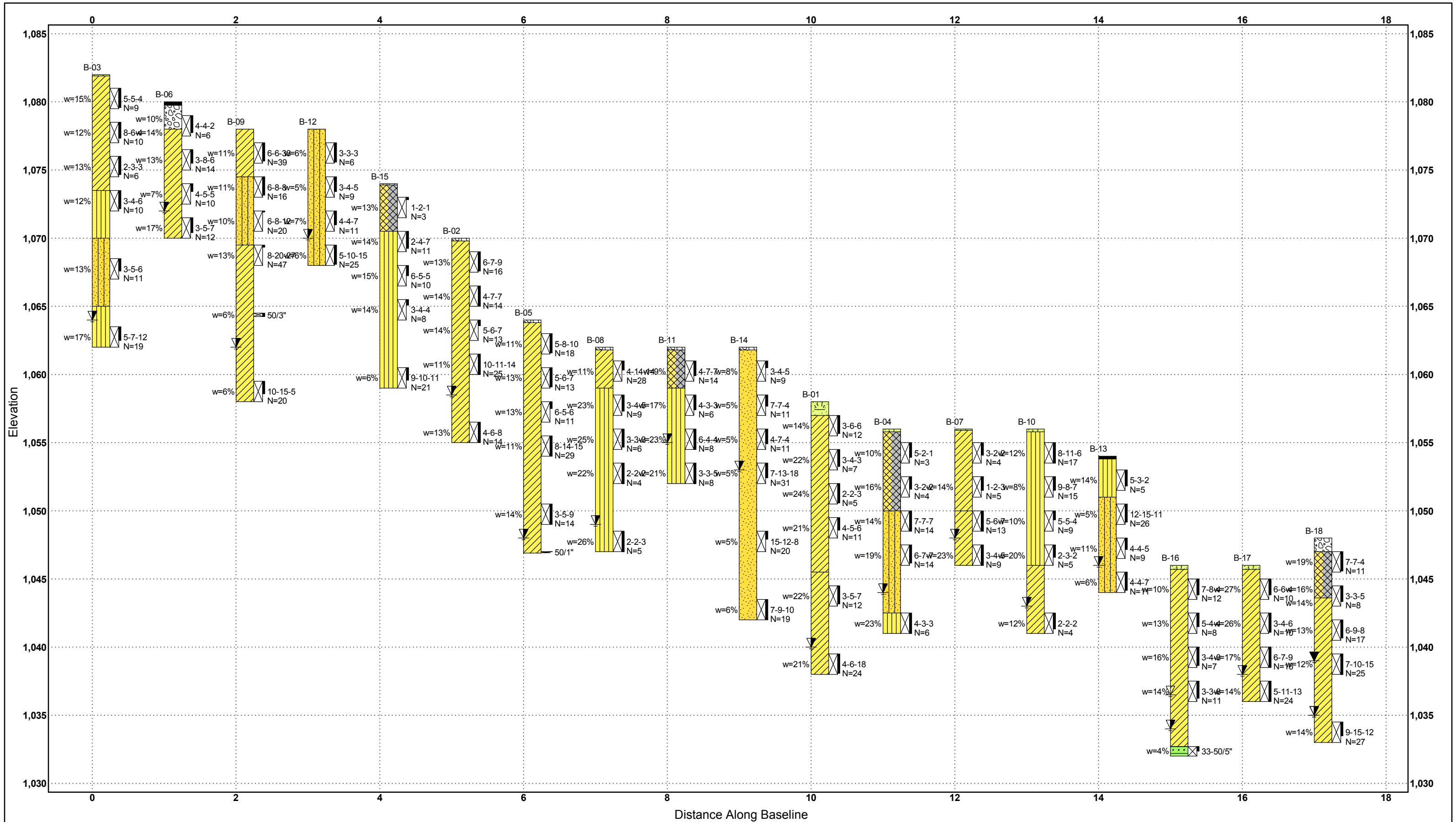
**New Elementary School**  
**Washington High School Site**  
**1 Paul E Brown Drive Southeast**  
**Massillon, Stark County, Ohio**  
**PSI Project No.: 0142-2428**

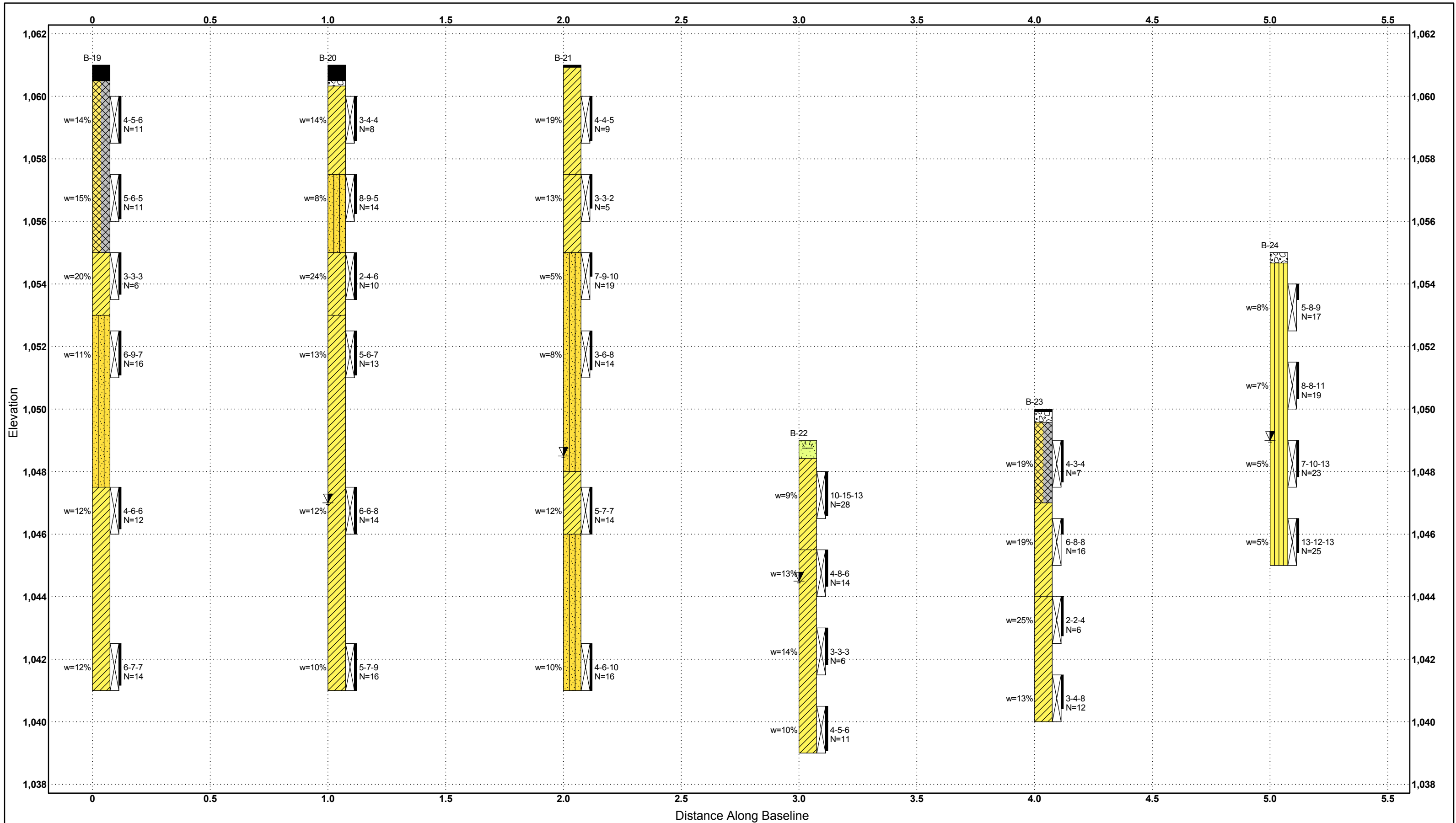


# Boring Location Plan









Professional Service Industries, Inc.  
5555 Canal Road  
Cleveland, OH 44125

## Profile

New East Side PK-3 School  
PSI Project Number: 0142-2590

1 Paul E. Brown Drive, SE  
Massillon, Stark County, Ohio

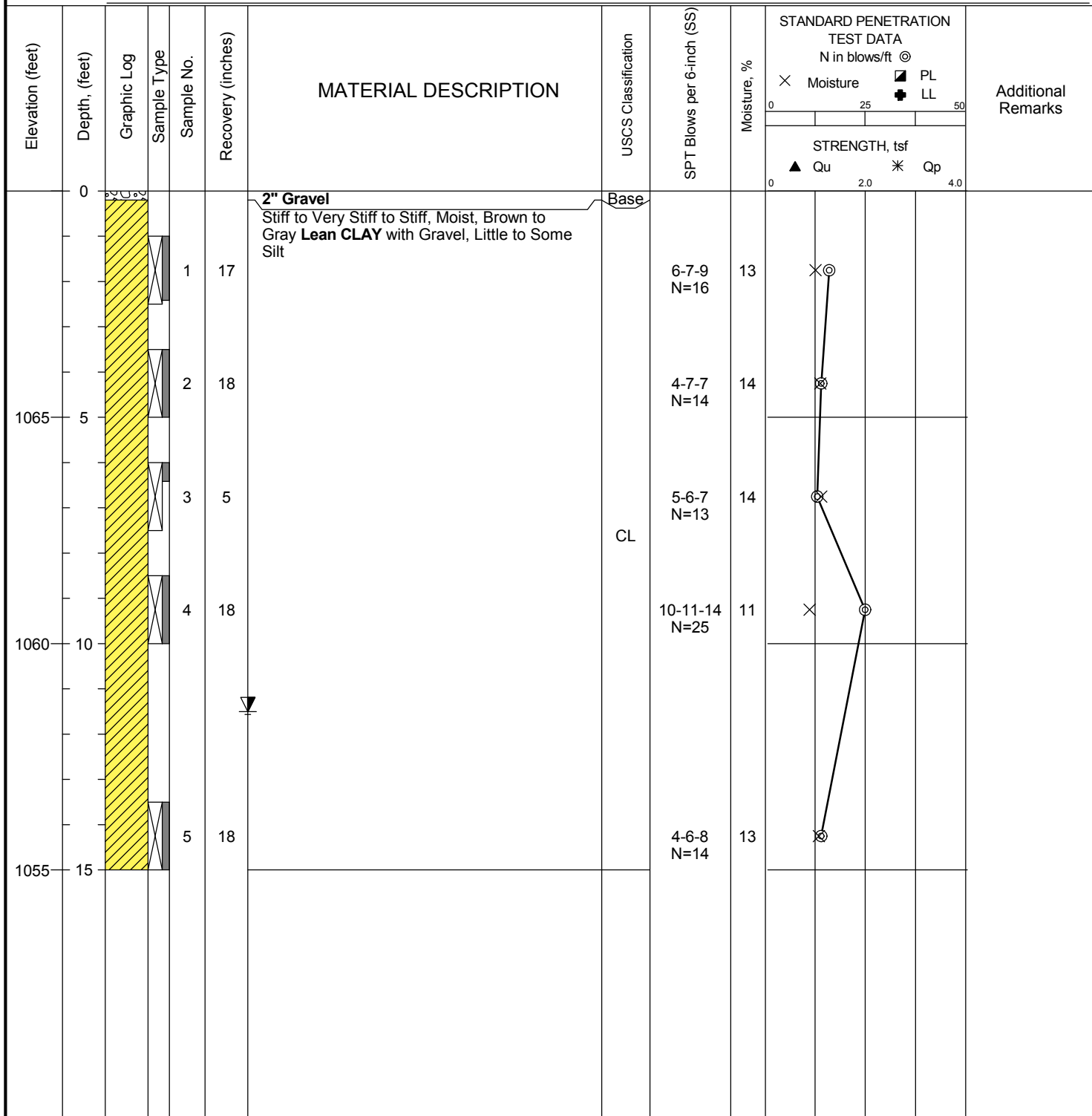


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<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger		
<b>ELEVATION:</b> 1058 ft		<b>SAMPLING METHOD:</b> 2-in SS		
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic		<b>BORING LOCATION:</b>
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%		
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV		
<b>REMARKS:</b>				

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ◎ X Moisture    PL LL  STRENGTH, tsf ▲ Qu    * Qp	Additional Remarks
0						12" Topsoil	Topsoil				
1055				1	16	Stiff to Medium Stiff to Stiff, Moist, Gray Lean CLAY with Silt, Trace to Little Gravel, Trace Organics		3-6-6 N=12	14		
	5			2	15			3-4-3 N=7	22		
				3	17		CL	2-2-3 N=5	24		
1050				4	11			4-5-6 N=11	21		
	10										
						Stiff to Very Stiff, Moist, Brown Lean CLAY, Trace Gravel		3-5-7 N=12	22		
1045				5	16		CL				
	15										
1040				6	17			4-6-18 N=24	21		
	20										

	Professional Service Industries, Inc.	<b>PROJECT NO.:</b> 0142-2428
	5555 Canal Road	<b>PROJECT:</b> Proposed Elem School - Washington
	Cleveland, OH 44125	<b>LOCATION:</b> 1 Paul E Brown Drive, Southeast
	Telephone: (216) 447-1335	Massillon, Stark County, Ohio

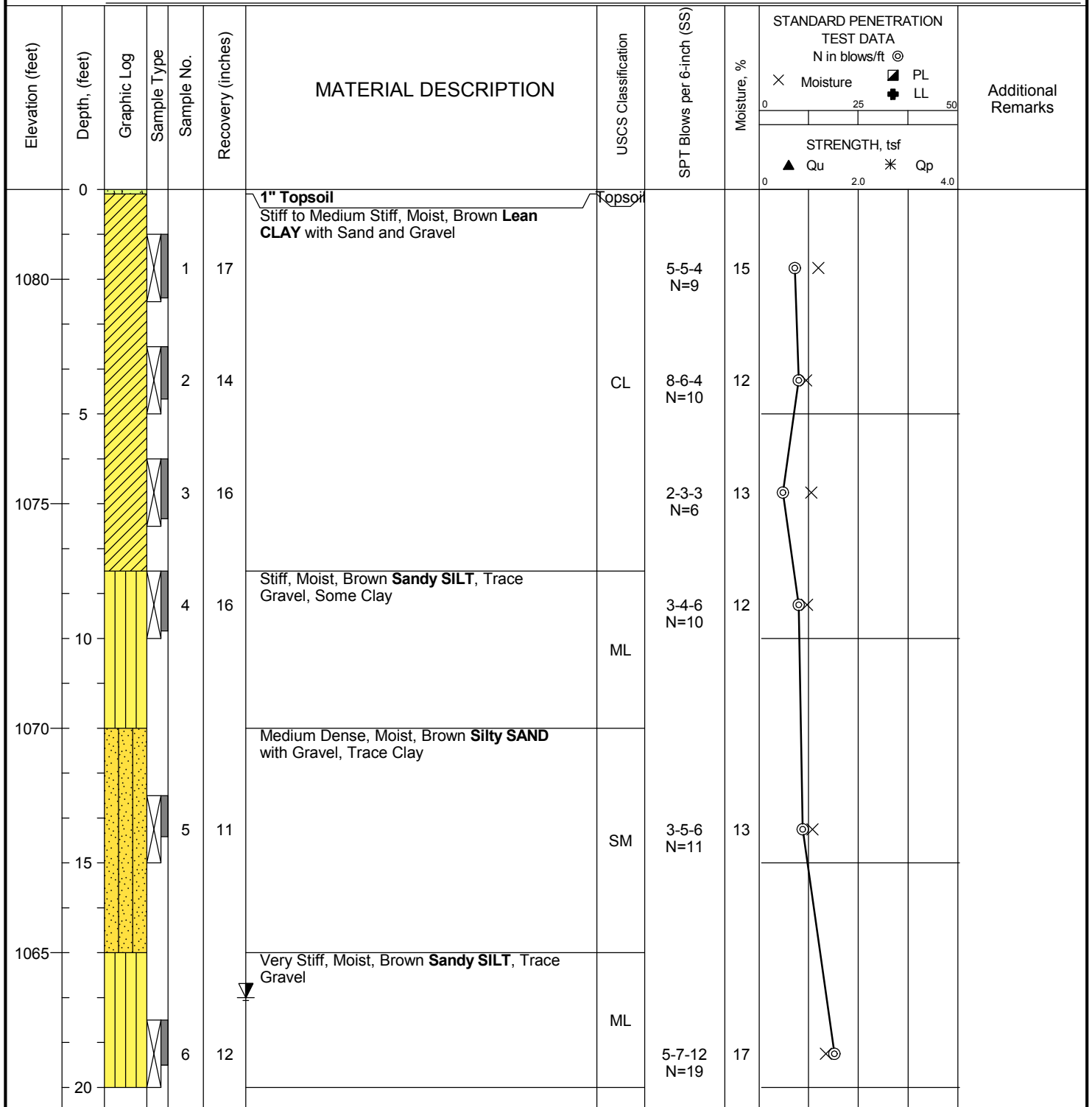
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BENCHMARK: N/A		DRILLING METHOD: Hollow Stem Auger		<b>BORING LOCATION:</b>	
ELEVATION: 1070 ft		SAMPLING METHOD: 2-in SS			
LATITUDE:		HAMMER TYPE: Automatic			
LONGITUDE:		EFFICIENCY: 93%			
STATION: N/A OFFSET: N/A		REVIEWED BY: AV			
REMARKS:					



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	5555 Canal Road	PROJECT: Proposed Elem School - Washington
	Cleveland, OH 44125	LOCATION: 1 Paul E Brown Drive, Southeast
	Telephone: (216) 447-1335	Massillon, Stark County, Ohio

The stratification lines represent approximate boundaries. The transition may be gradual.

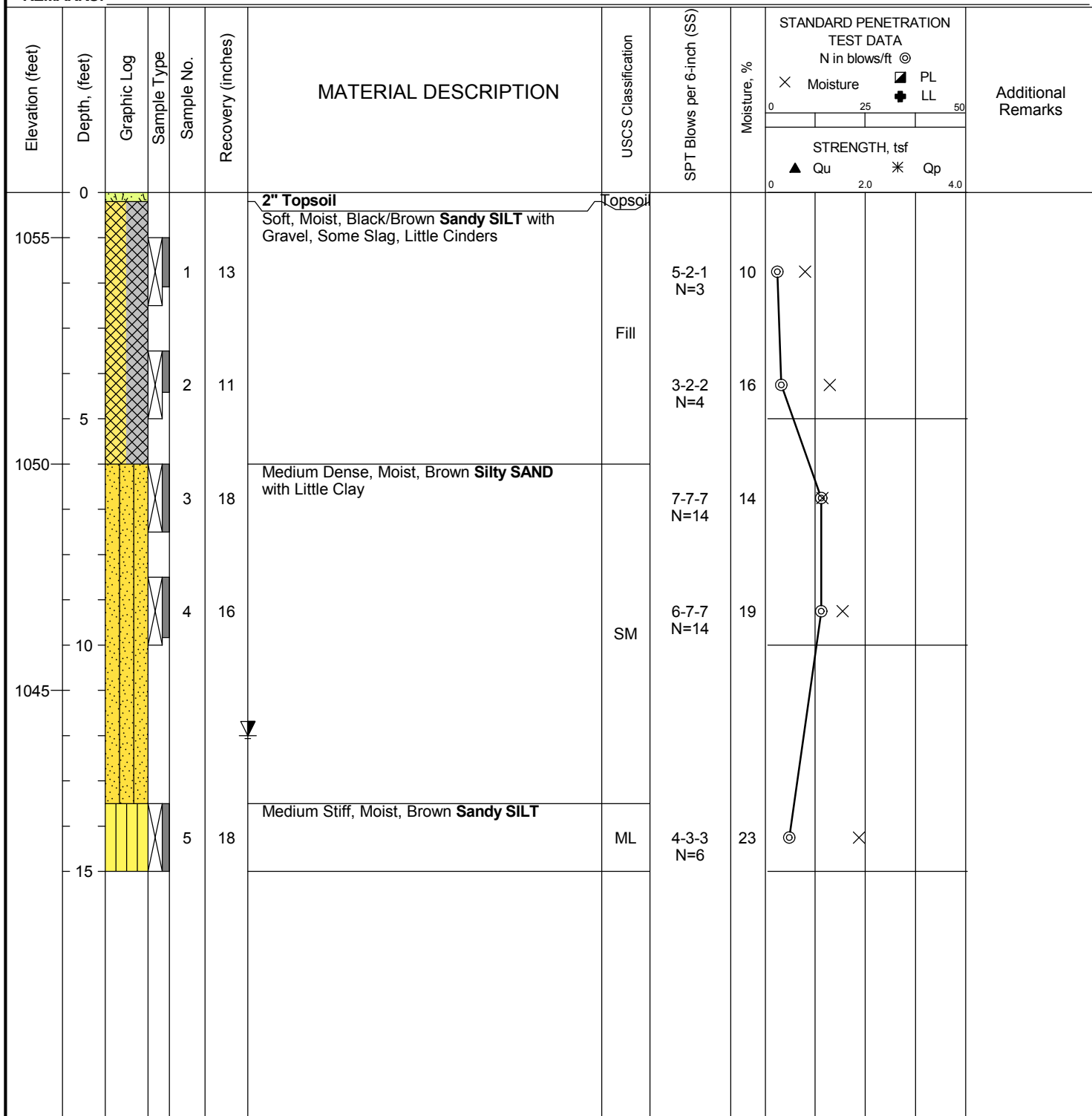
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<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
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<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic			
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					



Professional Service Industries, Inc.  
5555 Canal Road  
Cleveland, OH 44125  
Telephone: (216) 447-1335

**PROJECT NO.:** 0142-2428  
**PROJECT:** Proposed Elem School - Washington  
**LOCATION:** 1 Paul E Brown Drive, Southeast  
Massillon, Stark County, Ohio

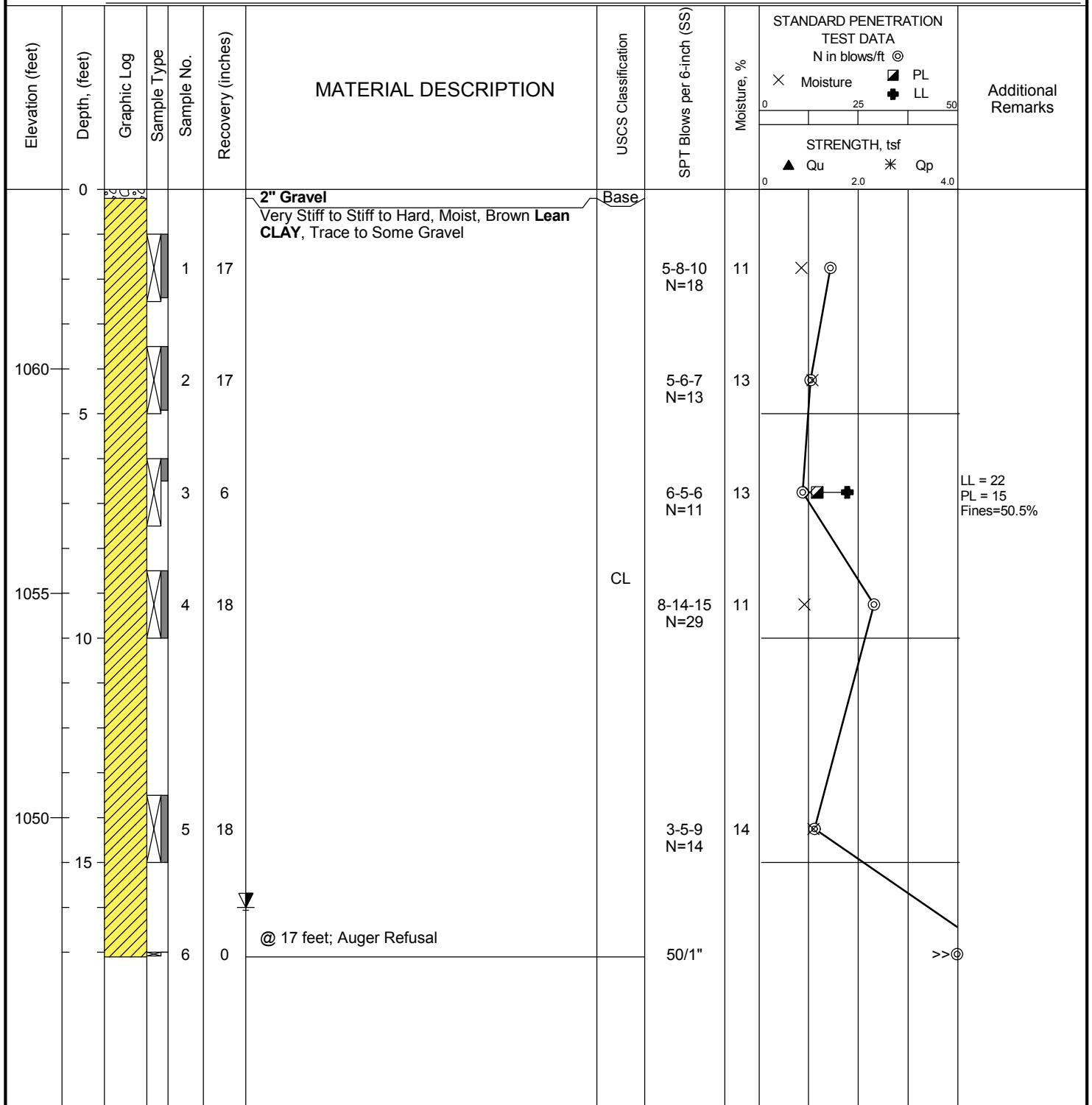
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<b>ELEVATION:</b> 1056 ft		<b>SAMPLING METHOD:</b> 2-in SS		
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic		<b>BORING LOCATION:</b>
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%		
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV		
<b>REMARKS:</b>				



	Professional Service Industries, Inc.	PROJECT NO.: 0142-2428
	5555 Canal Road	PROJECT: Proposed Elem School - Washington
	Cleveland, OH 44125	LOCATION: 1 Paul E Brown Drive, Southeast
	Telephone: (216) 447-1335	Massillon, Stark County, Ohio

The stratification lines represent approximate boundaries. The transition may be gradual.










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<b>COMPLETION DEPTH:</b> 17.1 ft		<b>DRILL RIG:</b> ATV CME-55		<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <b>Water</b>  <div style="display: flex; align-items: center;"> <div style="width: 10px; height: 10px; border: 1px solid black; margin-right: 5px;"></div> While Drilling </div> <div style="display: flex; align-items: center;"> <div style="width: 10px; height: 10px; border: 1px solid black; margin-right: 5px;"></div> Upon Completion </div> <div style="display: flex; align-items: center;"> <div style="width: 10px; height: 10px; border: 1px solid black; margin-right: 5px;"></div> Caved Depth </div> </div> <div style="width: 60%; text-align: right;"> N/A N/A 16 feet </div> </div>	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1064 ft		<b>SAMPLING METHOD:</b> 2-in SS		<b>BORING LOCATION:</b>	
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic			
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					




	Professional Service Industries, Inc. 5555 Canal Road Cleveland, OH 44125 Telephone: (216) 447-1335	<b>PROJECT NO.:</b> 0142-2428 <b>PROJECT:</b> Proposed Elem School - Washington <b>LOCATION:</b> 1 Paul E Brown Drive, Southeast Massillon, Stark County, Ohio

The stratification lines represent approximate boundaries. The transition may be gradual.

<b>DATE STARTED:</b> 9/30/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-06</b>											
<b>DATE COMPLETED:</b> 9/30/21		<b>DRILLER:</b> TS <b>LOGGED BY:</b> ZO													
<b>COMPLETION DEPTH:</b> 10.0 ft		<b>DRILL RIG:</b> ATV CME-55		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td rowspan="3" style="width: 30px; text-align: center; vertical-align: middle;"><b>Water</b></td> <td style="text-align: center;">▽</td> <td>While Drilling</td> <td style="text-align: right;">N/A</td> </tr> <tr> <td style="text-align: center;">▼</td> <td>Upon Completion</td> <td style="text-align: right;">N/A</td> </tr> <tr> <td style="text-align: center;">▽</td> <td>Caved Depth</td> <td style="text-align: right;">8 feet</td> </tr> </table>		<b>Water</b>	▽	While Drilling	N/A	▼	Upon Completion	N/A	▽	Caved Depth	8 feet
<b>Water</b>	▽	While Drilling	N/A												
	▼	Upon Completion	N/A												
	▽	Caved Depth	8 feet												
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger		<b>BORING LOCATION:</b>											
<b>ELEVATION:</b> 1080 ft		<b>SAMPLING METHOD:</b> 2-in SS													
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic													
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%													
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV													
<b>REMARKS:</b>															

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @			Additional Remarks
										<div> <div> <div>×</div> <div>Moisture</div> </div> <div> <div>▣</div> <div>PL</div> </div> <div> <div>+</div> <div>LL</div> </div> </div> <div> <div>0</div> <div>25</div> <div>50</div> </div>			
										<div> <div>▲</div> <div>Qu</div> </div> <div> <div>✱</div> <div>Qp</div> </div>			
										<div> <div>0</div> <div>2.0</div> <div>4.0</div> </div>			
	0					3" Asphalt over 21" Black Sand and Gravel Base	Asphalt Base						
				1	15	Medium Stiff to Stiff, Moist, Brown Lean CLAY with Sand and Gravel	Base	4-4-2 N=6	10				
									14				
				2	12			3-8-6 N=14	13				
1075	5												
				3	7		CL	4-5-5 N=10	7				
													
				4	13			3-5-7 N=12	17				
1070	10												

	Professional Service Industries, Inc.		<b>PROJECT NO.:</b> 0142-2428
	5555 Canal Road		<b>PROJECT:</b> Proposed Elem School - Washington
	Cleveland, OH 44125		<b>LOCATION:</b> 1 Paul E Brown Drive, Southeast
	Telephone: (216) 447-1335		Massillon, Stark County, Ohio

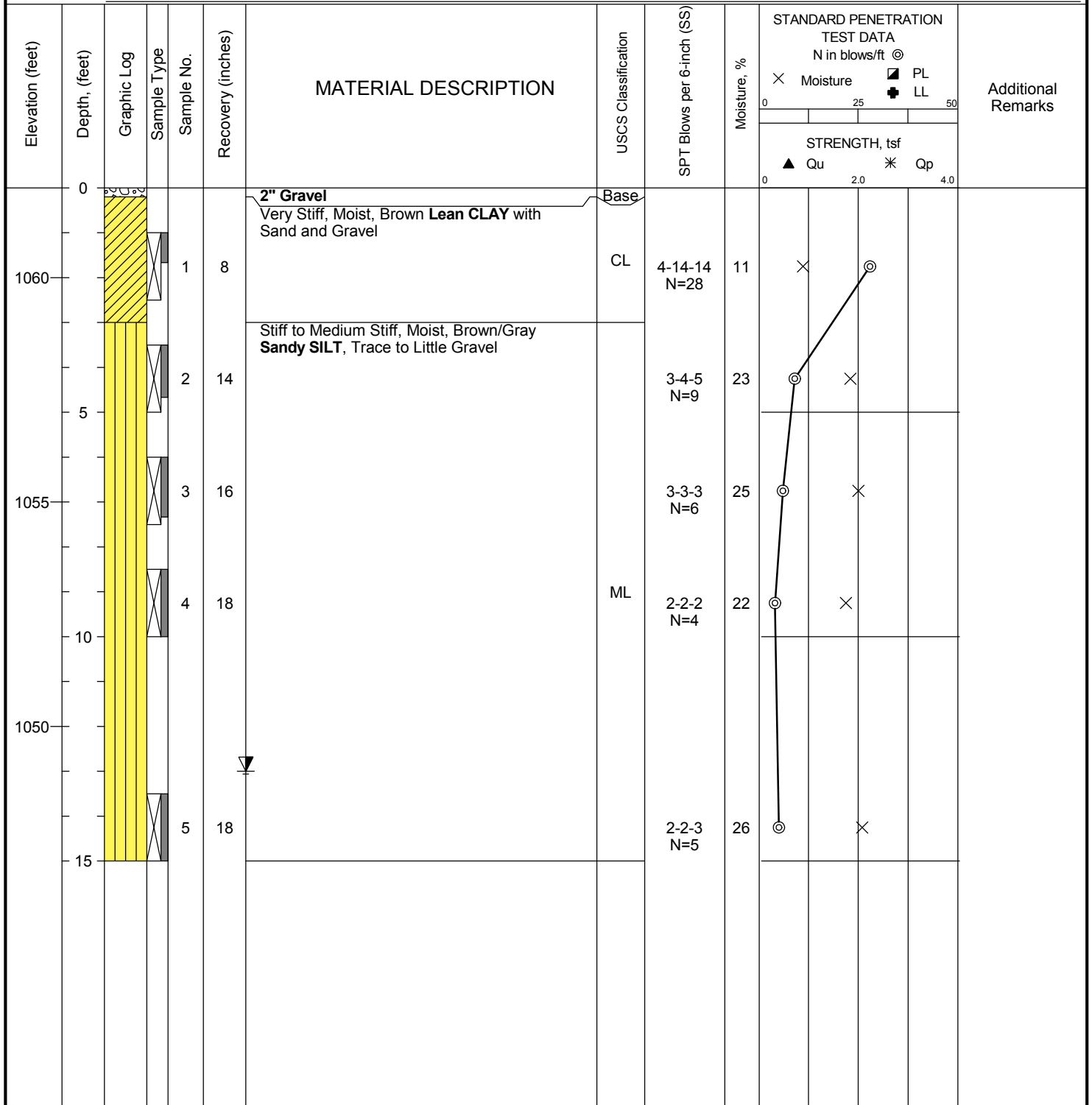
The stratification lines represent approximate boundaries. The transition may be gradual.

<b>DATE STARTED:</b> 10/4/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-07</b>	
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<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1056 ft		<b>SAMPLING METHOD:</b> 2-in SS		<b>BORING LOCATION:</b>	
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic			
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @				Additional Remarks
										<div> <div>×</div> Moisture <div>▣</div> PL <div>+</div> LL </div> <div> <div>▲</div> Qu <div>✱</div> Qp </div>				
	0					<b>1" Topsoil</b>	Topsoil							
1055				1	11	Medium Stiff, Moist, Brown <b>Lean CLAY</b> with Gravel and Rock Fragments (Clean Fill)	CL	3-2-2 N=4						
				2	12			1-2-3 N=5	14		×			
1050	5			3	18	Stiff, Moist, Brown <b>Lean CLAY</b> with Gravel and Rock Fragments	CL	5-6-7 N=13						
				4	18			3-4-5 N=9	23		×			
10	10													

	Professional Service Industries, Inc.	PROJECT NO.: 0142-2428
	5555 Canal Road	PROJECT: Proposed Elem School - Washington
	Cleveland, OH 44125	LOCATION: 1 Paul E Brown Drive, Southeast
	Telephone: (216) 447-1335	Massillon, Stark County, Ohio

<b>DATE STARTED:</b> 10/1/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-08</b>	
<b>DATE COMPLETED:</b> 10/1/21		<b>DRILLER:</b> JJ <b>LOGGED BY:</b> ZO			
<b>COMPLETION DEPTH:</b> 15.0 ft		<b>DRILL RIG:</b> ATV CME-55		<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">Water</div> <div style="display: flex; flex-direction: column; gap: 5px;"> <div><span style="font-size: 0.8em;">▽</span> While Drilling</div> <div><span style="font-size: 0.8em;">▼</span> Upon Completion</div> <div><span style="font-size: 0.8em;">▽</span> Caved Depth</div> </div> <div style="margin-left: 10px; text-align: right;"> N/A N/A 13 feet </div> </div>	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1062 ft		<b>SAMPLING METHOD:</b> 2-in SS			
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic		<b>BORING LOCATION:</b>	
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					

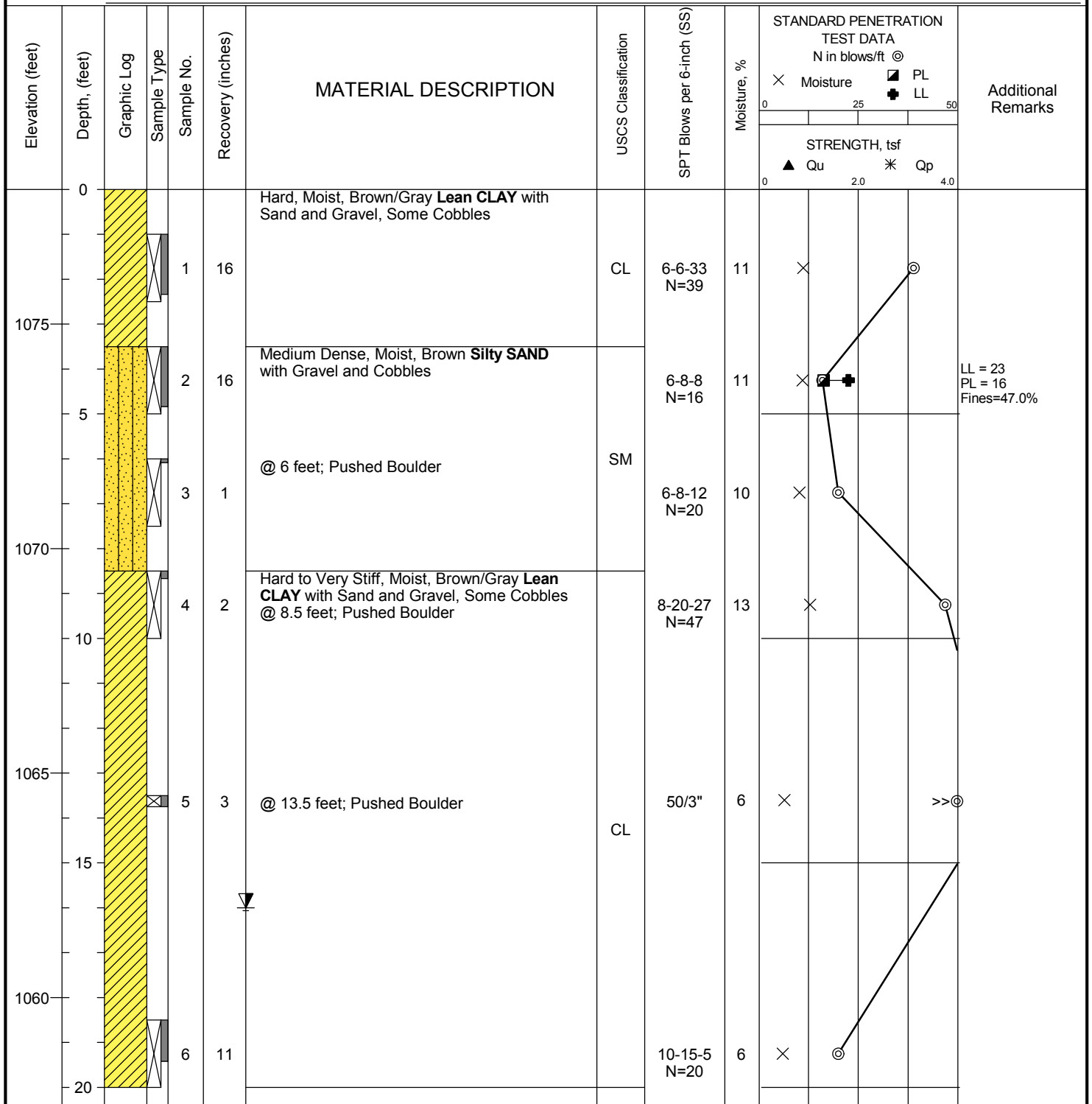


	Professional Service Industries, Inc. 5555 Canal Road Cleveland, OH 44125 Telephone: (216) 447-1335		<b>PROJECT NO.:</b> 0142-2428 <b>PROJECT:</b> Proposed Elem School - Washington <b>LOCATION:</b> 1 Paul E Brown Drive, Southeast Massillon, Stark County, Ohio

The stratification lines represent approximate boundaries. The transition may be gradual.



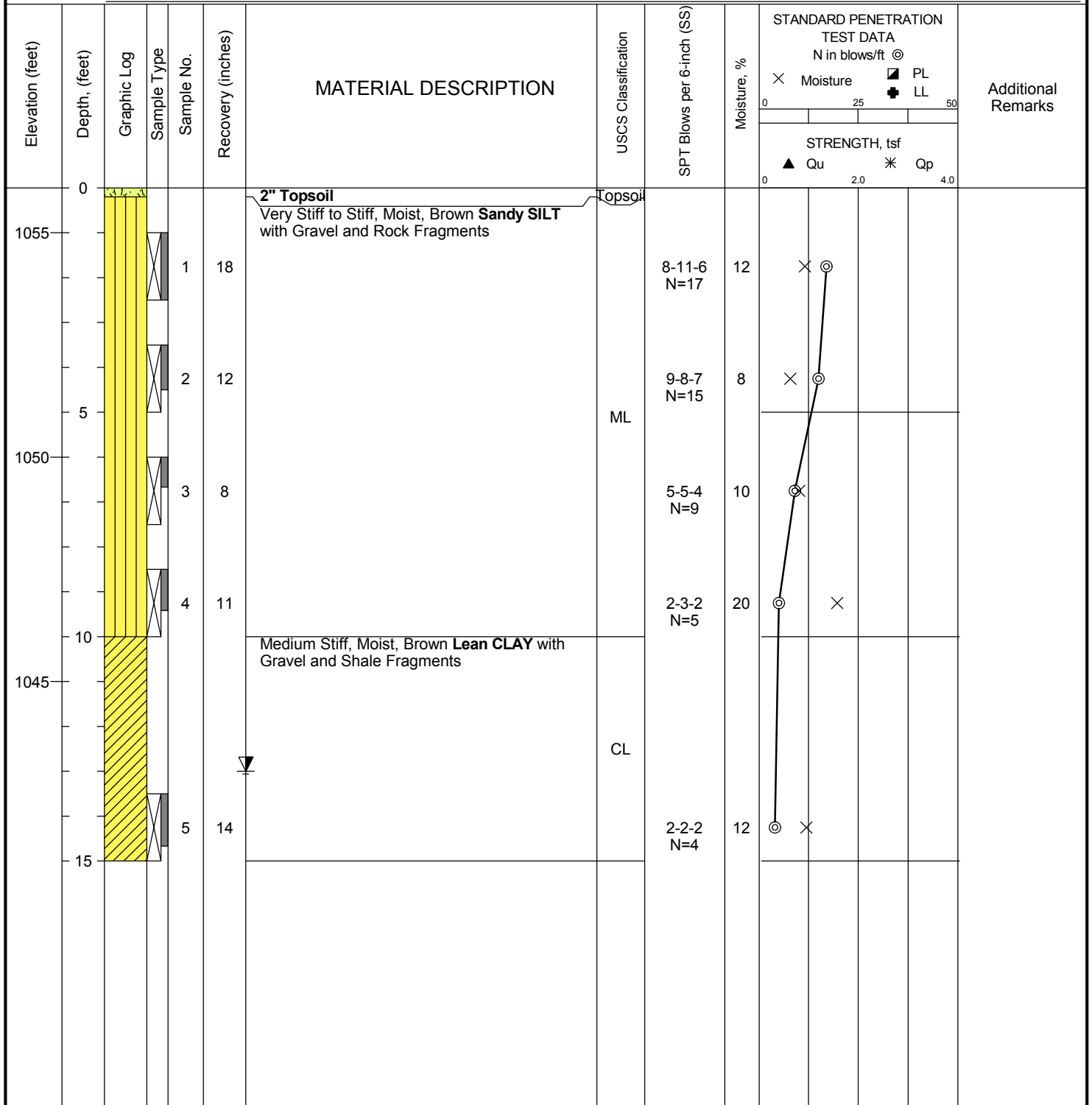
<b>DATE STARTED:</b> 9/30/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-09</b>	
<b>DATE COMPLETED:</b> 9/30/21		<b>DRILLER:</b> TS <b>LOGGED BY:</b> ZO			
<b>COMPLETION DEPTH:</b> 20.0 ft		<b>DRILL RIG:</b> ATV CME-55		<b>Water</b> ▽ While Drilling    N/A ▼ Upon Completion    N/A ▽ Caved Depth    16 feet	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1078 ft		<b>SAMPLING METHOD:</b> 2-in SS		<b>BORING LOCATION:</b>	
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic			
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					



Professional Service Industries, Inc.  
 5555 Canal Road  
 Cleveland, OH 44125  
 Telephone: (216) 447-1335

**PROJECT NO.:** 0142-2428  
**PROJECT:** Proposed Elem School - Washington  
**LOCATION:** 1 Paul E Brown Drive, Southeast  
 Massillon, Stark County, Ohio

<b>DATE STARTED:</b> 10/4/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-10</b>											
<b>DATE COMPLETED:</b> 10/4/21		<b>DRILLER:</b> TS <b>LOGGED BY:</b> ZO													
<b>COMPLETION DEPTH:</b> 15.0 ft		<b>DRILL RIG:</b> ATV CME-55		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td rowspan="3" style="width: 30px; text-align: center; vertical-align: middle;"><b>Water</b></td> <td style="text-align: center;">▽</td> <td>While Drilling</td> <td style="text-align: right;">N/A</td> </tr> <tr> <td style="text-align: center;">▼</td> <td>Upon Completion</td> <td style="text-align: right;">N/A</td> </tr> <tr> <td style="text-align: center;">▽</td> <td>Caved Depth</td> <td style="text-align: right;">13 feet</td> </tr> </table>		<b>Water</b>	▽	While Drilling	N/A	▼	Upon Completion	N/A	▽	Caved Depth	13 feet
<b>Water</b>	▽	While Drilling	N/A												
	▼	Upon Completion	N/A												
	▽	Caved Depth	13 feet												
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger		<b>BORING LOCATION:</b>											
<b>ELEVATION:</b> 1056 ft		<b>SAMPLING METHOD:</b> 2-in SS													
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic													
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%													
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV													
<b>REMARKS:</b>															



	Professional Service Industries, Inc. 5555 Canal Road Cleveland, OH 44125 Telephone: (216) 447-1335		<b>PROJECT NO.:</b> 0142-2428 <b>PROJECT:</b> Proposed Elem School - Washington <b>LOCATION:</b> 1 Paul E Brown Drive, Southeast Massillon, Stark County, Ohio	

The stratification lines represent approximate boundaries. The transition may be gradual.

<b>DATE STARTED:</b> 10/1/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-11</b>	
<b>DATE COMPLETED:</b> 10/1/21		<b>DRILLER:</b> JJ <b>LOGGED BY:</b> ZO			
<b>COMPLETION DEPTH:</b> 10.0 ft		<b>DRILL RIG:</b> ATV CME-55		<b>Water</b> <div style="display: flex; justify-content: space-between;"> <div> <div>▽ While Drilling</div> <div>▼ Upon Completion</div> <div>▽ Caved Depth</div> </div> <div> <div>N/A</div> <div>N/A</div> <div>7 feet</div> </div> </div>	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1062 ft		<b>SAMPLING METHOD:</b> 2-in SS			
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic		<b>BORING LOCATION:</b>	
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @				Additional Remarks
										<div> <div>×</div> Moisture <div>▣</div> PL <div>+</div> LL </div> <div> <div>▲</div> Qu <div>✱</div> Qp </div>				
	0					<b>2" Gravel</b> Stiff, Moist, Brown/Black <b>Lean CLAY</b> with Silt, Gravel and Cobbles, Trace Slag	Base							
1060				1	13		Fill	4-7-7 N=14	9		×	⊙		
				2	13	Medium Stiff to Stiff, Moist, Brown <b>Sandy SILT</b> , Trace Gravel, Trace Clay		4-3-3 N=6	17		⊙	×		
5														
1055				3	18		ML	6-4-4 N=8	23		⊙	×		
				4	18			3-3-5 N=8	21		⊙	×		
10														

	Professional Service Industries, Inc.	PROJECT NO.: 0142-2428
	5555 Canal Road	PROJECT: Proposed Elem School - Washington
	Cleveland, OH 44125	LOCATION: 1 Paul E Brown Drive, Southeast
	Telephone: (216) 447-1335	Massillon, Stark County, Ohio

<b>DATE STARTED:</b> 9/30/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-12</b>											
<b>DATE COMPLETED:</b> 9/30/21		<b>DRILLER:</b> TS <b>LOGGED BY:</b> ZO													
<b>COMPLETION DEPTH:</b> 10.0 ft		<b>DRILL RIG:</b> ATV CME-55		<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td rowspan="3" style="width: 30px; text-align: center; vertical-align: middle;"><b>Water</b></td> <td style="text-align: center;">▽</td> <td>While Drilling</td> <td style="text-align: right;">N/A</td> </tr> <tr> <td style="text-align: center;">▼</td> <td>Upon Completion</td> <td style="text-align: right;">N/A</td> </tr> <tr> <td style="text-align: center;">▽</td> <td>Caved Depth</td> <td style="text-align: right;">8 feet</td> </tr> </table>		<b>Water</b>	▽	While Drilling	N/A	▼	Upon Completion	N/A	▽	Caved Depth	8 feet
<b>Water</b>	▽	While Drilling	N/A												
	▼	Upon Completion	N/A												
	▽	Caved Depth	8 feet												
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger		<b>BORING LOCATION:</b>											
<b>ELEVATION:</b> 1078 ft		<b>SAMPLING METHOD:</b> 2-in SS													
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic													
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%													
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV													
<b>REMARKS:</b>															

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft ☉ ✕ Moisture    ▣ PL + LL				Additional Remarks
									0					
										STRENGTH, tsf ▲ Qu            * Qp				
									0					
	0					Loose to Medium Dense, Moist, Brown <b>Silty SAND</b> with Gravel								
				1	17			3-3-3 N=6	6	✕☉				
1075				2	13		SM	3-4-5 N=9	5	✕☉				
5				3	12			4-4-7 N=11	7	✕☉				
1070				4	17			5-10-15 N=25	6	✕☉				
10														

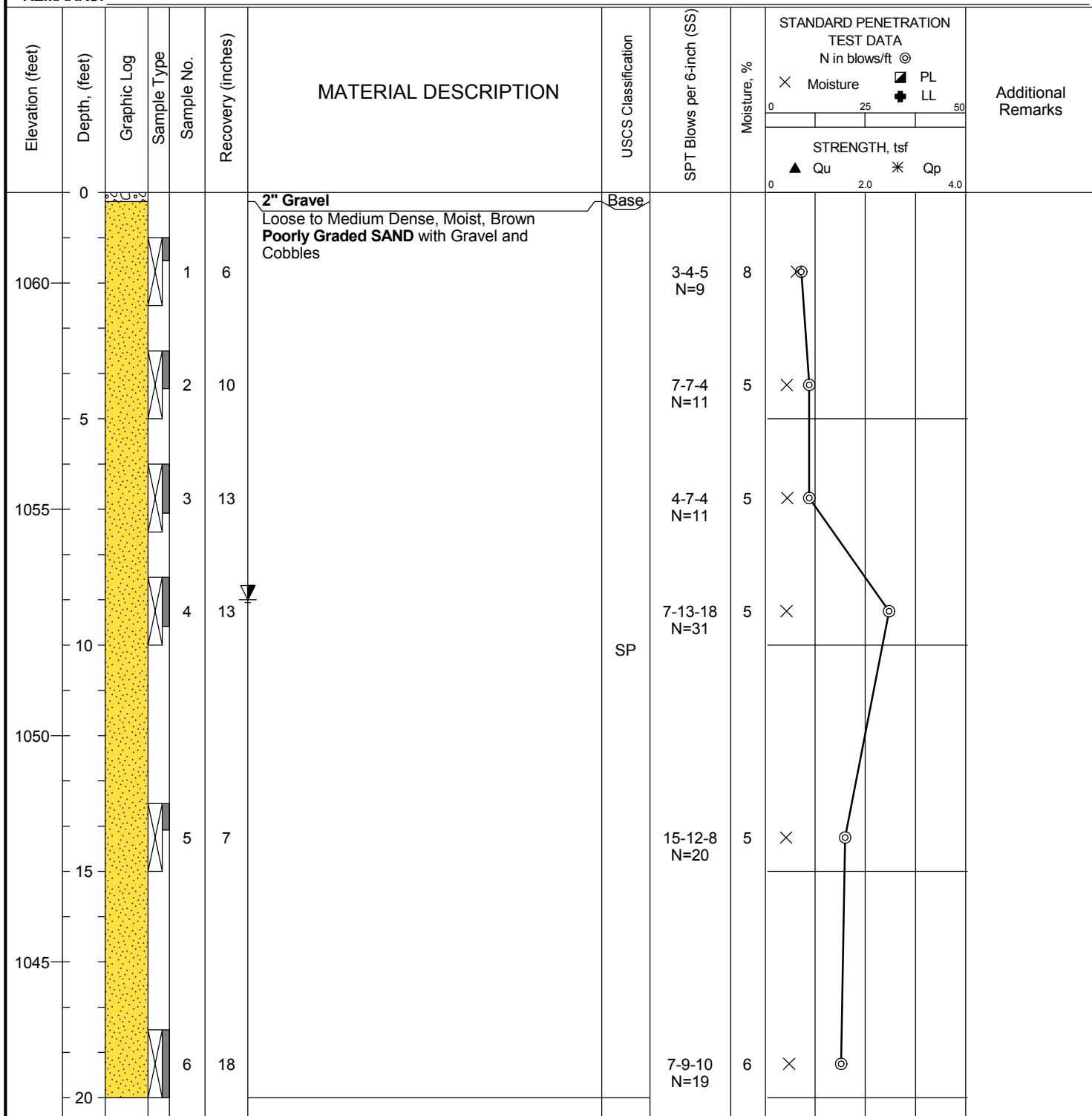
	Professional Service Industries, Inc. 5555 Canal Road Cleveland, OH 44125 Telephone: (216) 447-1335		<b>PROJECT NO.:</b> 0142-2428 <b>PROJECT:</b> Proposed Elem School - Washington <b>LOCATION:</b> 1 Paul E Brown Drive, Southeast Massillon, Stark County, Ohio

<b>DATE STARTED:</b> 10/4/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-13</b>											
<b>DATE COMPLETED:</b> 10/4/21		<b>DRILLER:</b> JJ <b>LOGGED BY:</b> ZO													
<b>COMPLETION DEPTH:</b> 10.0 ft		<b>DRILL RIG:</b> Truck D-50		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td rowspan="3" style="width: 30px; text-align: center; vertical-align: middle;"><b>Water</b></td> <td style="text-align: center;">▽</td> <td>While Drilling</td> <td style="text-align: right;">N/A</td> </tr> <tr> <td style="text-align: center;">▼</td> <td>Upon Completion</td> <td style="text-align: right;">N/A</td> </tr> <tr> <td style="text-align: center;">▽</td> <td>Caved Depth</td> <td style="text-align: right;">8 feet</td> </tr> </table>		<b>Water</b>	▽	While Drilling	N/A	▼	Upon Completion	N/A	▽	Caved Depth	8 feet
<b>Water</b>	▽	While Drilling	N/A												
	▼	Upon Completion	N/A												
	▽	Caved Depth	8 feet												
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger		<b>BORING LOCATION:</b>											
<b>ELEVATION:</b> 1054 ft		<b>SAMPLING METHOD:</b> 2-in SS													
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic													
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 94%													
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV													
<b>REMARKS:</b>															

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @	Additional Remarks
	0					<b>2" Asphalt</b> Medium Stiff, Moist, Brown <b>Sandy SILT</b> with Gravel	Asphalt			N in blows/ft @	
				1	14		ML	5-3-2 N=5	14		
1050				2	16	Medium Dense to Loose to Medium Dense, Moist, Brown <b>Silty SAND</b> with Gravel		12-15-11 N=26	5		
5				3	10		SM	4-4-5 N=9	11		
1045				4	16			4-4-7 N=11	6		
10											

	Professional Service Industries, Inc. 5555 Canal Road Cleveland, OH 44125 Telephone: (216) 447-1335		<b>PROJECT NO.:</b> 0142-2428 <b>PROJECT:</b> Proposed Elem School - Washington <b>LOCATION:</b> 1 Paul E Brown Drive, Southeast Massillon, Stark County, Ohio

<b>DATE STARTED:</b> 10/1/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-14</b>
<b>DATE COMPLETED:</b> 10/1/21		<b>DRILLER:</b> JJ <b>LOGGED BY:</b> ZO		
<b>COMPLETION DEPTH:</b> 20.0 ft		<b>DRILL RIG:</b> ATV CME-55		<b>Water</b> <div style="display: flex; justify-content: space-between;"> <div> <div></div> While Drilling N/A  <div></div> Upon Completion N/A  <div></div> Caved Depth 9 feet </div> </div>
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger		
<b>ELEVATION:</b> 1062 ft		<b>SAMPLING METHOD:</b> 2-in SS		
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic		<b>BORING LOCATION:</b>
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%		
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV		
<b>REMARKS:</b>				



	<b>Professional Service Industries, Inc.</b> 5555 Canal Road Cleveland, OH 44125 Telephone: (216) 447-1335		<b>PROJECT NO.:</b> 0142-2428 <b>PROJECT:</b> Proposed Elem School - Washington <b>LOCATION:</b> 1 Paul E Brown Drive, Southeast Massillon, Stark County, Ohio

<b>DATE STARTED:</b> 10/1/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-15</b>	
<b>DATE COMPLETED:</b> 10/1/21		<b>DRILLER:</b> TS <b>LOGGED BY:</b> ZO			
<b>COMPLETION DEPTH:</b> 15.0 ft		<b>DRILL RIG:</b> ATV CME-55		<b>Water</b> <div style="display: flex; justify-content: space-between;"> <div> <div>▽ While Drilling</div> <div>▼ Upon Completion</div> <div>▽ Caved Depth</div> </div> <div> <div>N/A</div> <div>N/A</div> <div>N/A</div> </div> </div>	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1074 ft		<b>SAMPLING METHOD:</b> 2-in SS		<b>BORING LOCATION:</b>	
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic			
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 93%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @				Additional Remarks
										<div> <div> <div>×</div> Moisture <div>■ PL</div> <div>● LL</div> </div> <div> <div>0</div> <div>25</div> <div>50</div> </div> </div> <div> <div>STRENGTH, tsf</div> <div> <div>▲ Qu</div> <div>* Qp</div> </div> <div> <div>0</div> <div>2.0</div> <div>4.0</div> </div> </div>				
	0					1" Gravel Soft, Moist, Brown/Black Lean CLAY with Silt, Gravel and Cobbles, Trace Organics	Base							
				1	2		Fill	1-2-1 N=3	13					
1070				2	15	Soft to Very Stiff, Moist, Brown Sandy SILT with Gravel, Trace Clay		2-4-7 N=11	14					
	5			3	9			6-5-5 N=10	15					
1065				4	5		ML	3-4-4 N=8	14					
	10													
1060				5	11			9-10-11 N=21	6					
	15													

	Professional Service Industries, Inc. 5555 Canal Road Cleveland, OH 44125 Telephone: (216) 447-1335		<b>PROJECT NO.:</b> 0142-2428 <b>PROJECT:</b> Proposed Elem School - Washington <b>LOCATION:</b> 1 Paul E Brown Drive, Southeast Massillon, Stark County, Ohio

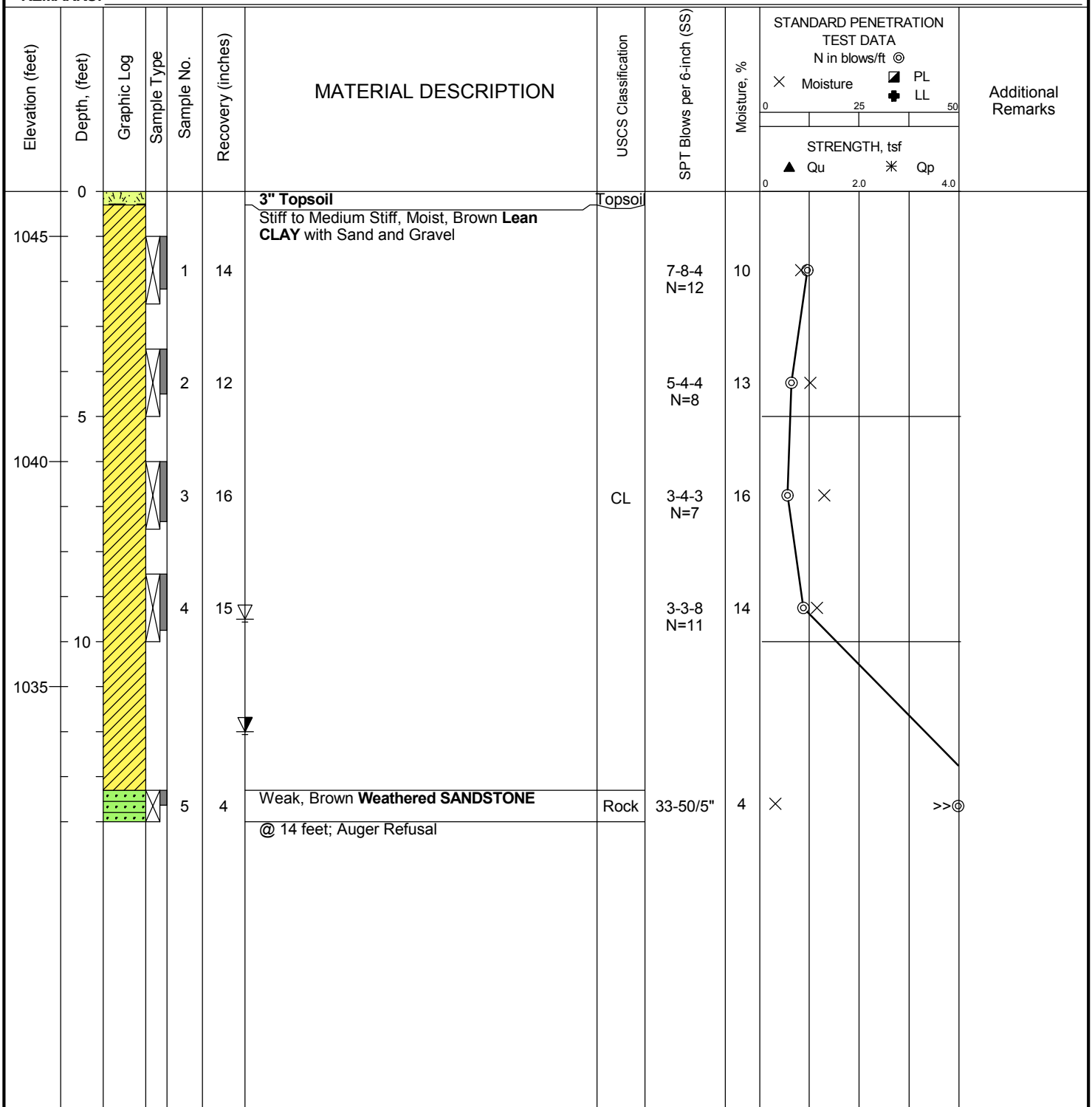
DATE STARTED: 10/4/21  
DATE COMPLETED: 10/4/21  
COMPLETION DEPTH: 14.0 ft  
BENCHMARK: N/A  
ELEVATION: 1046 ft  
LATITUDE:  
LONGITUDE:  
STATION: N/A OFFSET: N/A  
REMARKS:

DRILL COMPANY: PSI, Inc.  
DRILLER: JJ LOGGED BY: ZO  
DRILL RIG: Truck D-50  
DRILLING METHOD: Hollow Stem Auger  
SAMPLING METHOD: 2-in SS  
HAMMER TYPE: Automatic  
EFFICIENCY: 94%  
REVIEWED BY: AV

## BORING B-16

**Water**  
▽ While Drilling 9.5 feet  
▼ Upon Completion N/A  
▽ Caved Depth 12 feet

BORING LOCATION:



Professional Service Industries, Inc.  
5555 Canal Road  
Cleveland, OH 44125  
Telephone: (216) 447-1335

PROJECT NO.: 0142-2428  
PROJECT: Proposed Elem School - Washington  
LOCATION: 1 Paul E Brown Drive, Southeast  
Massillon, Stark County, Ohio



<b>DATE STARTED:</b> 10/4/21		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-17</b>							
<b>DATE COMPLETED:</b> 10/4/21		<b>DRILLER:</b> JJ <b>LOGGED BY:</b> ZO									
<b>COMPLETION DEPTH:</b> 10.0 ft		<b>DRILL RIG:</b> Truck D-50		<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td rowspan="3" style="text-align: center; vertical-align: middle;"><b>Water</b></td> <td> While Drilling</td> <td>N/A</td> </tr> <tr> <td> Upon Completion</td> <td>N/A</td> </tr> <tr> <td> Caved Depth</td> <td>8 feet</td> </tr> </table>	<b>Water</b>	While Drilling	N/A	Upon Completion	N/A	Caved Depth	8 feet
<b>Water</b>	While Drilling	N/A									
	Upon Completion	N/A									
	Caved Depth	8 feet									
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger									
<b>ELEVATION:</b> 1046 ft		<b>SAMPLING METHOD:</b> 2-in SS									
<b>LATITUDE:</b>		<b>HAMMER TYPE:</b> Automatic		<b>BORING LOCATION:</b>							
<b>LONGITUDE:</b>		<b>EFFICIENCY:</b> 94%									
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV									
<b>REMARKS:</b>											

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @				Additional Remarks
										<div> <div> X Moisture <div> <div>PL</div> <div>LL</div> </div> </div> <div> <div>0</div> <div>25</div> <div>50</div> </div> </div> <div> <div>STRENGTH, tsf</div> <div> <div>▲ Qu</div> <div>* Qp</div> </div> <div> <div>0</div> <div>2.0</div> <div>4.0</div> </div> </div>				
	0					<b>3" Topsoil</b> Stiff to Very Stiff, Moist, Brown/Gray <b>Lean CLAY</b> with Sand and Gravel	Topsoil							
1045				1	14			6-6-4 N=10	27					
				2	17			3-4-6 N=10	26					
1040	5			3	18		CL	6-7-9 N=16	17					
				4	18			5-11-13 N=24	14					
	10													

	Professional Service Industries, Inc.		<b>PROJECT NO.:</b> 0142-2428
	5555 Canal Road		<b>PROJECT:</b> Proposed Elem School - Washington
	Cleveland, OH 44125		<b>LOCATION:</b> 1 Paul E Brown Drive, Southeast
	Telephone: (216) 447-1335		Massillon, Stark County, Ohio

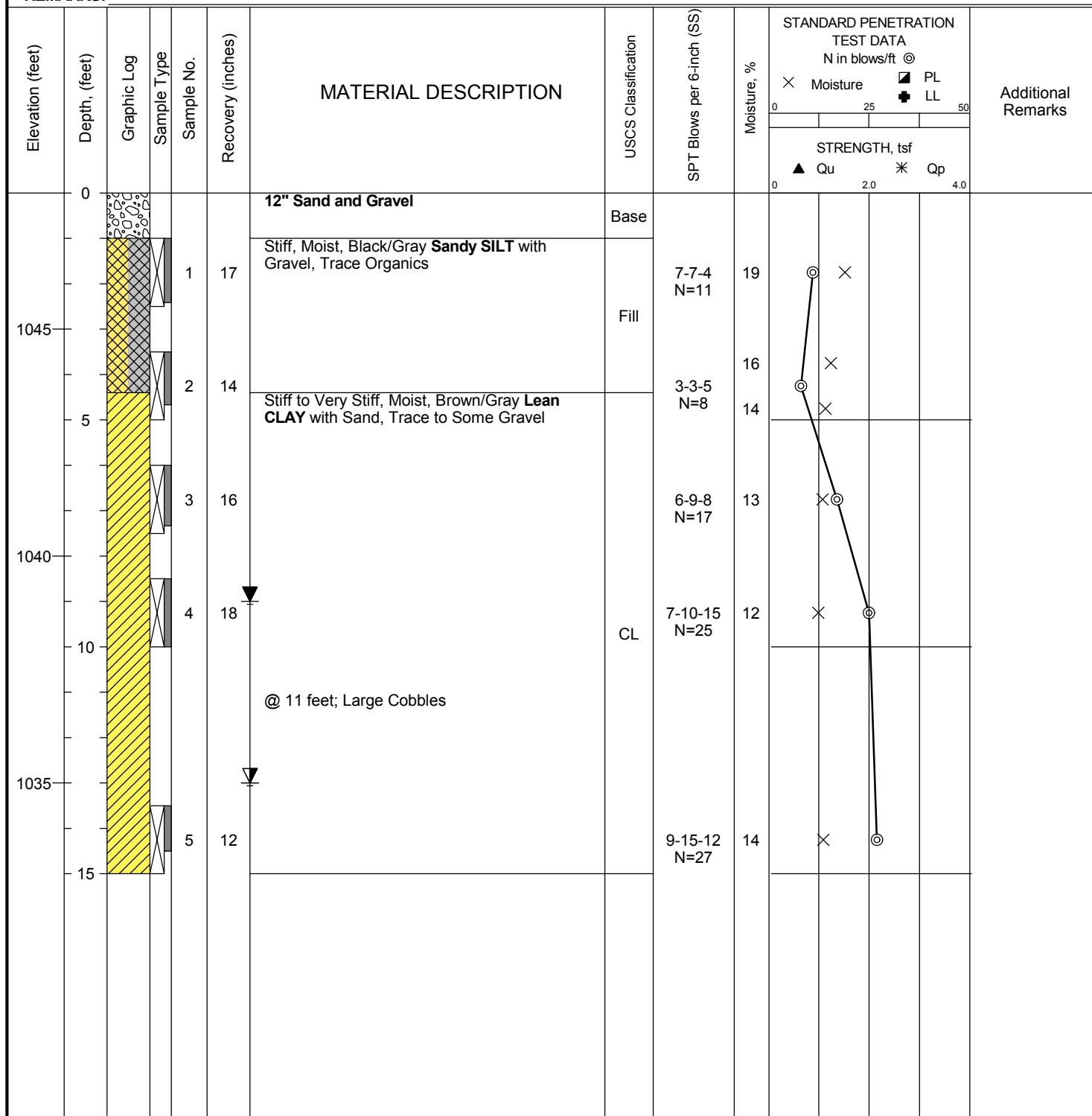
DATE STARTED: 10/4/21  
DATE COMPLETED: 10/4/21  
COMPLETION DEPTH: 15.0 ft  
BENCHMARK: N/A  
ELEVATION: 1048 ft  
LATITUDE:  
LONGITUDE:  
STATION: N/A OFFSET: N/A  
REMARKS:

DRILL COMPANY: PSI, Inc.  
DRILLER: JJ LOGGED BY: ZO  
DRILL RIG: Truck D-50  
DRILLING METHOD: Hollow Stem Auger  
SAMPLING METHOD: 2-in SS  
HAMMER TYPE: Automatic  
EFFICIENCY: 94%  
REVIEWED BY: AV

## BORING B-18

**Water**  
▽ While Drilling 13 feet  
▼ Upon Completion 9 feet  
▽ Caved Depth 13 feet

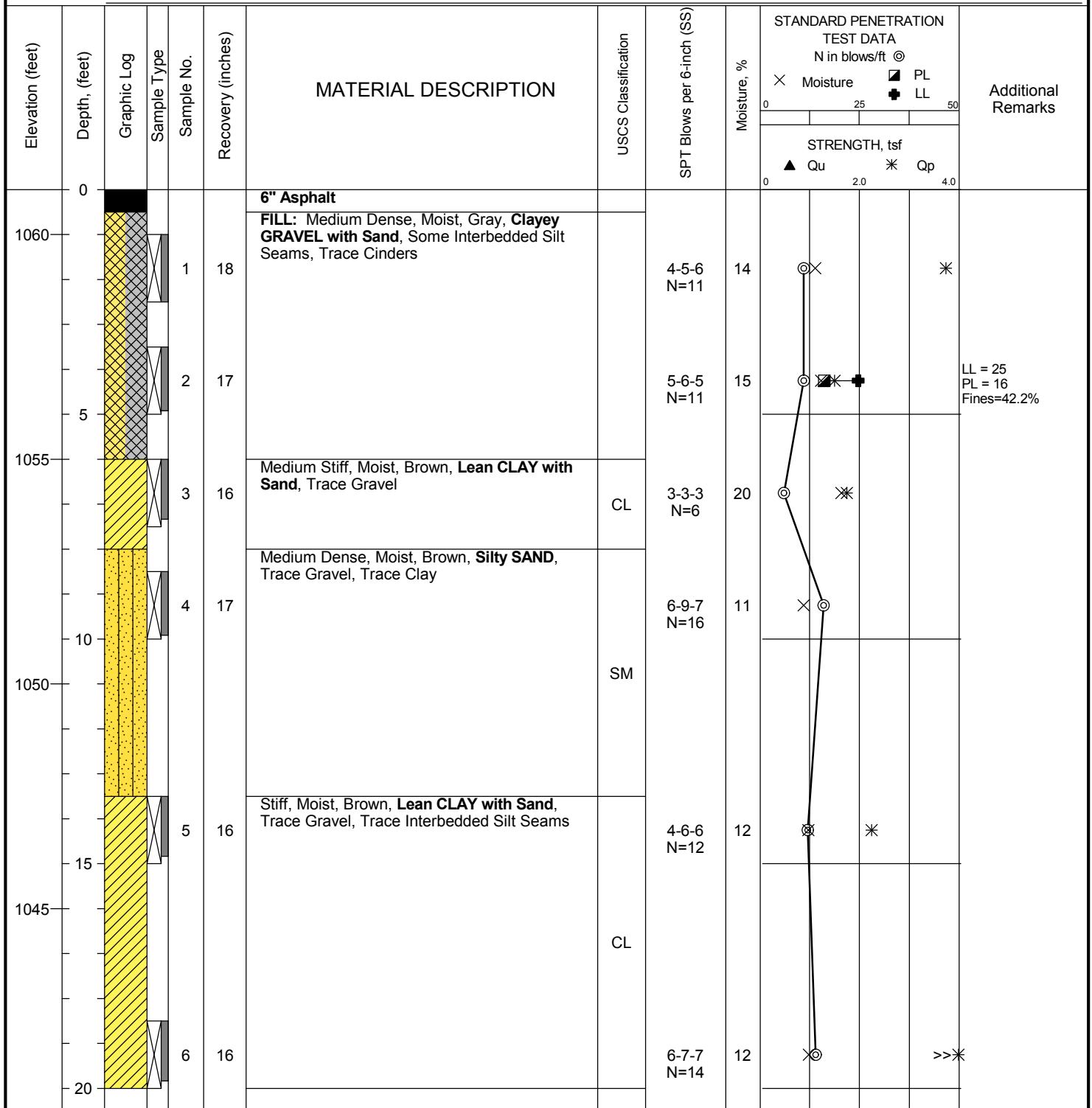
BORING LOCATION:



Professional Service Industries, Inc.  
5555 Canal Road  
Cleveland, OH 44125  
Telephone: (216) 447-1335

PROJECT NO.: 0142-2428  
PROJECT: Proposed Elem School - Washington  
LOCATION: 1 Paul E Brown Drive, Southeast  
Massillon, Stark County, Ohio

DATE STARTED: 7/8/22		DRILL COMPANY: PSI, Inc.		<b>BORING B-19</b>	
DATE COMPLETED: 7/8/22		DRILLER: JJ LOGGED BY: SP			
COMPLETION DEPTH: 20.0 ft		DRILL RIG: Truck D-50		<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">Water</div> <div style="display: flex; flex-direction: column; gap: 5px;"> <div><span style="font-size: 0.8em;">▽</span> While Drilling N/A</div> <div><span style="font-size: 0.8em;">▼</span> Upon Completion N/A</div> <div><span style="font-size: 0.8em;">▽</span> Caved Depth N/A</div> </div> </div>	
BENCHMARK: N/A		DRILLING METHOD: Hollow Stem Auger		BORING LOCATION:	
ELEVATION: 1061 ft		SAMPLING METHOD: 2-in SS			
LATITUDE: 40.792882°		HAMMER TYPE: Automatic			
LONGITUDE: -81.498219°		EFFICIENCY: 94%			
STATION: N/A		OFFSET: N/A			
REMARKS:		REVIEWED BY: AV			



	Professional Service Industries, Inc.	PROJECT NO.:	0142-2590
	5555 Canal Road	PROJECT:	New East Side PK-3 School
	Cleveland, OH 44125	LOCATION:	1 Paul E. Brown Drive, SE
	Telephone: (216) 447-1335		Massillon, Stark County, Ohio

The stratification lines represent approximate boundaries. The transition may be gradual.

<b>DATE STARTED:</b> 7/8/22		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-20</b>	
<b>DATE COMPLETED:</b> 7/8/22		<b>DRILLER:</b> JJ <b>LOGGED BY:</b> SP			
<b>COMPLETION DEPTH:</b> 20.0 ft		<b>DRILL RIG:</b> Truck D-50		<b>Water</b> <div style="display: flex; justify-content: space-between;"> <div> <div>▽ While Drilling</div> <div>▼ Upon Completion</div> <div>▽ Caved Depth</div> </div> <div> <div>N/A</div> <div>N/A</div> <div>14.0 feet</div> </div> </div>	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1061 ft		<b>SAMPLING METHOD:</b> 2-in SS		<b>BORING LOCATION:</b>	
<b>LATITUDE:</b> 40.792622°		<b>HAMMER TYPE:</b> Automatic			
<b>LONGITUDE:</b> -81.49823°		<b>EFFICIENCY:</b> 94%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @	Additional Remarks
										<div> <div> <div>×</div> Moisture <div>■</div> PL <div>+</div> LL </div> <div> <div>▲</div> Qu <div>*</div> Qp </div> </div>	
1060	0					6" Asphalt					
						2" Sand/Gravel Base					
				1	17	Medium Stiff, Moist, Brown, <b>Lean CLAY</b> with Sand, Trace Gravel	CL	3-4-4 N=8	14		*
				2	15	Medium Dense, Moist, Tan, <b>Silty SAND</b> , Trace Gravel, Trace Clay	SM	8-9-5 N=14	8		
1055	5			3	18	Stiff, Moist, Brown, <b>Lean CLAY</b> , Trace Sand, Trace Gravel	CL	2-4-6 N=10	24		*
				4	17	Stiff to Very Stiff, Moist, Reddish Brown, <b>Sandy Lean CLAY</b> , Trace Gravel, Trace Interbedded Silt Seams		5-6-7 N=13	13		*
1050	10										
				5	18		CL	6-6-8 N=14	12		*
1045	15										
				6	18			5-7-9 N=16	10		*
	20										

	Professional Service Industries, Inc.	<b>PROJECT NO.:</b> 0142-2590
	5555 Canal Road	<b>PROJECT:</b> New East Side PK-3 School
	Cleveland, OH 44125	<b>LOCATION:</b> 1 Paul E. Brown Drive, SE
	Telephone: (216) 447-1335	Massillon, Stark County, Ohio

The stratification lines represent approximate boundaries. The transition may be gradual.

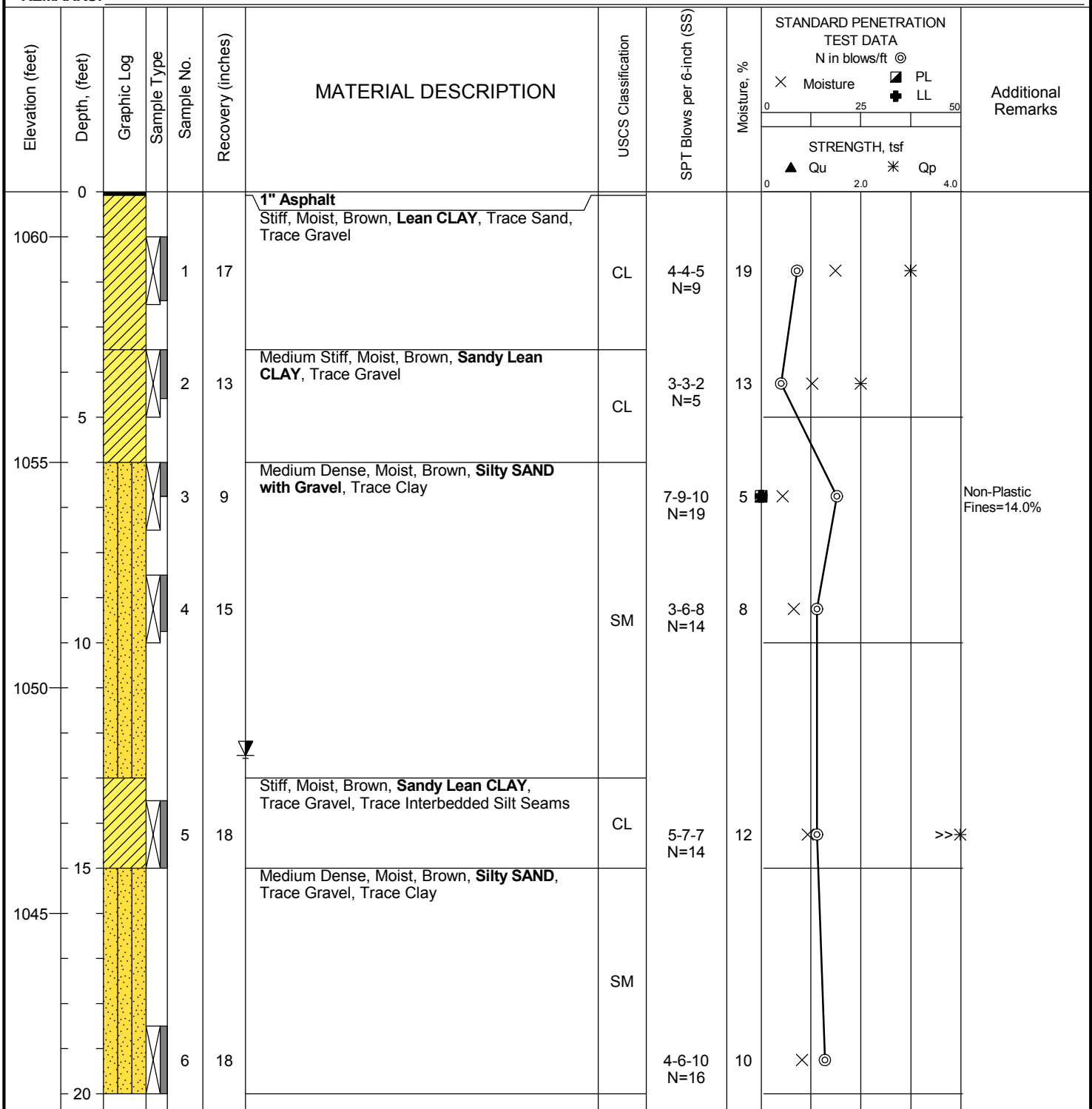
DATE STARTED: 7/8/22  
DATE COMPLETED: 7/8/22  
COMPLETION DEPTH: 20.0 ft  
BENCHMARK: N/A  
ELEVATION: 1061 ft  
LATITUDE: 40.79224°  
LONGITUDE: -81.498163°  
STATION: N/A  
REMARKS:

DRILL COMPANY: PSI, Inc.  
DRILLER: JJ  
LOGGED BY: SP  
DRILL RIG: Truck D-50  
DRILLING METHOD: Hollow Stem Auger  
SAMPLING METHOD: 2-in SS  
HAMMER TYPE: Automatic  
EFFICIENCY: 94%  
REVIEWED BY: AV

## BORING B-21

**Water**  
▽ While Drilling N/A  
▼ Upon Completion N/A  
▽ Caved Depth 12.5 feet

BORING LOCATION:



Professional Service Industries, Inc.  
5555 Canal Road  
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PROJECT NO.: 0142-2590  
PROJECT: New East Side PK-3 School  
LOCATION: 1 Paul E. Brown Drive, SE  
Massillon, Stark County, Ohio

DATE STARTED: 7/8/22  
 DATE COMPLETED: 7/8/22  
 COMPLETION DEPTH: 10.0 ft  
 BENCHMARK: N/A  
 ELEVATION: 1049 ft  
 LATITUDE: 40.791784°  
 LONGITUDE: -81.49885°  
 STATION: N/A  
 REMARKS:

DRILL COMPANY: PSI, Inc.  
 DRILLER: JJ  
 DRILL RIG: Truck D-50  
 DRILLING METHOD: Hollow Stem Auger  
 SAMPLING METHOD: 2-in SS  
 HAMMER TYPE: Automatic  
 EFFICIENCY: 94%  
 REVIEWED BY: AV

## BORING B-22

**Water**  
 ∇ While Drilling N/A  
 ▼ Upon Completion N/A  
 ▼ Caved Depth 4.5 feet

BORING LOCATION:

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @	Additional Remarks
										X Moisture PL LL STRENGTH, tsf ▲ Qu * Qp	
0						7" Topsoil					
				1	17	Very Stiff, Moist, Brown, <b>Sandy Lean CLAY</b> , Trace Gravel, Trace Interbedded Silt Seams	CL	10-15-13 N=28	9		LL = 24 PL = 16 Fines=54.2%
1045				2	14	Medium Stiff to Stiff, Moist, Brown, <b>Lean CLAY with Sand</b> , Some Rock Fragments, Trace Gravel, Trace Interbedded Silt Seams		4-8-6 N=14	13		
5				3	14		CL	3-3-3 N=6	14		
1040				4	17			4-5-6 N=11	10		
10											



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 5555 Canal Road  
 Cleveland, OH 44125  
 Telephone: (216) 447-1335

PROJECT NO.: 0142-2590  
 PROJECT: New East Side PK-3 School  
 LOCATION: 1 Paul E. Brown Drive, SE  
 Massillon, Stark County, Ohio

<b>DATE STARTED:</b> 7/8/22		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-23</b>	
<b>DATE COMPLETED:</b> 7/8/22		<b>DRILLER:</b> JJ <b>LOGGED BY:</b> SP			
<b>COMPLETION DEPTH:</b> 10.0 ft		<b>DRILL RIG:</b> Truck D-50		<b>Water</b> <div style="display: flex; justify-content: space-between;"> <div> <div>▽ While Drilling</div> <div>▼ Upon Completion</div> <div>▽ Caved Depth</div> </div> <div> <div>N/A</div> <div>N/A</div> <div>N/A</div> </div> </div>	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1050 ft		<b>SAMPLING METHOD:</b> 2-in SS			
<b>LATITUDE:</b> 40.791761°		<b>HAMMER TYPE:</b> Automatic		<b>BORING LOCATION:</b>	
<b>LONGITUDE:</b> -81.498131°		<b>EFFICIENCY:</b> 94%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @	Additional Remarks
						1" Asphalt					
						4" Sand/Gravel Base					
						FILL: Medium Stiff, Moist, Gray Mottled Black, Lean CLAY with Sand, Trace Gravel, Trace Cinders		4-3-4 N=7	19	⊗	
				1	16						
						Very Stiff, Moist, Brown, Lean CLAY with Sand, Trace Gravel	CL	6-8-8 N=16	19	⊗	
1045	5			2	6						
						Medium Stiff to Stiff, Moist, Brown, Lean CLAY with Sand, Trace Gravel	CL	2-2-4 N=6	25	⊗	
				3	15						
				4	13			3-4-8 N=12	13	⊗	
1040	10										

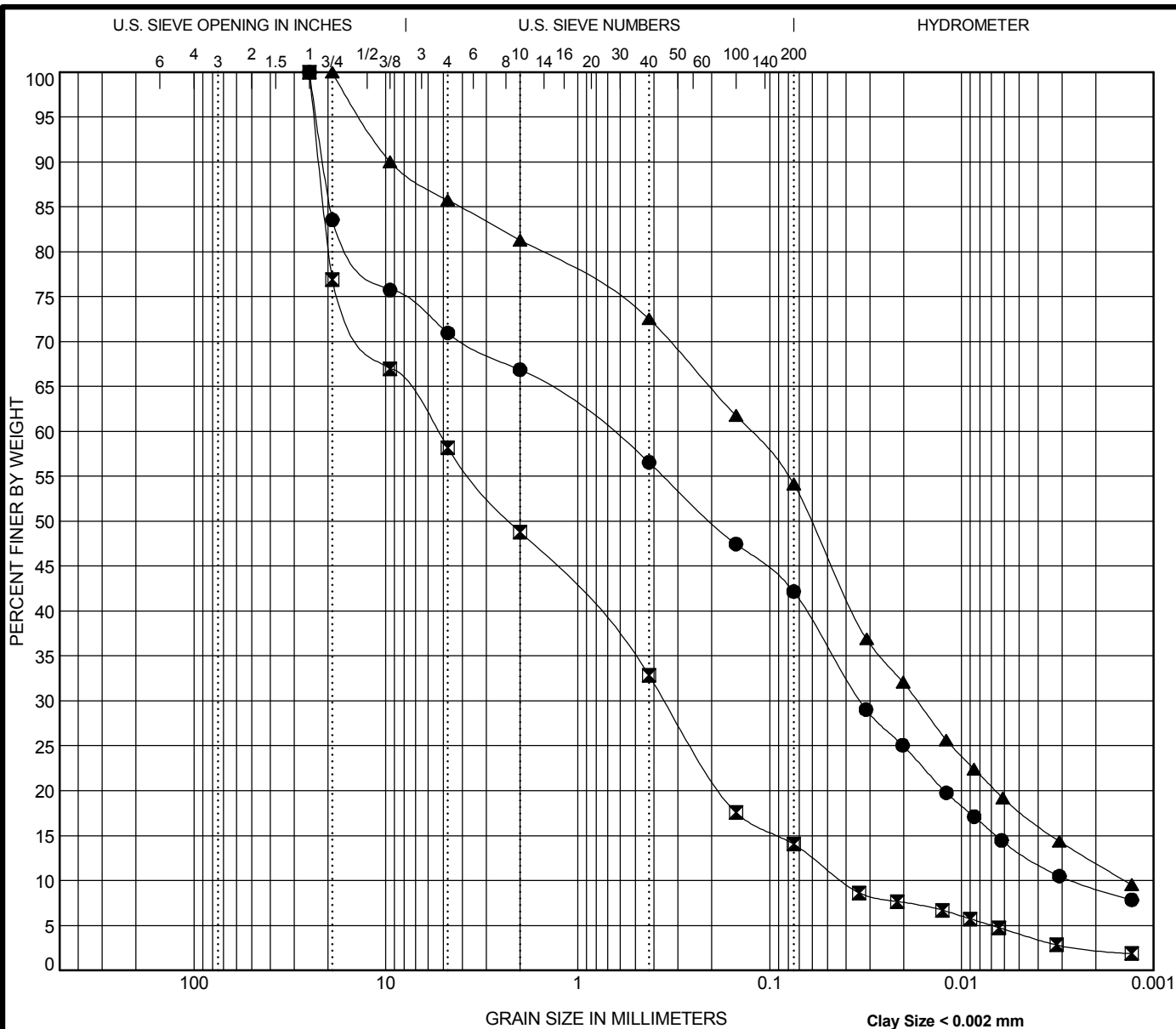
	Professional Service Industries, Inc.	PROJECT NO.: 0142-2590
	5555 Canal Road	PROJECT: New East Side PK-3 School
	Cleveland, OH 44125	LOCATION: 1 Paul E. Brown Drive, SE
	Telephone: (216) 447-1335	Massillon, Stark County, Ohio

<b>DATE STARTED:</b> 7/8/22		<b>DRILL COMPANY:</b> PSI, Inc.		<b>BORING B-24</b>	
<b>DATE COMPLETED:</b> 7/8/22		<b>DRILLER:</b> JJ <b>LOGGED BY:</b> SP			
<b>COMPLETION DEPTH:</b> 10.0 ft		<b>DRILL RIG:</b> Truck D-50		<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">Water</div> <div style="display: flex; flex-direction: column; gap: 5px;"> <div><span style="font-size: 0.8em;">▽</span> While Drilling    N/A</div> <div><span style="font-size: 0.8em;">▼</span> Upon Completion    N/A</div> <div><span style="font-size: 0.8em;">▽</span> Caved Depth    6.0 feet</div> </div> </div>	
<b>BENCHMARK:</b> N/A		<b>DRILLING METHOD:</b> Hollow Stem Auger			
<b>ELEVATION:</b> 1055 ft		<b>SAMPLING METHOD:</b> 2-in SS			
<b>LATITUDE:</b> 40.791739°		<b>HAMMER TYPE:</b> Automatic		<b>BORING LOCATION:</b>	
<b>LONGITUDE:</b> -81.497416°		<b>EFFICIENCY:</b> 94%			
<b>STATION:</b> N/A <b>OFFSET:</b> N/A		<b>REVIEWED BY:</b> AV			
<b>REMARKS:</b>					

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	STANDARD PENETRATION TEST DATA N in blows/ft @				Additional Remarks
										<div> <div> <div>×</div>Moisture <div>■</div>PL <div>+</div>LL </div> <div> <div>▲</div>Qu <div>✱</div>Qp </div> </div>				
	0					<b>4" Gravel</b> Medium Dense, Moist, Brown, <b>Sandy SILT</b> , Trace Gravel, Trace Rock Fragments, Trace Interbedded Clay Seams								
				1	6			5-8-9 N=17	8	×	⊙			
				2	14			8-8-11 N=19	7	×	⊙			
1050	5			3	14		ML	7-10-13 N=23	5	×	⊙			
				4	13			13-12-13 N=25	5	×	⊙			
1045	10													

	Professional Service Industries, Inc. 5555 Canal Road Cleveland, OH 44125 Telephone: (216) 447-1335	<b>PROJECT NO.:</b> 0142-2590 <b>PROJECT:</b> New East Side PK-3 School <b>LOCATION:</b> 1 Paul E. Brown Drive, SE Massillon, Stark County, Ohio





COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Classification	LL	PL	PI	Cc	Cu
● B-19 4.3	CLAYEY GRAVEL with Sand (GC)	25	16	9	0.60	269.58
⊠ B-21 6.8	SILTY SAND with Gravel (SM)	NP	NP	NP	0.54	131.39
▲ B-22 1.8	SANDY LEAN CLAY (CL)	24	16	8	1.62	90.26

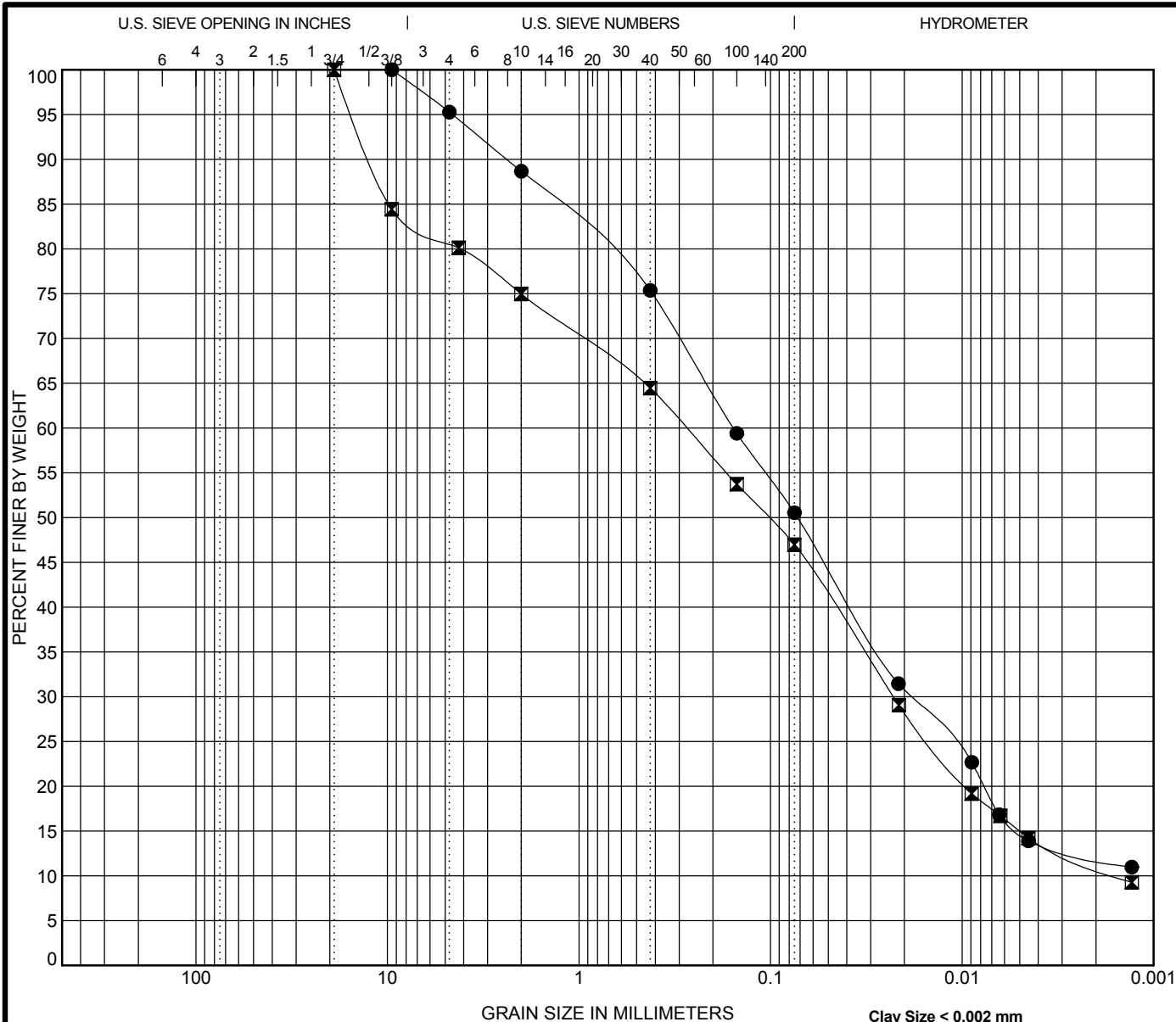
Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-19 4.3	25	0.712	0.034	0.003	29.0	28.8	33.0	9.2
⊠ B-21 6.8	25	5.476	0.35	0.042	41.8	44.2	11.7	2.3
▲ B-22 1.8	19	0.128	0.017	0.001	14.2	31.6	42.2	11.9



Professional Service Industries, Inc.  
5555 Canal Road  
Cleveland, OH 44125  
Telephone: (216) 447-1335  
Fax: (216) 642-7008

## GRAIN SIZE DISTRIBUTION

Project: New East Side PK-3 School  
PSI Job No.: 0142-2590  
Location: 1 Paul E. Brown Drive, SE  
Massillon, Stark County, Ohio



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification			LL	PL	PI	Cc	Cu
●	B-5	6.8	Lean CLAY (CL)			22	15	7		
⊠	B-9	4.3	Silty SAND (SM)			23	16	7	1.21	176.84

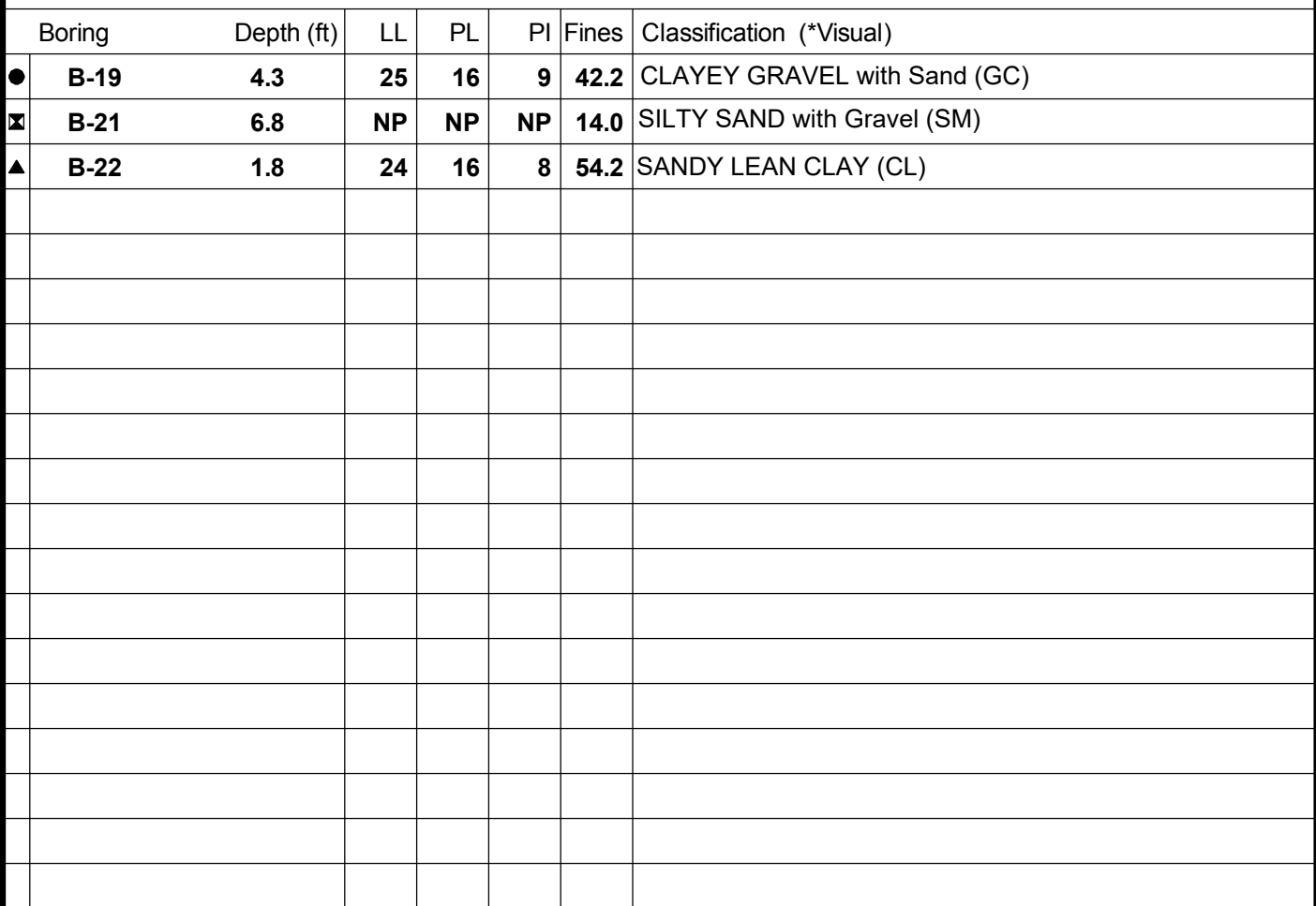
Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-5	6.8	9.5	0.156	0.019	4.7	44.7	38.6	12.0
⊠	B-9	4.3	19	0.276	0.023	0.002	19.3	33.7	36.0



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 Cleveland, OH 44125  
 Telephone: (216) 447-1335  
 Fax: (216) 642-7008

## GRAIN SIZE DISTRIBUTION

Project: Washington High School  
 PSI Job No.: 0142-2428  
 Location: 1 Paul E Brown Drive, Southeast  
 Massillon, Stark County, Ohio



PSI Job No.: 0142-2590  
Project: New East Side PK-3 School  
Location: 1 Paul E. Brown Drive, SE  
Massillon, Stark County, Ohio



## GENERAL NOTES

### SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

### DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.	SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
HSA: Hollow Stem Auger - typically 3 1/4" or 4 1/4" I.D. openings, except where noted.	ST: Shelby Tube - 3" O.D., except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry	BS: Bulk Sample
R.C.: Diamond Bit Core Sampler	PM: Pressuremeter
H.A.: Hand Auger	CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings
P.A.: Power Auger - Handheld motorized auger	

### SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N <sub>60</sub> : A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q <sub>u</sub> : Unconfined compressive strength, TSF
Q <sub>p</sub> : Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL), %
DD: Dry unit weight, pcf
▼, ▼, ▼: Apparent groundwater level at time noted

### RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

### ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

### GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (3/4 in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to 3/4 in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.0075 mm to 0.075 mm
Clay:	<0.0075 mm (< 3/64 in.)

### PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

### RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%



## **GENERAL NOTES**

(Continued)

### **CONSISTENCY OF FINE-GRAINED SOILS**

<u>Q<sub>u</sub> - TSF</u>	<u>N - Blows/foot</u>	<u>Consistency</u>
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

### **MOISTURE CONDITION DESCRIPTION**

<u>Description</u>	<u>Criteria</u>
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

### **RELATIVE PROPORTIONS OF SAND AND GRAVEL**

<u>Descriptive Term</u>	<u>% Dry Weight</u>
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

### **STRUCTURE DESCRIPTION**

<u>Description</u>	<u>Criteria</u>	<u>Description</u>	<u>Criteria</u>
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick	Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick	Lensed:	Inclusion of small pockets of different soils
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing	Layer:	Inclusion greater than 3 inches thick (75 mm)
Slickensided:	Fracture planes appear polished or glossy, sometimes striated	Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
		Parting:	Inclusion less than 1/8-inch (3 mm) thick

### **SCALE OF RELATIVE ROCK HARDNESS**

<u>Q<sub>u</sub> - TSF</u>	<u>Consistency</u>
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

### **ROCK BEDDING THICKNESSES**

<u>Description</u>	<u>Criteria</u>
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

### **ROCK VOIDS**

<u>Voids</u>	<u>Void Diameter</u>
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

### **GRAIN-SIZED TERMINOLOGY**

<u>(Typically Sedimentary Rock)</u>	
<u>Component</u>	<u>Size Range</u>
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

### **ROCK QUALITY DESCRIPTION**



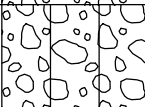


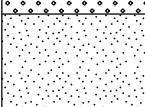
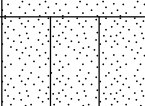
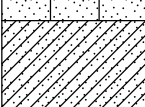
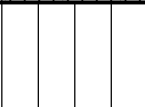
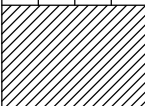
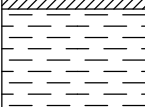
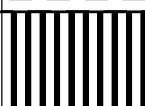
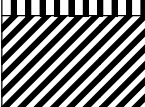
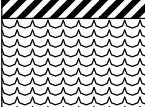
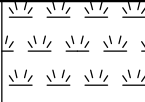
<u>Rock Mass Description</u>	<u>RQD Value</u>
Excellent	90 - 100
Good	75 - 90
Fair	50 - 75
Poor	25 - 50
Very Poor	Less than 25

### **DEGREE OF WEATHERING**

Slightly Weathered:	Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.
Weathered:	Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
Highly Weathered:	Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

# SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS  MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS  MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS  (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS  MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS  (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES  (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS  MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS  LIQUID LIMIT LESS THAN 50			ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS  LIQUID LIMIT GREATER THAN 50			MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS



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**LICENSING AGREEMENT – Auto CAD File Waiver Form**

**Architectural Vision Group, Ltd.  
and their consultants  
23850 Sperry Drive  
Cleveland, Ohio 44145  
HEREINAFTER CALLED “ARCHITECT”**

**Date:**

**Company:  
Contact:  
Address:  
City, State, Zip;  
HEREINAFTER CALLED “CONTRACTOR”**

**AVG Project 2203-2  
New Eastside PK-3 Elementary School**

WHEREAS, the Architect has prepared Contract Documents for the Owner for the complete construction of the PROJECT using computer aided drafting (CAD) equipment, and

WHEREAS, the Contractor has entered into a contract with the Owner, or the Owner’s Construction Manager, to provide selected construction services for said Project, and

WHEREAS, the Contractor has requested that the Architect to provide copies of the CAD File (hereinafter call “File”) which contain portion of the Contract Documents, as selected by the Contractor, and all Addendum Documents for Contractor’s use in preparing their required Shop Drawings submittals for this Project. Contactor shall resume full responsibility of incorporating Addendum information into the Contract Document. In the event of any discrepancy between the printed Contract Documents and these electronic files, the printed Documents shall take precedence. All Shop Drawings will be reviewed in accordance with the printed Contract Documents.

NOW, THEREFORE, to effect the arrangement to transfer the Diskette to Contractor, the Parties agree as follows:

1. That the File(s) are being provided to Contractor for the sole purpose stated above.
2. That the Architect’s title block on each drawing contained within the File(s) has been deleted and this Licensing Agreement grants no right to reproduce the title block.
3. Under no circumstances shall the providing of the File(s) be deemed a sale of a product and the Architect makes no warranties, express or implied, in consenting to provide these File(s).
4. Contractor understands that the automated of information and data from the system and format used by the Architect to an alternate system or format cannot be accomplished with the introduction of inexactitudes, anomalies, and errors. In the event project documentation provided to Contractor in machine readable form is so converted, Contractor agrees to assume all risks associated therewith.



- This Agreement represents the entire Agreement between the Architect, the Architect's Consultants, and the Contractor.

**CONTRACTOR:**

**By:** \_\_\_\_\_

**Title:**

Date:

[illegible]



## ELECTRONIC AND BACKGROUND DATA AGREEMENT

DATE: \_\_\_\_\_  
PROJECT NO: \_\_\_\_\_ REQUEST NO: \_\_\_\_\_

PROJECT DESCRIPTION: \_\_\_\_\_

OWNER:	_____	CONTRACTOR:	_____
	_____		_____
	_____		_____
	_____	Attention:	_____
	_____		_____

This agreement by and between Osborn Engineering Company ("OEC") and the undersigned Contractor, Subcontractor, or Vendor ("Contractor") is made the date set forth above.

For a sum of dollars to be paid to OEC and for other considerations as set forth herein, the parties agree as follows:

1. This Agreement shall be effective in the event that OEC under terms and conditions set forth herein, agrees to provide, but is not obligated to provide CADD or electronic data, background drawings, or other such items.
2. OEC makes no representation, warranties, or guarantees, express or implied, whatsoever, as to any matter including, without limitation, the condition of any item, or its fitness for any particular use or purpose. All items are provide "as-is".
3. It is understood and agreed that OEC takes no responsibility or liability whatsoever with respect to such data, background drawings, or other items for reasons including, but not limited to, that such items were produced for the use of OEC, there could be differences in computer equipment and programs, that errors or changes can be made by user of the item, that there can be electrical interruptions or interferences, that changes to drawings could have been made by a user of the item, that changes to drawings could have been made by hand and not stored on computer or added to backgrounds, that changes could have been made in dimensions and drawings not revised, that drawings may not be to scale, there could be a virus in a computer system and for other reasons not under the control of OEC.
4. Supply of data or other items shall not in any manner change or alter the requirements of any Contract or Subcontract Documents, or the responsibilities or liabilities of the Contractor.



5. The Drawings, Specifications, and other documents or data prepared by OEC are instruments of OEC's service. Neither the Contractor, nor any lower tier Subcontractor or supplier shall own or claim a copyright in the Drawings, Specifications, and other documents or data prepared by OEC. OEC shall be deemed the author of them and will retain all common law, statutory, and other reserved rights, in addition to the copyright. The Drawings, Specifications, and other documents or data prepared by OEC, and copies thereof furnished to the Contractor are for use solely with respect to this Project. They are not to be used by the Contractor or any lower tier contractor or supplier on other projects or for additions to this Project. The Contractor, lower tier subcontractors, and suppliers are granted a limited license to use and reproduce applicable portions of data prepared by OEC appropriate to and for use in the execution of their Work in the referenced Project. Submittal of distribution to meet official regulatory requirements for other purposes in connection with this Project is not to be construed as publication in derogation of OEC's copyright or other reserved rights.
6. Any data or documents used shall not include or use OEC's name except as otherwise agreed upon in writing.
7. For a period of ten (10) years from the date of disclosure, the Contractor agrees to hold all Confidential Information in trust and confidence for OEC and agrees not to use Confidential Information other than as required for compliance with this Agreement and the Project. Except as may be authorized by OEC in writing, the Contractor shall not disclose any Confidential Information, by publication or otherwise, to any other than the Contractor's employees or lower tier subcontractor or supplier having a need to know. The Contractor shall obtain non-disclosure agreements from persons and firms that it employs. Confidential information shall not include information that was already known to the Contractor prior to its disclosure to the Contractor by OEC that is or becomes publicly available; which is rightfully received by the Contractor from third parties without accompanying secrecy obligations.
8. Without prior written approval of OEC, the Contractor shall have no right to use OEC's trademark or trade name, or the trademark or trade name of the Owner.
9. Contractor waives all claims against OEC, other contractors, Owner and their related entities, Subcontractors of any tier and for all the foregoing their shareholders, directors, officers, employees, agents and each of their successors and assigns (collectively "Designees"); covenants not to sue or arbitrate; agrees the items not matter how provided, shall not be the basis of a change in time or sum in any Contract with OEC; and releases Designees from any and all liabilities, damages, losses, costs, penalties, expenses, or responsibilities of any kind, any of which arises directly or indirectly out of the items at the Project site or at any other location, including any negligence of Designees.
10. Contractor assumes the risk of, and shall appear for, defense, indemnify, and hold harmless Designees against any and all liabilities, damages, losses, economic losses, costs, penalties, expenses or responsibilities including, but not limited to, attorney's fees, sustained in connection with any claim, demand, cause of action, suit, arbitration, provided herein including any negligence of Designees or any claims of Contractor's workers. It is agreed Worker's Compensation shall not be a defense of the Contractor as to Designees. Designees shall have the right to accept or decline any compromise or settlement of any claims or actions against it.



11. This Agreement represents the entire and integrated agreement between Contractor and OEC with respect to items provided herein and supersedes any prior negotiations, representations, or agreements, either written or oral. This Agreement may be amended only by written instrument signed by OEC and Contractor. Nothing in this Agreement shall create a contractual relationship with or duties, obligations or courses of action in favor of any third party against either Owner or OEC.
12. OEC and Contractor, respectively, bind themselves, their successors, assigns and legal representatives to the other party to all agreements and to the successors, assigns and legal representatives of the other party with respect to all covenants. Neither OEC nor Contractor shall assign, sublet or transfer any interest in this Agreement without the written consent of the other. The laws of the State of Ohio shall govern this Agreement. The person signing below represents that he/she has full authority to bind the Contractor.
13. Items provided: See attached "Electronic and Background Data Request & Transmittal Form".
14. Further terms: Electronic files are not transferable.

Total Cost to be paid to OEC: \_\_\_\_\_  
(Make check payable to: The Osborn Engineering Company)

The Osborn Engineering Company

Contractor:

\_\_\_\_\_  
Signature Date

\_\_\_\_\_  
Signature Date

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Printed Title

\_\_\_\_\_  
Printed Title

Please return one signed copy of Agreement to OEC with payment.



## ELECTRONIC AND BACKGROUND DATA REQUEST AND TRANSMITTAL FORM

PROJECT NO: \_\_\_\_\_ REQUEST NO: \_\_\_\_\_ DATE: \_\_\_\_\_

PROJECT DESCRIPTION: \_\_\_\_\_

OWNER: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

CONTRACTOR: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

OEC ATTN: \_\_\_\_\_

INTENDED USE OF FILES: \_\_\_\_\_  
\_\_\_\_\_

REQUEST Contractor to Complete		TRANSMITTAL OEC to Complete <i>After</i> Request		
Drawing No.	Drawing Description and Date	OEC File Name	Copied on Disc No.	Cost
Remarks:		Total Files	Total Discs	Total Cost

Please review attached blank "Electronic and Background Data Agreement". After receipt of "Request and Transmittal Form", OEC will determine cost and send two signed copies of the agreement to the Contractor. Contractor should return to OEC one copy with payment, after which time disc(s) will be forwarded to Contractor. **Electronic drawing files will be in AutoCAD format, unless otherwise noted.**

For Request: \_\_\_\_\_  
Contractor's Signature

Date: \_\_\_\_\_

For Transmittal: \_\_\_\_\_  
Osborn Signature

Date: \_\_\_\_\_

**Contractor Name:** \_\_\_\_\_

**Contractor Address:** \_\_\_\_\_

**Project Name:** \_\_\_\_\_

Deliverable: AutoCAD 2018 file(s), via email.

The submitted files are intended to work only as described in these terms and conditions. These files are compatible only with AutoCAD 2013, operating on a PC using Windows 10. Behnke Associates, Inc. makes no representation as to the compatibility of these files beyond the specified release of the above-stated software. The contractor agrees to save and hold Behnke Associates, Inc. harmless for the use of the file data outside or beyond the scope of this agreement.

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The recipient assumes responsibility for use of the data and for coordination of any updated or additional data. If changes to this information are necessitated, Behnke Associates, Inc. will not automatically update this information. A new file will have to be requested if these changes affect the recipient's work.

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Check the data files and media or email for virus contamination before use.

This data may not be copied without the permission of Behnke Associates, Inc.

**By signing this document, \_\_\_\_\_ (Contractor Name)  
acknowledges agreement to the above terms and conditions. A signed acceptance of this  
agreement must be received before release of the file(s).**

**Authorized Signature** \_\_\_\_\_

**Clearly-Printed Name** \_\_\_\_\_

**Title** \_\_\_\_\_

**Company** \_\_\_\_\_

**Date** \_\_\_\_\_

**Requested Sheet No's** \_\_\_\_\_

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## Usage of Electronic Files

### *Indemnification Agreement*

Lewis Land Professionals, Inc. ("LLP") will provide electronic files for your convenience and use in the preparation of shop drawings related to the New Eastside PK-3 Elementary School subject to the following terms and conditions:

\_\_\_\_\_ herein after referred to as "contractor".

The electronic files are compatible with Autodesk AutoCAD Civil 3D 2022 software and Microsoft Windows 10 64bit-oriented hardware specifications. LLP makes no representation as to the compatibility of these files with your hardware or your software beyond the specified release of the referenced specifications.

Data contained on these electronic files are part of LLP's Instruments of Service and shall not be used by contractor or anyone else receiving this data through or contractor for any purpose other than as a convenience in the preparation of shop drawings for the referenced project. Any other use or reuse by contractor or by others will be at contractor sole risk and without liability of legal exposure to LLP. Contractor agrees to make no claim and hereby waives, to the fullest extent permitted by law, any claim or cause of action of any nature against LLP, its officers, directors, employees, agents and subconsultants that may arise out of or in connection with your use of the electronic files.

Furthermore, contractor shall, to the fullest extent permitted by law, indemnify and hold LLP harmless against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from contractor's use of the electronic files.

The electronic files are not construction documents. Differences may exist between these electronic files and corresponding hard-copy construction documents. LLP makes no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the hard-copy bid or construction documents supplied to you by LLP and the electronic files, the hard-copy bid or construction documents shall govern. Contractor is responsible for determining if any conflict exists. By your use of these electronic files, contractor, is not relieved of its duty to fully comply with the contract documents, including without limitation the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate contractor's work with that of other contractors on the project.

Because information presented on the electronic files can be modified, unintentionally or otherwise, LLP reserves the right to remove all indicia of ownership and/or involvement from each electronic display.

LLP will furnish \_\_\_\_\_ AutoCAD plans per their request.

A service fee of \$0.00 shall be remitted to LLP prior to delivery of the electronic files.

Under no circumstances shall delivery of the electronic files for use by contractor be deemed a sale by LLP, and we make no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall LLP be liable for any loss of profit or any consequential damages as a result of your use or reuse of these electronic files.

#### **Agreed to and Accepted By:**

**Lewis Land Professionals, Inc.**  
8691 Wadsworth Road  
Suite 100  
Wadsworth, OH 44281

By: Thomas A. Weiss III

Its: Project  
Manager \_\_\_\_\_

Date: July 7, 2023

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

By: \_\_\_\_\_

Its: \_\_\_\_\_

Date: \_\_\_\_\_

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DOCUMENT 000116 - LIST OF DRAWING SHEETS

1.1 LIST OF DRAWINGS

- A. Drawings: Drawings consist of the Contract Drawings and other drawings listed on the Table of Contents page of the separately bound drawing set titled, dated June 15, 2023, as modified by subsequent Addenda and Contract modifications.
- B. List of Drawings: Drawings consist of the following Contract Drawings and other drawings of type indicated:
  - 1. Prepared by Architectural Vision Group, Ltd.  
G-001 COVER SHEET
  - 2. Prepared by Verostko Consulting Engineers  
  
M501 HVAC SCHEDULES  
E-401 ONE LINE POWER RISER DIAGRAM  
E-403 PANEL SCHEDULES  
E-404 PANEL SCHEDULES AND DETAILS
  - 3. Prepared by Diebel Surveying  
V-001 SURVEY

END OF DOCUMENT 000115



## DOCUMENT 002400 - PROCUREMENT SUBSTITUTION PROCEDURES

## 1.1 DEFINITIONS

- A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.
- B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 012500 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

## 1.2 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

## 1.3 PROCUREMENT SUBSTITUTIONS

- A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.
- B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:
  - 1. Extensive revisions to the Contract Documents are not required.
  - 2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
  - 3. The request is fully documented and properly submitted.

## 1.4 SUBMITTALS

- A. Procurement Substitution Request: Submit to Architect. Procurement Substitution Request must be made in writing in compliance with the following requirements:
  - 1. Requests for substitution of materials and equipment will be considered if received no later than 10 days prior to date of bid opening.
  - 2. Submittal Format: Submit three copies of each written Procurement Substitution Request, using CSI Substitution Request Form 1.5C.

- a. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specifications Sections and drawing numbers.
- b. Provide complete documentation on both the product specified and the proposed substitute, including the following information as appropriate:
  - 1) Point-by-point comparison of specified and proposed substitute product data, fabrication drawings, and installation procedures.
  - 2) Copies of current, independent third-party test data of salient product or system characteristics.
  - 3) Samples where applicable or when requested by Architect.
  - 4) Detailed comparison of significant qualities of the proposed substitute with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
  - 5) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - 6) Research reports, where applicable, evidencing compliance with building code in effect for Project, from ICC-ES.
  - 7) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will become necessary to accommodate the proposed substitute.
- c. Provide certification by manufacturer that the substitute proposed is equal to or superior to that required by the Procurement and Contracting Documents, and that its in-place performance will be equal to or superior to the product or equipment specified in the application indicated.
- d. Bidder, in submitting the Procurement Substitution Request, waives the right to additional payment or an extension of Contract Time because of the failure of the substitute to perform as represented in the Procurement Substitution Request.

B. Architect's Action:

1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

C. Architect's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF DOCUMENT 002600

## DOCUMENT 002513 - PREBID MEETINGS

## 1.1 PREBID MEETING

- A. Construction Manager will schedule and conduct a Prebid meeting.
- B. Attendance:
  - 1. Prime Bidders: Attendance at Prebid meeting is recommended.
  - 2. Subcontractors: Attendance at Prebid meeting is recommended.
  - 3. Notice: Bids will only be accepted from prime bidders represented on Prebid Meeting sign-in sheet.
- C. Bidder Questions: Submit written questions to be addressed at Prebid meeting minimum of two business days prior to meeting.
- D. Agenda: Prebid meeting agenda will include review of topics that may affect proper preparation and submittal of bids, including the following:
  - 1. Procurement and Contracting Requirements:
    - a. Advertisement for Bids.
    - b. Instructions to Bidders.
    - c. Bidder Qualifications.
    - d. Bonding.
    - e. Insurance.
    - f. Bid Security.
    - g. Bid Form and Attachments.
    - h. Bid Submittal Requirements.
    - i. Bid Submittal Checklist.
    - j. Notice of Award.
  - 2. Communication during Bidding Period:
    - a. Obtaining documents.
    - b. Access to Project Web site.
    - c. Bidder's Requests for Information.
    - d. Bidder's Substitution Request/Prior Approval Request.
    - e. Addenda.
  - 3. Contracting Requirements:
    - a. Agreement.
    - b. The General Conditions.
    - c. The Supplementary Conditions.
    - d. Other Owner requirements.
  - 4. Construction Documents:

- a. Scopes of Work.
    - b. Temporary Facilities.
    - c. Use of Site.
    - d. Work Restrictions.
    - e. Alternates, Allowances, and Unit Prices.
    - f. Substitutions following award.
  5. Separate Contracts:
    - a. Work by Owner.
    - b. Work of Other Contracts.
  6. Schedule:
    - a. Project Schedule.
    - b. Contract Time.
    - c. Liquidated Damages.
    - d. Other Bidder Questions.
  7. Site/facility visit or walkthrough.
  8. Post-Meeting Addendum.
- E. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes to attendees and others known by the issuing office to have received a complete set of Procurement and Contracting Documents. Minutes of meeting are issued as Available Information and do not constitute a modification to the Procurement and Contracting Documents. Modifications to the Procurement and Contracting Documents are issued by written Addendum only.
1. Sign-in Sheet: Minutes will include list of meeting attendees.
  2. List of Planholders: Minutes will include list of planholders.

END OF DOCUMENT 002513



## DOCUMENT 003132 - GEOTECHNICAL DATA

## 1.1 GEOTECHNICAL DATA

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.
- B. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.
- C. A geotechnical investigation report for Project, prepared by Professional Services Industries, Inc., dated July 2, 2019 (Revised September 24, 2019) , as appended to this Document.
  - 1. The opinions expressed in this report are those of a geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by a geotechnical engineer. Owner is not responsible for interpretations or conclusions drawn from the data.
  - 2. Any party using information described in the geotechnical report shall make additional test borings and conduct other exploratory operations that may be required to determine the character of subsurface materials that may be encountered.
- D. Related Requirements:
  - 1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.

END OF DOCUMENT 003132

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## SECTION 012100 - ALLOWANCES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
- B. Types of allowances include the following:
  - 1. Lump-sum allowances.
  - 2. Unit-cost allowances.
  - 3. Quantity allowances.
  - 4. Contingency allowances.
  - 5. Testing and inspecting allowances.
- C. Related Requirements:
  - 1. Section 012200 "Unit Prices" for procedures for using unit prices, including adjustment of quantity allowances when applicable.
  - 2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

## 1.3 DEFINITIONS

- A. Allowance is a quantity of work or dollar amount established in lieu of additional requirements, used to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

## 1.4 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection, or purchase and delivery, of each product or system described by an allowance must be completed by the Owner to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

### 1.5 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances in the form specified for Change Orders.

### 1.6 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

### 1.7 LUMP-SUM ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
  - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

### 1.8 UNIT-COST ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include freight and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
  - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

## 1.9 QUANTITY ALLOWANCES

- A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include freight and delivery to Project site.
- B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
  - 1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

## 1.10 CONTINGENCY ALLOWANCES

- A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Contractor's overhead, profit, bond cost and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, insurance, equipment rental, and similar costs.
- C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and 10% overhead and 5% profit.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

## 1.11 TESTING AND INSPECTING ALLOWANCES

- A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.
- B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.
- C. Costs of testing and inspection services not required by the Contract Documents are not included in the allowance.
- D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

### 1.12 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
  - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
  - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other markups.
  - 3. Submit substantiation of a change in scope of Work, if any, claimed in Change Orders related to unit-cost allowances.
  - 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
  - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of Work has changed from what could have been foreseen from information in the Contract Documents.
  - 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

#### 3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

#### 3.3 SCHEDULE OF ALLOWANCES

- A. See Bid Form for Schedule of Allowances.

END OF SECTION 012100

## SECTION 012300 - ALTERNATES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

## 1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
  - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

## 1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

## 3.1 SCHEDULE OF ALTERNATES

## A. Alternate #1 - Rubber Floor Tile

1. Base Bid is linoleum flooring.
2. Alternate #1: Provide rubber flooring in lieu of linoleum flooring where indicated on drawings as alternate.

## B. Alternate #2 - Monument Sign (the second monument sign)

1. Base Bid: Provide one monumental sign as shown on drawings.
2. Alternate #2: Provide a second monument sign as indicated on drawings and as specified.

## C. Alternate #3 - Playground Equipment

1. Base Bid: No work.
2. Alternate #3: Provide Playground equipment as indicated on the drawings and as specified.

## D. Alternate #4 – Poured in Place Rubber Play Surface

1. Base Bid: Engineered Wood Fiber Play Surface
2. Provide Poured in Place Rubber Play Surface in lieu of Engineered Wood Fiber Play Surface where indicated on drawings.

## E. Alternate #5 - Benches and Trash Receptacles

1. Base Bid: No work.
2. Provide benches and trash receptacles where indicated on drawings.

## F. Alternate #6 - Precast Concrete Seating Elements

1. Base Bid: No work.
2. Provide precast concrete seating elements as indicated on drawings and specified.

## G. Alternate #7 – Additional Planting

1. Base Bid: Provide base bid planting as shown on drawings.
2. Alternate #7: Provide alternate planting as shown on drawings.

END OF SECTION 012300



## SECTION 012500 - SUBSTITUTION PROCEDURES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Section 012100 "Allowances" for products selected under an allowance.
  - 2. Section 012300 "Alternates" for products selected under an alternate.
  - 3. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

## 1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
  - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
  - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

## 1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Substitution Request Form: Use facsimile of form provided in Project Manual.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation method cannot be provided, if applicable.

- b. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
  - c. Detailed comparison of significant qualities of proposed substitutions with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes, such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
  - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
  - e. Samples, where applicable or requested.
  - f. Certificates and qualification data, where applicable or requested.
  - g. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
  - h. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
  - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES and Ohio Building Code.
  - j. Detailed comparison of Contractor's construction schedule using proposed substitutions with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents, except as indicated in substitution request, is compatible with related materials and is appropriate for applications indicated.
  - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
  - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

## 1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

## 1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

## 1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

- 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- b. Substitution request is fully documented and properly submitted.
- c. Requested substitution will not adversely affect Contractor's construction schedule.
- d. Requested substitution has received necessary approvals of authorities having jurisdiction.
- e. Requested substitution is compatible with other portions of the Work.
- f. Requested substitution has been coordinated with other portions of the Work.
- g. Requested substitution provides specified warranty.
- h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

- B. Substitutions for Convenience: Not allowed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

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## SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
  - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

## 1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue through Construction Manager supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710.

## 1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Construction Manager will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Work Change Proposal Requests issued by Construction Manager are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
    - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
    - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    - c. Include costs of labor and supervision directly attributable to the change.
    - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and

finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

- e. Quotation Form: Use forms provided by Owner.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Construction Manager.
- 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  - 4. Include costs of labor and supervision directly attributable to the change.
  - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
  - 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
  - 7. Proposal Request Form: Use form provided by Owner. Sample copy is included in Project Manual.

## 1.5 ADMINISTRATIVE CHANGE ORDERS

- A. Allowance Adjustment: See Section 012100 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.
- B. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

## 1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Change Proposal Request, Construction Manager will issue a Change Order for signatures of Owner and Contractor.

## 1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Construction Manager may issue a Construction Change Directive on AIA Document G714CMA. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
  1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

#### 1.8 WORK CHANGE DIRECTIVE

- A. Work Change Directive: Construction Manager may issue a Work Change Directive on EJCDC Document C-940. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
  1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.
  1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

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## SECTION 012900 - PAYMENT PROCEDURES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
  - 1. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
  - 2. Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.
  - 3. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 4. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

## 1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

## 1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.
  - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
  - 2. Submit the schedule of values to Architect through Construction Manager at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
  - 3. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.

- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
    - a. Project name and location.
    - b. Name of Architect.
    - c. Architect's Project number.
    - d. Contractor's name and address.
    - e. Date of submittal.
  2. Arrange schedule of values consistent with format of AIA Document G703.
  3. Arrange the schedule of values in tabular form, with separate columns to indicate the following for each item listed:
    - a. Related Specification Section or Division.
    - b. Description of the Work.
    - c. Name of subcontractor.
    - d. Name of manufacturer or fabricator.
    - e. Name of supplier.
    - f. Change Orders (numbers) that affect value.
    - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
      - 1) Labor.
      - 2) Materials.
      - 3) Equipment.
  4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
  5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    - a. Differentiate between items stored on-site and items stored off-site.
  6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
  7. Overhead Costs: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
  8. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
  9. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

## 1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and Construction Manager and paid for by Owner.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
  - 1. Submit draft copy of Application for Payment 10 days prior to due date for review by Architect.
- C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
  - 1. Other Application for Payment forms proposed by the Contractor shall be acceptable to Architect, Construction Manager and Owner. Submit forms for approval with initial submittal of schedule of values.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager will return incomplete applications without action.
  - 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
  - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
  - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
  - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
  - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
  - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
  - 3. Provide summary documentation for stored materials indicating the following:
    - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

- F. Transmittal: Submit signed and notarized original copies of each Application for Payment to Architect and Construction Manager by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment including subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
  2. When an application shows completion of an item, submit conditional final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  5. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
  2. Schedule of values.
  3. Contractor's construction schedule (preliminary if not final).
  4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
  5. Products list (preliminary if not final).
  6. Sustainable design action plans, including preliminary project materials cost data.
  7. Schedule of unit prices.
  8. Submittal schedule (preliminary if not final).
  9. List of Contractor's staff assignments.
  10. List of Contractor's principal consultants.
  11. Copies of building permits.
  12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  13. Initial progress report.
  14. Report of preconstruction conference.
  15. Certificates of insurance and insurance policies.
  16. Performance and payment bonds.
  17. Data needed to acquire Owner's insurance.
- I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
  2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  3. Updated final statement, accounting for final changes to the Contract Sum.
  4. AIA Document G706.
  5. AIA Document G706A.
  6. AIA Document G707.
  7. Evidence that claims have been settled.
  8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
  9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

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## SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General coordination procedures.
  - 2. Coordination drawings.
  - 3. RFIs.
  - 4. Digital project management procedures.
  - 5. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.
- C. Related Requirements:
  - 1. Section 011200 "Multiple Contract Summary" for a description of the division of work among separate contracts and responsibility for coordination activities not in this Section.
  - 2. Section 013200 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
  - 3. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  - 4. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.
  - 5. Section 019113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

## 1.3 DEFINITIONS

- A. BIM: Building Information Modeling.
- B. RFI: Request for Information. Request from Owner, Construction Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
  - 1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
  - 1. Post copies of list in project meeting room, in temporary field office, in web-based Project software directory. Keep list current at all times.

#### 1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Coordination: Each contractor shall cooperate with Project coordinator who shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its own operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components with other contractors to ensure maximum performance and accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
- C. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.



1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and scheduled activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
  2. Preparation of the schedule of values.
  3. Installation and removal of temporary facilities and controls.
  4. Delivery and processing of submittals.
  5. Progress meetings.
  6. Preinstallation conferences.
  7. Project closeout activities.
  8. Startup and adjustment of systems.

## 1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
    - b. Coordinate the addition of trade-specific information to coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
    - c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
    - e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
    - f. Indicate required installation sequences.
    - g. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
  2. Plenum Space: Indicate subframing for support of ceiling, and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
  3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
  4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
  5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
  6. Mechanical and Plumbing Work: Show the following:
    - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
    - b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
    - c. Fire-rated enclosures around ductwork.
  7. Electrical Work: Show the following:
    - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
    - b. Panel board, switch board, switchgear, transformer, busway, generator, and motor-control center locations.
    - c. Location of pull boxes and junction boxes, dimensioned from column center lines.
  8. Fire-Protection System: Show the following:
    - a. Locations of standpipes, mains piping, branch lines, pipe drops, and sprinkler heads.
  9. Review: Architect will review coordination drawings to confirm that in general the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.
  10. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."
- C. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
  2. File Preparation Format: DWG, operating in Microsoft Windows operating system.

3. File Submittal Format: Submit or post coordination drawing files using PDF format.
4. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
  - a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.
  - b. Digital Data Software Program: Drawings are available in AutoCAD 2013.
  - c. Contractor shall execute a data licensing agreement in the form of Agreement included in this Project Manual.

#### 1.7 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified using the web based program designated by Turner Construction Company.
  1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
  2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
  1. Project name.
  2. Project number.
  3. Date.
  4. Name of Contractor.
  5. Name of Architect and Construction Manager.
  6. RFI number, numbered sequentially.
  7. RFI subject.
  8. Specification Section number and title and related paragraphs, as appropriate.
  9. Drawing number and detail references, as appropriate.
  10. Field dimensions and conditions, as appropriate.
  11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  12. Contractor's signature.
  13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
    - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
  1. Attachments shall be electronic files in PDF format using the web based program designated by Turner Construction Company.

- D. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect or Construction Manager after 1:00 p.m. will be considered as received the following working day.
1. The following Contractor-generated RFIs will be returned without action:
    - a. Requests for approval of submittals.
    - b. Requests for approval of substitutions.
    - c. Requests for approval of Contractor's means and methods.
    - d. Requests for coordination information already indicated in the Contract Documents.
    - e. Requests for adjustments in the Contract Time or the Contract Sum.
    - f. Requests for interpretation of Architect's actions on submittals.
    - g. Incomplete RFIs or inaccurately prepared RFIs.
  2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect or Construction Manager of additional information.
  3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of web-based Project software. Include the following:
1. Project name.
  2. Name and address of Contractor.
  3. Name and address of Architect and Construction Manager.
  4. RFI number including RFIs that were returned without action or withdrawn.
  5. RFI description.
  6. Date the RFI was submitted.
  7. Date Architect's and Construction Manager's response was received.
  8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
  9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- F. On receipt of Architect's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven days if Contractor disagrees with response.

## 1.8 DIGITAL PROJECT MANAGEMENT PROCEDURES

- A. Use of Architect's Digital Data Files: Digital data files of Architect's CAD drawings will be provided by Architect for Contractor's use during construction.
1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
  2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
  3. Digital Drawing Software Program: Contract Drawings are available in AutoCAD format.
  4. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Architect.
    - a. Subcontractors, and other parties granted access by Contractor to Architect's digital data files shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.
  5. The following digital data files will be furnished for each appropriate discipline:
    - a. Site plans.
- B. Web-Based Project Software: Use Construction Manager's web-based Project software site for purposes of hosting and managing Project communication and documentation until Final Completion.
1. Web-based Project software site includes, at a minimum, the following features:
    - a. Compilation of Project data, including Contractor, subcontractors, Architect, architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
    - b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.
    - c. Document workflow planning, allowing customization of workflow between project entities.
    - d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
    - e. Track status of each Project communication in real time, and log time and date when responses are provided.
    - f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
    - g. Processing and tracking of payment applications.
    - h. Processing and tracking of contract modifications.
    - i. Creating and distributing meeting minutes.
    - j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
    - k. Management of construction progress photographs.
    - l. Mobile device compatibility, including smartphones and tablets.

2. Provide up to seven web-based Project software user licenses for use of Owner, Construction Manager, Architect, and Architect's consultants. Provide eight hours of software training at Architect's office for web-based Project software users.
  3. At completion of Project, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.
  4. Provide one of the following web-based Project software packages under their current published licensing agreements:
    - a. Meridian Systems; Prolog.
    - b. Procore Technologies, Inc.
- C. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  2. Name file with submittal number or other unique identifier, including revision identifier.
  3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

## 1.9 PROJECT MEETINGS

- A. General: Construction Manager will schedule and conduct job coordination meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times a minimum of 10 working days prior to meeting.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, and Architect, within three days of the meeting.
- B. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Responsibilities and personnel assignments.
    - b. Tentative construction schedule.
    - c. Phasing.
    - d. Critical work sequencing and long lead items.
    - e. Designation of key personnel and their duties.

- f. Lines of communications.
  - g. Use of web-based Project software.
  - h. Procedures for processing field decisions and Change Orders.
  - i. Procedures for RFIs.
  - j. Procedures for testing and inspecting.
  - k. Procedures for processing Applications for Payment.
  - l. Distribution of the Contract Documents.
  - m. Submittal procedures.
  - n. Sustainable design requirements.
  - o. Preparation of Record Documents.
  - p. Use of the premises and existing building.
  - q. Work restrictions.
  - r. Working hours.
  - s. Owner's occupancy requirements.
  - t. Responsibility for temporary facilities and controls.
  - u. Procedures for moisture and mold control.
  - v. Procedures for disruptions and shutdowns.
  - w. Construction waste management and recycling.
  - x. Parking availability.
  - y. Office, work, and storage areas.
  - z. Equipment deliveries and priorities.
  - aa. First aid.
  - bb. Security.
  - cc. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other sections and when required for coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Construction Manager of scheduled meeting dates.
  - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases.
    - f. Deliveries.
    - g. Submittals.
    - h. Sustainable design requirements.
    - i. Review of mockups.
    - j. Possible conflicts.
    - k. Compatibility requirements.
    - l. Time schedules.

- m. Weather limitations.
  - n. Manufacturer's written instructions.
  - o. Warranty requirements.
  - p. Compatibility of materials.
  - q. Acceptability of substrates.
  - r. Temporary facilities and controls.
  - s. Space and access limitations.
  - t. Regulations of authorities having jurisdiction.
  - u. Testing and inspecting requirements.
  - v. Installation procedures.
  - w. Coordination with other work.
  - x. Required performance results.
  - y. Protection of adjacent work.
  - z. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
  - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Construction Manager will schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
- 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
  - 2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    - a. Preparation of Record Documents.
    - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    - c. Procedures for completing and archiving web-based Project software site data files.
    - d. Submittal of written warranties.
    - e. Requirements for completing sustainable design documentation.
    - f. Requirements for preparing operations and maintenance data.
    - g. Requirements for delivery of material samples, attic stock, and spare parts.
    - h. Requirements for demonstration and training.
    - i. Preparation of Contractor's punch list.
    - j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    - k. Submittal procedures.
    - l. Coordination of separate contracts.



- m. Owner's partial occupancy requirements.
  - n. Installation of Owner's furniture, fixtures, and equipment.
  - o. Responsibility for removing temporary facilities and controls.
- 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- E. Progress Meetings: Construction Manager will conduct progress meetings at weekly intervals.
  - 1. Coordinate dates of meetings with preparation of payment requests.
  - 2. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
  - 3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Resolution of BIM component conflicts.
      - 4) Status of submittals.
      - 5) Status of sustainable design documentation.
      - 6) Deliveries.
      - 7) Off-site fabrication.
      - 8) Access.
      - 9) Site use.
      - 10) Temporary facilities and controls.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Status of correction of deficient items.
      - 14) Field observations.
      - 15) Status of RFIs.
      - 16) Status of Proposal Requests.
      - 17) Pending changes.
      - 18) Status of Change Orders.
      - 19) Pending claims and disputes.
      - 20) Documentation of information for payment requests.

4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
  - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Construction Manager will conduct Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
  1. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    - c. Review present and future needs of each contractor present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Resolution of BIM component conflicts.
      - 4) Status of submittals.
      - 5) Deliveries.
      - 6) Off-site fabrication.
      - 7) Access.
      - 8) Site use.
      - 9) Temporary facilities and controls.
      - 10) Work hours.
      - 11) Hazards and risks.
      - 12) Progress cleaning.
      - 13) Quality and work standards.
      - 14) Status of RFIs.
      - 15) Proposal Requests.
      - 16) Change Orders.
      - 17) Pending changes.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

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## SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Startup construction schedule.
  - 2. Contractor's Construction Schedule.
  - 3. Construction schedule updating reports.
  - 4. Daily construction reports.
  - 5. Material location reports.
  - 6. Site condition reports.
  - 7. Unusual event reports.

## 1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction Project. Activities included in a construction schedule consume time and resources.
  - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
  - 2. Predecessor Activity: An activity that precedes another activity in the network.
  - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum.
- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
  2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
  3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for completing an activity as scheduled.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
1. Working electronic copy of schedule file, where indicated.
  2. PDF file.
- B. Startup construction schedule.
1. Submittal of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.
- C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.
- E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
  2. Logic Report: List of preceding and succeeding activities for each activity, sorted in ascending order by activity number and then by early start date, or actual start date if known.
  3. Total Float Report: List of activities sorted in ascending order of total float.
  4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.
- F. Construction Schedule Updating Reports: Submit with Applications for Payment.
- G. Daily Construction Reports: Submit at monthly intervals.

- H. Material Location Reports: Submit at monthly intervals.
- I. Site Condition Reports: Submit at time of discovery of differing conditions.
- J. Unusual Event Reports: Submit at time of unusual event.
- K. Qualification Data: For scheduling consultant.

## 1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's Construction Schedule, including, but not limited to, the following:
  - 1. Review software limitations and content and format for reports.
  - 2. Verify availability of qualified personnel needed to develop and update schedule.
  - 3. Discuss constraints, including phasing, work stages, area separations, interim milestones and partial Owner occupancy.
  - 4. Review delivery dates for Owner-furnished products.
  - 5. Review schedule for work of Owner's separate contracts.
  - 6. Review submittal requirements and procedures.
  - 7. Review time required for review of submittals and resubmittals.
  - 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
  - 9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
  - 10. Review and finalize list of construction activities to be included in schedule.
  - 11. Review procedures for updating schedule.

## 1.6 COORDINATION

- A. Coordinate Contractor's Construction Schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
  - 1. Secure time commitments for performing critical elements of the Work from entities involved.
  - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

## 1.7 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
  2. List of separate contractors at Project site.
  3. Approximate count of personnel at Project site.
  4. Equipment at Project site.
  5. Material deliveries.
  6. High and low temperatures and general weather conditions, including presence of rain or snow.
  7. Testing and inspection.
  8. Accidents.
  9. Meetings and significant decisions.
  10. Unusual events.
  11. Stoppages, delays, shortages, and losses.
  12. Meter readings and similar recordings.
  13. Emergency procedures.
  14. Orders and requests of authorities having jurisdiction.
  15. Change Orders received and implemented.
  16. Construction Change Directives received and implemented.
  17. Services connected and disconnected.
  18. Equipment or system tests and startups.
  19. Partial completions and occupancies.
  20. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
  2. Material stored prior to previous report and since removed from storage and installed.
  3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- D. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
1. Submit unusual event reports directly to Owner within 14 day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.



1.8 RECORD DRAWINGS

- A. The Contractor shall keep on the job site one complete set of drawings that shall be utilized as an ongoing record of the job. Such drawings shall be maintained on a daily basis, and shall indicate all deviations from the Contract Documents.
- B. The deviations indicated, at the completion of the project, shall be incorporated into the electronic files by the Contractor, and shall be submitted to the Architect in both hard and electronic copies for approval, along with the original marked up set. These drawings shall be reviewed for general content and acceptability. Once approved, and returned to the Contractor, the Contractor shall make any necessary corrections, and submit one set, both electronic and hard, to the Architect and one set, both electronic and hard, to the Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

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## SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
  - 1. Preconstruction photographs.
  - 2. Preconstruction video recordings.
- B. Related Requirements:
  - 1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.

## 1.3 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph and video recording. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit image files within three days of taking photographs.
  - 1. Submit photos by uploading to web-based project software. Include copy of key plan indicating each photograph's location and direction.
  - 2. Identification: Provide the following information with each image description in web-based project software site:
    - a. Name of Project.
    - b. Name and contact information for photographer.
    - c. Name of Architect and Construction Manager.
    - d. Name of Contractor.
    - e. Date photograph was taken.
    - f. Description of location, vantage point, and direction.
    - g. Unique sequential identifier keyed to accompanying key plan.
- C. Printed Photographs: Submit two sets of prints of each photographic view within seven days of taking photographs.
  - 1. Format: 8-by-10-inch (203-by-254-mm) smooth-surface matte prints on single-weight, paper; enclosed back to back in clear plastic sleeves punched for three-ring binder.

Include copy of key plan indicating each photograph's location and direction. Provide one binder for each set of prints.

2. Identification: On back of each print, label with the following information:
    - a. Name of Project.
    - b. Name and contact information for photographer.
    - c. Name of Architect and Construction Manager.
    - d. Name of Contractor.
    - e. Date photograph was taken if not date stamped by camera.
    - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
    - g. Unique sequential identifier keyed to accompanying key plan.
- D. Video Recordings: Submit video recordings within seven days of recording.
1. Submit video recordings by uploading to web-based project software site. Include copy of key plan indicating each video's location and direction.
  2. Identification: With each submittal, provide the following information on web-based project software site:
    - a. Name of Project.
    - b. Name and address of photographer.
    - c. Name of Architect and Construction Manager.
    - d. Name of Contractor.
    - e. Date video recording was recorded.
    - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
  3. Transcript: Prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in three-ring binders. Provide label on front and spine. Include a cover sheet with label information. Include name of Project and date of video recording on each page.

#### 1.4 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.
- B. Construction Webcam Service Provider: A firm specializing in providing photographic equipment, web-based software, and related services for construction projects, with record of providing satisfactory services similar to those required for Project.

#### 1.5 FORMATS AND MEDIA

- A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.
- B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format, produced by a digital camera with minimum sensor resolution of 12 megapixels and capable of recording in

full high-definition mode. Provide supplemental lighting in low light levels or backlit conditions.

- C. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
- D. Metadata: Record accurate date and time and GPS location data from camera.
- E. File Names: Name media files with date, Project area and sequential numbering suffix.

#### 1.6 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs with maximum depth of field and in focus.
  - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Construction Manager.
  - 1. Flag excavation areas and construction limits before taking construction photographs.
  - 2. Take 20 photographs to show existing conditions adjacent to property before starting the Work.
  - 3. Take 20 photographs of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
  - 4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

#### 1.7 CONSTRUCTION VIDEO RECORDINGS

- A. Video Recording Photographer: Engage a qualified videographer to record construction video recordings.
- B. Narration: Describe scenes on video recording by audio narration by microphone while or dubbing audio narration off-site after video recording is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
  - 1. Confirm date and time at beginning and end of recording.
  - 2. Begin each video recording with name of Project, Contractor's name, videographer's name, and Project location.
- C. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from video recording opposite the corresponding narration segment.

- D. Preconstruction Video Recording: Before starting site work, record video recording of Project site and surrounding properties from different vantage points, as directed by Construction Manager.
1. Flag excavation areas and construction limits before recording construction video recordings.
  2. Show existing conditions adjacent to Project site before starting the Work.
  3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of site work.
  4. Show protection efforts by Contractor.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013233

## SECTION 013300 - SUBMITTAL PROCEDURES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

## A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

## B. Related Requirements:

1. Section 012900 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Section 013113 "Project Coordination" for submitting coordination drawings and subcontract list and for requirements for web-based Project software.
3. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
4. Section 013233 "Photographic Documentation" for submitting preconstruction photographs, periodic construction photographs, and final completion construction photographs.
5. Section 014000 "Quality Requirements" for submitting test and inspection reports, and schedule of tests and inspections.
6. Section 017700 "Closeout Procedures" for submitting closeout submittals and maintenance material submittals.
7. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
8. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

## 1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

#### 1.4 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and Construction Manager and additional time for handling and reviewing submittals required by those corrections.
1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
  2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
  3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
    - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
  4. Format: Arrange the following information in a tabular format:
    - a. Scheduled date for first submittal.
    - b. Specification Section number and title.
    - c. Submittal Category: Action; informational.
    - d. Name of subcontractor.
    - e. Description of the Work covered.
    - f. Scheduled date for Architect's and Construction Manager's final release or approval.
    - g. Scheduled dates for purchasing.
    - h. Scheduled date of fabrication.
    - i. Scheduled dates for installation.
    - j. Activity or event number.

#### 1.5 SUBMITTAL FORMATS

- A. Submittal Information: Include the following information in each submittal:
1. Project name.
  2. Date.
  3. Name of Architect.
  4. Name of Construction Manager.
  5. Name of Contractor.
  6. Name of firm or entity that prepared submittal.
  7. Names of subcontractor, manufacturer, and supplier.
  8. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier; and alphanumeric suffix for resubmittals.
  9. Category and type of submittal.



10. Submittal purpose and description.
11. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
12. Drawing number and detail references, as appropriate.
13. Indication of full or partial submittal.
14. Location(s) where product is to be installed, as appropriate.
15. Other necessary identification.
16. Remarks.
17. Signature of transmitter.

- B. Options: Identify options requiring selection by Architect.
- C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect and Construction Manager on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.
- D. Paper Submittals:
1. Place a permanent label or title block on each submittal item for identification; include name of firm or entity that prepared submittal.
  2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect and Construction Manager.
  3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect, through Construction Manager, will return two copies.
  4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect and Construction Manager will not return copies.
  5. Additional Copies: Unless additional copies are required for final submittal, and unless Architect or Construction Manager observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
  6. Transmittal for Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using the web based program designated by Turner Construction Company.
- E. PDF Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.
- F. Submittals for Web-Based Project Software: Prepare submittals as PDF files, or other format indicated by Project software website.

## 1.6 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Email: Prepare submittals as PDF package, and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.

- a. Architect, through Construction Manager, will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.
  2. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
  3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
  4. Coordinate transmittal of submittals for related parts of the Work specified in different Sections so processing will not be delayed because of need to review submittals concurrently for coordination.
- a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 15 days for review of each resubmittal.
  4. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Construction Manager, through Architect, before being returned to Contractor.
- a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect and Construction Manager.
- D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  3. Resubmit submittals until they are marked with approval notation from Architect's and Construction Manager's action stamp.

- E. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- F. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's and Construction Manager's action stamp.

## 1.7 SUBMITTAL REQUIREMENTS

- A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard published data are unsuitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Mark each copy of each submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.
    - e. Testing by recognized testing agency.
    - f. Application of testing agency labels and seals.
    - g. Notation of coordination requirements.
    - h. Availability and delivery time information.
  - 4. For equipment, include the following in addition to the above, as applicable:
    - a. Wiring diagrams that show factory-installed wiring.
    - b. Printed performance curves.
    - c. Operational range diagrams.
    - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
  - 5. Submit Product Data before Shop Drawings, and before or concurrent with Samples.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data unless submittal based on Architect's digital data drawing files is otherwise permitted.
  - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Identification of products.
    - b. Schedules.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.

- g. Seal and signature of professional engineer if specified.
  - 2. Paper Sheet Size: Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
    - a. Two opaque (bond) copies of each submittal. Architect, through Construction Manager, will return one copy.
- C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other materials.
  - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  - 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
    - a. Project name and submittal number.
    - b. Generic description of Sample.
    - c. Product name and name of manufacturer.
    - d. Sample source.
    - e. Number and title of applicable Specification Section.
    - f. Specification paragraph number and generic name of each item.
  - 3. Email Transmittal: Provide PDF transmittal. Include digital image file illustrating Sample characteristics, and identification information for record.
  - 4. Web-Based Project Software: Prepare submittals in PDF form, and upload to web-based Project software website. Enter required data in web-based software site to fully identify submittal.
  - 5. Paper Transmittal: Include paper transmittal including complete submittal information indicated.
  - 6. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  - 7. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, through Construction Manager, will return submittal with options selected.
  - 8. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and

physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

- a. Number of Samples: Submit three sets of Samples. Architect and Construction Manager will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
  - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
  - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
  2. Manufacturer and product name, and model number if applicable.
  3. Number and name of room or space.
  4. Location within room or space.
- E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
  1. Certificates and Certifications Submittals: Submit a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity. Provide a notarized signature where indicated.
  2. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
  3. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
  4. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

5. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
2. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
3. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
4. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
5. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
6. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  - a. Name of evaluation organization.
  - b. Date of evaluation.
  - c. Time period when report is in effect.
  - d. Product and manufacturers' names.
  - e. Description of product.
  - f. Test procedures and results.
  - g. Limitations of use.

1.8 CONTRACTOR'S REVIEW

- A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect and Construction Manager.
- B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

1. Architect and Construction Manager will not review submittals received from Contractor that do not have Contractor's review and approval.

#### 1.9 ARCHITECT'S AND CONSTRUCTION MANAGER'S REVIEW

- A. Action Submittals: Architect and Construction Manager will review each submittal, indicate corrections or revisions required, and return it.
  1. PDF Submittals: Architect and Construction Manager will indicate, via markup on each submittal, the appropriate action, as follows:
    - a. A/E Stamp
      - 1) NO EXCEPTIONS TAKEN
      - 2) EXCEPTIONS TAKEN AS NOTED
      - 3) NOT ACCEPTABLE RESUBMIT
    - b. Construction Manager's Stamp
      - 1) NO EXCEPTIONS TAKEN
      - 2) EXCEPTIONS TAKEN AS NOTED
      - 3) NOT ACCEPTABLE RESUBMIT
  2. Paper Submittals: Architect and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
    - a. A/E Stamp
      - 1) NO EXCEPTIONS TAKEN
      - 2) EXCEPTIONS TAKEN AS NOTED
      - 3) NOT ACCEPTABLE RESUBMIT
    - b. Construction Manager's Stamp
      - 1) NO EXCEPTIONS TAKEN
      - 2) EXCEPTIONS TAKEN AS NOTED
      - 3) NOT ACCEPTABLE RESUBMIT
- B. Informational Submittals: Architect and Construction Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect and Construction Manager will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect and Construction Manager.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Architect and Construction Manager will return without review submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013300



## SECTION 014000 - QUALITY REQUIREMENTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Authority, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
  - 4. Specific test and inspection requirements are not specified in this Section.
- C. Related Requirements:
  - 1. Section 012100 "Allowances" for testing and inspecting allowances.

## 1.3 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to

show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
  2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
  3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

#### 1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

## 1.5 ACTION SUBMITTALS

- A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.
  - 1. Indicate manufacturer and model number of individual components.
  - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

## 1.6 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data : For Contractor's quality-control personnel.
- C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
  - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
  - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
- D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Entity responsible for performing tests and inspections.
  - 3. Description of test and inspection.
  - 4. Identification of applicable standards.
  - 5. Identification of test and inspection methods.
  - 6. Number of tests and inspections required.
  - 7. Time schedule or time span for tests and inspections.
  - 8. Requirements for obtaining samples.
  - 9. Unique characteristics of each quality-control service.

## 1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

- A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice of Award, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.
- B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.
  - 1. Project quality-control manager may also serve as Project superintendent.
- C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.
- D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:
  - 1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
  - 2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
  - 3. Owner-performed tests and inspections indicated in the Contract Documents, including tests and inspections indicated to be performed by the Commissioning Authority.
- E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.
- F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

## 1.8 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
  - 1. Date of issue.
  - 2. Project title and number.
  - 3. Name, address, and telephone number of testing agency.
  - 4. Dates and locations of samples and tests or inspections.
  - 5. Names of individuals making tests and inspections.

6. Description of the Work and test and inspection method.
  7. Identification of product and Specification Section.
  8. Complete test or inspection data.
  9. Test and inspection results and an interpretation of test results.
  10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
  12. Name and signature of laboratory inspector.
  13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
  2. Statement that equipment complies with requirements.
  3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  4. Statement whether conditions, products, and installation will affect warranty.
  5. Other required items indicated in individual Specification Sections.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.
- 1.9 QUALITY ASSURANCE
- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
  - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
  - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
  - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
  - 1. Contractor responsibilities include the following:
    - a. Provide test specimens representative of proposed products and construction.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

- c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
  - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
  - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
  - f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.
- 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
  - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.
  - 2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
  - 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
  - 4. Demonstrate the proposed range of aesthetic effects and workmanship.
  - 5. Obtain Architect's and Construction Manager's approval of mockups before starting work, fabrication, or construction.
    - a. Allow seven days for initial review and each re-review of each mockup.
  - 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  - 7. Demolish and remove mockups when directed unless otherwise indicated.
- L. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.

#### 1.10 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
  - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
  - 2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.

3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
  2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
  4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Architect, Commissioning Authority, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect, Commissioning Authority, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.



3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
  4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
  5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
  6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
  2. Incidental labor and facilities necessary to facilitate tests and inspections.
  3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
  4. Facilities for storage and field curing of test samples.
  5. Delivery of samples to testing agencies.
  6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
1. Distribution: Distribute schedule to Owner, Architect, Commissioning Authority, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.
- 1.11 SPECIAL TESTS AND INSPECTIONS
- A. Special Tests and Inspections: Engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner as follows:
- B. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.

2. Notifying Architect, Commissioning Authority, Construction Manager, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority, through Construction Manager, with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
  1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. Date test or inspection results were transmitted to Architect.
  4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's, and Construction Manager's reference during normal working hours.

### 3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
  1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

## SECTION 014200 - REFERENCES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

## 1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

#### 1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.
  - 1. AASHTO - American Association of State Highway and Transportation Officials; [www.transportation.org](http://www.transportation.org).
  - 2. ACI - American Concrete Institute; (Formerly: ACI International); [www.concrete.org](http://www.concrete.org)
  - 3. AIA - American Institute of Architects (The); [www.aia.org](http://www.aia.org).
  - 4. ANSI - American National Standards Institute; [www.ansi.org](http://www.ansi.org).
  - 5. ASCE - American Society of Civil Engineers; [www.asce.org](http://www.asce.org).
  - 6. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
  - 7. ASME - ASME International; (American Society of Mechanical Engineers); [www.asme.org](http://www.asme.org).
  - 8. ASTM - ASTM International; [www.astm.org](http://www.astm.org).
  - 9. AWWA - American Water Works Association; [www.awwa.org](http://www.awwa.org).
  - 10. NEMA - National Electrical Manufacturers Association; [www.nema.org](http://www.nema.org).
  - 11. NFPA - National Fire Protection Association; [www.nfpa.org](http://www.nfpa.org).
  - 12. PDI - Plumbing & Drainage Institute; [www.pdionline.org](http://www.pdionline.org).
  - 13. UL - Underwriters Laboratories Inc.; <http://www.ul.com>.
- C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.
  - 1. IAPMO - International Association of Plumbing and Mechanical Officials; [www.iapmo.org](http://www.iapmo.org).
  - 2. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
  - 3. ICC-ES - ICC Evaluation Service, LLC; [www.icc-es.org](http://www.icc-es.org).

- D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. EPA - Environmental Protection Agency; [www.epa.gov](http://www.epa.gov).
2. OSHA - Occupational Safety & Health Administration; [www.osha.gov](http://www.osha.gov).

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

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## SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

## PART 1 - GENERAL

## 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 00 and Division 01 Specifications Sections, apply to this Section.

## 1.02 SUMMARY

- A. Section includes general protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Requirements:
  - 1. Section 015000 "Temporary Facilities and Controls" for temporary site fencing.
  - 2. Section 311000 "Site Clearing" for removing existing trees and shrubs.

## 1.03 DEFINITIONS

- A. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and defined by the tree drip line unless otherwise indicated.
- B. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

## 1.04 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:
    - a. Coordination of Work and equipment movement with the locations of protection zones.

## 1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.

## 1.06 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
  - 1. Use sufficiently detailed photographs or video recordings.
  - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

## 1.07 FIELD CONDITIONS

- A. The following practices are prohibited within protection zones:
  - 1. Storage of construction materials, debris, or excavated material.
  - 2. Moving or parking vehicles or equipment.
  - 3. Foot traffic.
  - 4. Erection of sheds or structures.
  - 5. Impoundment of water.
  - 6. Excavation or other digging unless otherwise indicated.
  - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Backfill Soil: Planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.
  - 1. Planting Soil: Planting soil as specified in Section 329113 "Soil Preparation"
- B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
  - 1. Type: Shredded hardwood.
  - 2. Size Range: 3 inches maximum, 1 1/2 inch minimum.
  - 3. Color: Natural.
- C. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements: Previously used materials may be used when approved by Architect.
  - 1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch opening, 0.148-inch-diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch-OD line posts, and 2-7/8-inch-OD corner and pull posts ; with 0.177-inch-diameter top tension wire and 0.177-inch-diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.
    - a. Height: 72 inches.
  - 2. Gates: Single- swing access gates matching material and appearance of fencing, to allow for maintenance activities within protection zones; leaf width 36 inches.



- D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering and as follows:
  - 1. Size and Text: Minimum 24 inches by 24 inches.
  - 2. Lettering: 3-inch-high minimum, white characters on red background.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

#### 3.02 PREPARATION

- A. Locate and clearly identify trees to remain. Tie a 1-inch blue vinyl tape around each tree trunk at 54 inches above the ground.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

#### 3.03 PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.
  - 1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
  - 2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.
  - 3. Access Gates: Install where required for easy access; adjust to operate smoothly, easily, and quietly; free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 20 feet on protection-zone fencing, but no fewer than two signs with each facing a different direction.
- C. Maintain protection zones free of weeds and trash.

- D. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.
  - 1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.

### 3.04 EXCAVATION

- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312001 "Site Grading" unless otherwise indicated.
- B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.
- C. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction and as required for root pruning.
- D. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

### 3.05 ROOT PRUNING

- A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:
  - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
  - 2. Cut Ends: Do not paint cut root ends.
  - 3. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
  - 4. Cover exposed roots with burlap and water regularly.
  - 5. Backfill as soon as possible according to requirements in Section 312001 "Site Grading."
- B. Root Pruning at Edge of Protection Zone: Prune tree roots 12 inches outside of the protection zone by cleanly cutting all roots to the depth of the required excavation.

- C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

### 3.06 CROWN PRUNING

- A. Prune branches that are affected by temporary and permanent construction.
  - 1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
  - 2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
  - 3. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
- B. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.
- C. Cut branches with sharp pruning instruments; do not break or chop.
- D. Do not paint or apply sealants to wounds.
- E. Chip removed branches and dispose of off-site.

### 3.07 REPAIR AND REPLACEMENT

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.
  - 1. Submit details of proposed pruning and repairs.
  - 2. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
  - 3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.
- B. Trees: Remove and replace trees indicated to remain that are more than 66 percent dead or in an unhealthy condition or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
  - 1. Large Trees: Provide one new tree(s) of 12-inch caliper size for each tree being replaced that measures more than 12 inches in caliper size.
    - a. Species: As selected by Landscape Architect.
  - 2. Plant and maintain new trees as specified in Section 329300 "Plants."
- C. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 2-inch uniform thickness to remain.

- D. Soil Aeration: Aerate surface soil compacted during construction. Aerate 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inch-diameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of augered soil and sand.

### 3.08 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

END OF SECTION 015639

## SECTION 016000 - PRODUCT REQUIREMENTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
  - 1. Section 012100 "Allowances" for products selected under an allowance.
  - 2. Section 012300 "Alternates" for products selected under an alternate.
  - 3. Section 012500 "Substitution Procedures" for requests for substitutions.
  - 4. Section 014200 "References" for applicable industry standards for products specified.

## 1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
  - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
  - 3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

#### 1.4 ACTION SUBMITTALS

- A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
  - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
  - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a comparable product request. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
    - a. Form of Architect's Approval of Submittal: As specified in Section 013300 "Submittal Procedures."
    - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

#### 1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
  - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
  - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
  - 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.

2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
  - a. Name of product and manufacturer.
  - b. Model and serial number.
  - c. Capacity.
  - d. Speed.
  - e. Ratings.
3. See individual identification sections in Divisions 21, 22, 23, and 26 for additional identification requirements.

#### 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
  1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
  1. Store products to allow for inspection and measurement of quantity or counting of units.
  2. Store materials in a manner that will not endanger Project structure.
  3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
  4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
  5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  6. Protect stored products from damage and liquids from freezing.
  7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

## 1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
  - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
  - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
  - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
  - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
  - 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
  - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
  - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
  - 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
  - 4. Where products are accompanied by the term "as selected," Architect will make selection.
  - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
  - 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
    - a. Submit additional documentation required by Architect through Construction Manager in order to establish equivalency of proposed products. Evaluation of "or equal" product status is by the Architect, whose determination is final.



B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: ..."
2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: ..."
3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: ..."
4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.
  - a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following: ..."
5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  - a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: ..."
6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.
  - a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following: ..."
7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or

indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

- a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

## 2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
  2. Evidence that proposed product provides specified warranty.
  3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
  4. Samples, if requested.
- B. Submittal Requirements: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

## PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

## SECTION 017300 - EXECUTION

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Coordination of Owner-installed products.
  - 6. Progress cleaning.
  - 7. Starting and adjusting.
  - 8. Protection of installed construction.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for limits on use of Project site.
  - 2. Section 013300 "Submittal Procedures" for submitting surveys.
  - 3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

## 1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

## 1.4 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.
  - 1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting

and patching work. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:

- a. Contractor's superintendent.
  - b. Trade supervisor responsible for cutting operations.
  - c. Trade supervisor(s) responsible for patching of each type of substrate.
  - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affecting by cutting and patching operations.
2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
  1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
  2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
  3. Products: List products to be used for patching and firms or entities that will perform patching work.
  4. Dates: Indicate when cutting and patching will be performed.
  5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
    - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- E. Certified Surveys: Submit two copies signed by land surveyor.
- F. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

## 1.6 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
  2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    - a. Plumbing piping systems.
    - b. Mechanical systems piping.
    - c. Electrical wiring systems.
  3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
  4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
  - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services; and other utilities.
  - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
  - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
  - 1. Description of the Work.
  - 2. List of detrimental conditions, including substrates.
  - 3. List of unacceptable installation tolerances.
  - 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before

fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Construction Manager promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
  - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  - 2. Establish limits on use of Project site.
  - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  - 4. Inform installers of lines and levels to which they must comply.
  - 5. Check the location, level and plumb, of every major element as the Work progresses.
  - 6. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
  - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Construction Manager.

### 3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.

- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
  - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.
  - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
  - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
  - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
  - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
  - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

### 3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
  - 1. Make vertical work plumb and make horizontal work level.
  - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.



- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Where possible, select tools or equipment that minimize production of excessive noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
  - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
  - 2. Allow for building movement, including thermal expansion and contraction.
  - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.
  - 1. Comply with Section 017700 "Closeout Procedures" for repairing or removing and replacing defective Work.

### 3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
  - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

### 3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
  - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
  - 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

### 3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
  - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
  - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
  - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
    - a. Use containers intended for holding waste materials of type to be stored.
  - 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
  - 1. Remove liquid spills promptly.
  - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

### 3.9 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

END OF SECTION 017300

## SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 00 and Division 01 Specifications Sections, apply to this Section.

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
  - 1. Recycling non-hazardous demolition and construction waste.
  - 2. Disposing of nonhazardous demolition and construction waste.

## 1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Hazardous: Exhibiting the characteristics of hazardous substances, i.e. ignitibility, corrosivity, toxicity or reactivity.
- G. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- H. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

- I. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- J. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- K. Reuse: To reuse a construction waste material in some manner on the project site.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable and reusable material.

#### 1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes the Property of Contractor.

#### 1.5 PERFORMANCE REQUIREMENTS

- A. General: Prime contractors shall work together to develop Waste Management Plan that results in end-of-Project rates for salvage/recycling of 75% percent or more by volume (yds) in a Minimum of FIVE (5) Material/Waste Streams, of total waste generated by the Work. All work must comply with the requirements of LEED V4/V4.1.
- B. Owner requires that this project generate the least amount of trash and waste possible.
- C. Contractor shall develop, submit for Approval, and follow a Comprehensive Construction and Demolition Waste Management Plan within Thirty (30) Days of date established for Commencement of Work, and prior to ANY onsite demolition or construction, designed to implement these requirements. A contracted off-site waste hauler/recycler may provide the Waste

Management Plan in lieu of contractor if one is to be contracted for the project. Plan must be compliant with the requirements of LEED V4/V4.1.

- D. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination or other factors.
- E. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- F. Salvage/Recycle Requirements: Owner's goal is to salvage and recycle as much nonhazardous demolition and construction waste as possible including the following materials:
  - 1. Land clearing debris.
  - 2. Clean dimensional wood & all pallet wood
  - 3. Plywood, OSB & particleboard.
  - 4. Concrete
  - 5. Brick
  - 6. Concrete masonry units.
  - 7. Asphalt paving
  - 8. Cardboard, paper, packing
  - 9. Roofing materials
  - 10. Metals – including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
  - 11. Gypsum wall board (unpainted) & plaster
  - 12. Paints
  - 13. Glass
  - 14. Plastics
  - 15. Carpet and pad remnants
  - 16. Insulation
  - 17. Electrical conduit
  - 18. Aluminum and plastic beverage containers
  - 19. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100% percent of the following uncontaminated packaging materials:
    - a. Paper
    - b. Cardboard
    - c. Boxes
    - d. Plastic sheet and film
    - e. Polystyrene packaging
    - f. Wood crates
    - g. Plastic pails
- G. LEED Certification for this project is dependent on diversion of 75% percent or more by volume (yds), of potential landfill trash/waste by recycling and/or salvage with a minimum of FIVE (5) Material Streams.
- H. Contractor shall submit CWM Tracking Forms (end of section) at all payouts for any self hauled wastes not placed in the contracted off-site sorting

companies' dumpsters; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure (yards) on all reports.

- I. Methods of trash/waste disposal that are not acceptable are:
  - 1. Burning on the project site.
  - 2. Burying on the project site.
  - 3. Dumping or burying on other property, public or private.
  - 4. Other illegal dumping or burying.
- J. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, State and local requirements, pertaining to legal disposal of all construction and demolition waste materials.
- K. Provided off-site sorting companies dumpsters will be covered nightly and on weekends during snowy months to adequately protect materials from being ruined from entering the recycling stream. Frozen and waterlogged loads cannot be adequately sorted therefore the loads will count against the overall projects CWM calculations. Therefore, at a minimum during the winter months the dumpsters will be tarped/lidded or located under covered storage.

#### 1.6 SUBMITTALS

- A. LEED Submittals: Submit Waste Management Plan (self generated or provided by contracted off-site sorter, if a combination of hauling methods will be performed the Construction Waste Management Plan must reflect and outline this process) and Construction Waste Management Tracking Forms (end of this section).
- B. Construction Waste Management Plan: Submit a Construction Waste Management Plan within Thrity days (30) of date established for commencement of the Work.
- C. Construction Waste Management Plan: Include the following information:
  - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
  - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s) and the projected cost of disposing all project trash/waste in the landfill(s).
  - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse or salvage.
    - a. List each material proposed to be salvaged or reused or recycled.
  - 4. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage and packaging.



5. Transportation: Identify the destination and means of transportation of materials to be recycled.
  - a. On-Site: Materials will be site-separated by each contractor and self-hauled to designated centers. ---\*\**The on-site sorting method is not approved for this project. Only off-site sorting will be approved*\*\*---
  - b. Off-Site: Mixed materials will be collected by a waste hauler that will sort recyclables at their facility. However, On-Site Separation of construction waste from non-construction waste (food/organic/non-construction refuse) is mandatory. Provide on-site a standard trashcan/recycling bin to prevent mixing of non-construction waste. For example - lunch waste from contractors must go in separate trashcan/recycling bins – NOT combined with construction waste. All other standard construction waste will go into single bin that will be sorted off-site by waste hauler. Preliminary OnSite separation of large quantities of individual Material Streams is encouraged and shall be discussed with contracted Waste/Recycle Hauler.
- D. CWM Tracking Forms (end of section): Submit this form only for wastes being hauled independently of the contracted off-site sorting companies dumpsters, at specified intervals with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
  1. Submit updated Tracking Forms with each Application for Progress Payment; failure to submit Forms will delay payment.
  2. Construction Waste Management Tracking Form (end of this section): Submit three copies of the form which will include ticket #'s, container sizes, non-recycled and recycled yardage, Load percentage recycled and notes regarding each load. This will provide a method to track current rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work to date by each contractor or subcontractor.
  3. Landfill disposal: Include the following information:
    - a. Identification of material.
    - b. Amount in cubic yards of trash/waste material from the project disposed of in landfills.
    - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
    - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
  4. Incinerator Disposal: Include the following information:
    - a. Identification of material.
    - b. Amount in cubic yards of trash/waste material from the project delivered to incinerators.
    - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
    - d. Include manifests, weight tickets, receipts and invoices as evidence of quantity and cost.
  5. Recycled Materials: Include the following information for each:

- a. Amount in cubic yards, date removed from the project site and receiving party.
    - b. Transportation cost, amount paid or received for the material and the net total cost or savings of salvage or recycling each material.
    - c. Include manifests, weight tickets, receipts and invoices as evidence of quantity and cost.
    - d. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
  6. Material Reused on Project: Include the following information for each:
    - a. Identification of material and how it was used in the project.
    - b. Amount in cubic yards.
    - c. Include weight tickets as evidence of quantity.
  7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.
- E. Total Waste Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work. Use ALL previous and any new CWM Tracking Forms combined with all Contracted Off-Site Recycle/Waste Hauler Reports to calculate and provide an accurate total of all waste. Contracted off-site sorting company can provide this documentation in a final closeout submittal upon request.
- F. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- G. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt. Provide copies of receipts.
- H. Narrative: For each type of waste diverted from landfills provide a narrative of how it is to be used or diverted.
- I. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices. Provide copies of all documentation.
- J. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- K. LEED Submittal: LEED submittal template for Credit MR 5 completed by Architect/LEED Consultant shall be based on information provided by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

## 1.7 QUALITY ASSURANCE

- A. Waste Management Conference: Conduct conference at Project site with owner representative, architect and representatives of all prime contractors. Review methods and procedures related to waste management including, but not limited to the following:
  - 1. Review and discuss waste management plan including responsibilities of each contractor and waste management coordinator.
  - 2. Review requirements for documenting quantities of each type of waste and its disposition.
  - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
  - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
  - 5. Review waste management requirements for each trade.
- B. Off Site Sorting Service Suppliers: Companies wishing to supply Off Site Sorting services of construction waste shall have experience in offsite sorting of waste and providing documentation for at least 5 previous LEED projects. Recommended haulers are provided in 3.2, B, 1 of this section.

## 1.8 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification and waste reduction work plan. Indicate quantities by volume (cubic yards).
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Total Waste: All waste generated by each contractor (whether or not it is recycled), if not disposed of in provided off-site sorters containers are to be documented and included in all reports and submitted on the provided CWM Tracking Forms (end of this section). The total waste generated by the project must be calculated. No matter to whom the benefit accrues, ALL waste removed from the site must be documented.
- D. Forms: Prepare Construction Waste Management Plan outlining planned procedures and processes for removal of waste, off-site sorting company contracted, and requirements for submission of CWM Tracking Forms (end of section) for any wastes hauled independently of the contracted off-site sorting companies provided dumpsters.

## PART 2 - PRODUCTS

### 2.1 SORTING METHOD

- A. Off site sorting is the only approved method of waste management for this project.
- B. Where a contractor is diverting waste independent of the off-site recycling container provided, it is the responsibility of that contractor to provide a Waste Management Plan and progress reports and maintain a minimum 75% construction waste recycling value.
- C. Construction waste management items which may be recycled independent of the off-site sorting containers, although not favored or encouraged, include:
  - 1. Sheet metal
  - 2. Metal framing materials
  - 3. Electrical wiring
  - 4. Crushed concrete or concrete masonry units
  - 5. Asphalt
  - 6. Wood
  - 7. Land clearing debris (not included in CWM calculator)
  - 8. Brick
  - 9. Other materials as approved in writing by Construction Manager

### 2.2 RECYCLABLE WASTE

- A. The following products shall be recycled to the greatest extent possible. Construction Waste Recycling shall be 75% percent by volume or greater with a minimum of FIVE (5) or more Waste Streams.
  - 1. Clean dimensional wood, palette wood
  - 2. Plywood, OSB, and particleboard
  - 3. Concrete
  - 4. Brick
  - 5. Concrete Masonry Units (CMU)
  - 6. Asphaltic Concrete
  - 7. Cardboard, paper, packaging
  - 8. Roofing materials
  - 9. Metals
  - 10. Gypsum Wallboard (unpainted) & plaster
  - 11. Paint
  - 12. Glass
  - 13. Plastics
  - 14. Carpet and pad remnants
  - 15. Beverage containers
  - 16. Insulation
  - 17. Electrical conduit

## PART 3 - EXECUTION

## 3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by Owner. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
  - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
  - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  - 2. Comply with Division 1 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.
- D. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- E. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner and Architect.
- F. Instruction: Provide on-site instruction of appropriate separation, handling and recycling, salvage, reuse and return methods to be used by all parties at the appropriate stages of the project.
- G. Meetings: Discuss trash/waste management goals, status and issues at project meetings.
- H. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return and trash disposal locations for use by all contractors and installers.
  - 1. At a minimum provide:

- a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking, ground masonry/asphalt for fill, etc... (See 3.1/K for more information)
    - b. For OFF-SITE Sorting - Separate dumpsters for at a minimum, construction waste and non-construction waste. You may choose to provide containers for each category of recyclable.
    - c. Recycling bins at worker lunch area required for both ON-Site and OFF-Site sorting options. Lunch wastes are not to be placed in the contracted off-site sorting companies provided dumpsters.
  2. Provide containers as required.
  3. Provide temporary enclosures around piles of separated materials to be recycled if applicable.
  4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
  5. Locate enclosures out of the way of construction traffic.
  6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
  7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
  8. Keep recycling trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- I. Hazardous Wastes: Separate, store and dispose of hazardous wastes according to applicable regulations found in other sections in the specifications.
1. All quantities of wastes designated as hazardous are to be quantified and submitted for appropriate tracking. Hazardous wastes are not included in the projects overall CWM goals and will not negatively impact overall percentages, however, they must be tracked and quantified in cubic yards and submitted to LEED Consultant and Architect.
- J. Recycling: Separate, store, protect and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- K. Reuse of Materials On-Site: Set aside, sort and protect separated products in preparation for reuse on-site. For ALL materials reused on-site provide an accurate estimate of the total yardage reused on company letterhead and provide a short description/narrative of what the material was used for (i.e. wood blocking, fill, etc...). Also provide a dated photo to give an accurate depiction of the quantity claimed. Also provide an estimate by the Construction Manager of the materials \$ value if purchased new. This information shall be submitted on the Material Use Confirmation Form found in the division 1 section 018113 "Sustainable Design Requirements".

### 3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Receivers and Processors: Must have experience with a minimum of 5 documentable LEED projects. List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:
  - 1. Mixed Waste:
    - a. Pete and Pete Container Service, 4830 Warner Rd, Cleveland, OH 44125, 216-441-4422
    - b. Rosby Resource Recovery, 54 East Schaaf Road, Brooklyn Hts., OH 44131, 216-661-6102
    - c. Kurtz Bros., Inc., 5603 Canal Road Valley View, OH 44125, 216-641-7000
    - d. For mixed waste services ensure all supplier requirements are met to avoid contamination of loads.
  - 2. Asphalt, Concrete & site clearing debris:
    - a. Asphalt, Concrete and site clearing debris may be separately recycled if documentation is provided showing that at least 75% percent by volume will be diverted from the landfill. All Quantities removed from the project site are to be tracked and submitted for Overall Project Tracking. If self hauling or using a separate Demo Hauler, submit all quantities of waste in Cubic Yards, removed from the project site using the Form at End of Section.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include a list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.
  - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  - 4. Store components off the ground and protect from the weather.
  - 5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor or if utilizing an off-site sorting service contact contracted waste hauler to maintain regular pickups.

END OF SECTION 017419

***TO BE SUBMITTED WITH EACH PAY OUT APPLICATION***

**Contractor/Subcontractor:**

**Scope of Work Narrative:** \_\_\_\_\_

**Contractor/Subcontractor Signature of Agreement:**

[illegible]

**Total Yards of ALL Containers (B): \_\_\_\_\_ :Total ALL Recycled Yards (A)**

**Total Recycled Construction Waste = (Total ALL Recycled Yards (A) / Total Yards of ALL Containers (B)):** **%**(must equal required)



## SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 00 and Division 01 Specifications Sections, apply to this Section.

## 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
  - 1. Recycling non-hazardous demolition and construction waste.
  - 2. Disposing of nonhazardous demolition and construction waste.

## 1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Hazardous: Exhibiting the characteristics of hazardous substances, i.e. ignitibility, corrosivity, toxicity or reactivity.
- G. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
- H. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

- I. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- J. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- K. Reuse: To reuse a construction waste material in some manner on the project site.
- L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- N. Toxic: Poisonous to humans either immediately or after a long period of exposure.
- O. Trash: Any product or material unable to be reused, returned, recycled or salvaged.
- P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable and reusable material.

#### 1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition and construction waste becomes the Property of Contractor.

#### 1.5 PERFORMANCE REQUIREMENTS

- A. General: Prime contractors shall work together to develop Waste Management Plan that results in end-of-Project rates for salvage/recycling of 75% percent or more by volume (yds) in a Minimum of FIVE (5) Material/Waste Streams, of total waste generated by the Work. All work must comply with the requirements of LEED V4/V4.1.
- B. Owner requires that this project generate the least amount of trash and waste possible.
- C. Contractor shall develop, submit for Approval, and follow a Comprehensive Construction and Demolition Waste Management Plan within Thirty (30) Days of date established for Commencement of Work, and prior to ANY onsite demolition or construction, designed to implement these requirements. A contracted off-site waste hauler/recycler may provide the Waste

Management Plan in lieu of contractor if one is to be contracted for the project. Plan must be compliant with the requirements of LEED V4/V4.1.

- D. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination or other factors.
- E. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.
- F. Salvage/Recycle Requirements: Owner's goal is to salvage and recycle as much nonhazardous demolition and construction waste as possible including the following materials:
  - 1. Land clearing debris.
  - 2. Clean dimensional wood & all pallet wood
  - 3. Plywood, OSB & particleboard.
  - 4. Concrete
  - 5. Brick
  - 6. Concrete masonry units.
  - 7. Asphalt paving
  - 8. Cardboard, paper, packing
  - 9. Roofing materials
  - 10. Metals – including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
  - 11. Gypsum wall board (unpainted) & plaster
  - 12. Paints
  - 13. Glass
  - 14. Plastics
  - 15. Carpet and pad remnants
  - 16. Insulation
  - 17. Electrical conduit
  - 18. Aluminum and plastic beverage containers
  - 19. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100% percent of the following uncontaminated packaging materials:
    - a. Paper
    - b. Cardboard
    - c. Boxes
    - d. Plastic sheet and film
    - e. Polystyrene packaging
    - f. Wood crates
    - g. Plastic pails
- G. LEED Certification for this project is dependent on diversion of 75% percent or more by volume (yds), of potential landfill trash/waste by recycling and/or salvage with a minimum of FIVE (5) Material Streams.
- H. Contractor shall submit CWM Tracking Forms (end of section) at all payouts for any self hauled wastes not placed in the contracted off-site sorting

companies' dumpsters; all landfill disposal, incineration, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure (yards) on all reports.

- I. Methods of trash/waste disposal that are not acceptable are:
  - 1. Burning on the project site.
  - 2. Burying on the project site.
  - 3. Dumping or burying on other property, public or private.
  - 4. Other illegal dumping or burying.
- J. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, State and local requirements, pertaining to legal disposal of all construction and demolition waste materials.
- K. Provided off-site sorting companies dumpsters will be covered nightly and on weekends during snowy months to adequately protect materials from being ruined from entering the recycling stream. Frozen and waterlogged loads cannot be adequately sorted therefore the loads will count against the overall projects CWM calculations. Therefore, at a minimum during the winter months the dumpsters will be tarped/lidded or located under covered storage.

#### 1.6 SUBMITTALS

- A. LEED Submittals: Submit Waste Management Plan (self generated or provided by contracted off-site sorter, if a combination of hauling methods will be performed the Construction Waste Management Plan must reflect and outline this process) and Construction Waste Management Tracking Forms (end of this section).
- B. Construction Waste Management Plan: Submit a Construction Waste Management Plan within Thrity days (30) of date established for commencement of the Work.
- C. Construction Waste Management Plan: Include the following information:
  - 1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
  - 2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s) and the projected cost of disposing all project trash/waste in the landfill(s).
  - 3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse or salvage.
    - a. List each material proposed to be salvaged or reused or recycled.
  - 4. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage and packaging.

5. Transportation: Identify the destination and means of transportation of materials to be recycled.
  - a. On-Site: Materials will be site-separated by each contractor and self-hauled to designated centers. ---\*\**The on-site sorting method is not approved for this project. Only off-site sorting will be approved*\*\*---
  - b. Off-Site: Mixed materials will be collected by a waste hauler that will sort recyclables at their facility. However, On-Site Separation of construction waste from non-construction waste (food/organic/non-construction refuse) is mandatory. Provide on-site a standard trashcan/recycling bin to prevent mixing of non-construction waste. For example - lunch waste from contractors must go in separate trashcan/recycling bins – NOT combined with construction waste. All other standard construction waste will go into single bin that will be sorted off-site by waste hauler. Preliminary OnSite separation of large quantities of individual Material Streams is encouraged and shall be discussed with contracted Waste/Recycle Hauler.
- D. CWM Tracking Forms (end of section): Submit this form only for wastes being hauled independently of the contracted off-site sorting companies dumpsters, at specified intervals with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
  1. Submit updated Tracking Forms with each Application for Progress Payment; failure to submit Forms will delay payment.
  2. Construction Waste Management Tracking Form (end of this section): Submit three copies of the form which will include ticket #'s, container sizes, non-recycled and recycled yardage, Load percentage recycled and notes regarding each load. This will provide a method to track current rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work to date by each contractor or subcontractor.
  3. Landfill disposal: Include the following information:
    - a. Identification of material.
    - b. Amount in cubic yards of trash/waste material from the project disposed of in landfills.
    - c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
    - d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
  4. Incinerator Disposal: Include the following information:
    - a. Identification of material.
    - b. Amount in cubic yards of trash/waste material from the project delivered to incinerators.
    - c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
    - d. Include manifests, weight tickets, receipts and invoices as evidence of quantity and cost.
  5. Recycled Materials: Include the following information for each:

- a. Amount in cubic yards, date removed from the project site and receiving party.
    - b. Transportation cost, amount paid or received for the material and the net total cost or savings of salvage or recycling each material.
    - c. Include manifests, weight tickets, receipts and invoices as evidence of quantity and cost.
    - d. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
  6. Material Reused on Project: Include the following information for each:
    - a. Identification of material and how it was used in the project.
    - b. Amount in cubic yards.
    - c. Include weight tickets as evidence of quantity.
  7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.
- E. Total Waste Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work. Use ALL previous and any new CWM Tracking Forms combined with all Contracted Off-Site Recycle/Waste Hauler Reports to calculate and provide an accurate total of all waste. Contracted off-site sorting company can provide this documentation in a final closeout submittal upon request.
- F. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- G. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt. Provide copies of receipts.
- H. Narrative: For each type of waste diverted from landfills provide a narrative of how it is to be used or diverted.
- I. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices. Provide copies of all documentation.
- J. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- K. LEED Submittal: LEED submittal template for Credit MR 5 completed by Architect/LEED Consultant shall be based on information provided by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

## 1.7 QUALITY ASSURANCE

- A. Waste Management Conference: Conduct conference at Project site with owner representative, architect and representatives of all prime contractors. Review methods and procedures related to waste management including, but not limited to the following:
  - 1. Review and discuss waste management plan including responsibilities of each contractor and waste management coordinator.
  - 2. Review requirements for documenting quantities of each type of waste and its disposition.
  - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
  - 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
  - 5. Review waste management requirements for each trade.
- B. Off Site Sorting Service Suppliers: Companies wishing to supply Off Site Sorting services of construction waste shall have experience in offsite sorting of waste and providing documentation for at least 5 previous LEED projects. Recommended haulers are provided in 3.2, B, 1 of this section.

## 1.8 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification and waste reduction work plan. Indicate quantities by volume (cubic yards).
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Total Waste: All waste generated by each contractor (whether or not it is recycled), if not disposed of in provided off-site sorters containers are to be documented and included in all reports and submitted on the provided CWM Tracking Forms (end of this section). The total waste generated by the project must be calculated. No matter to whom the benefit accrues, ALL waste removed from the site must be documented.
- D. Forms: Prepare Construction Waste Management Plan outlining planned procedures and processes for removal of waste, off-site sorting company contracted, and requirements for submission of CWM Tracking Forms (end of section) for any wastes hauled independently of the contracted off-site sorting companies provided dumpsters.

## PART 2 - PRODUCTS

### 2.1 SORTING METHOD

- A. Off site sorting is the only approved method of waste management for this project.
- B. Where a contractor is diverting waste independent of the off-site recycling container provided, it is the responsibility of that contractor to provide a Waste Management Plan and progress reports and maintain a minimum 75% construction waste recycling value.
- C. Construction waste management items which may be recycled independent of the off-site sorting containers, although not favored or encouraged, include:
  - 1. Sheet metal
  - 2. Metal framing materials
  - 3. Electrical wiring
  - 4. Crushed concrete or concrete masonry units
  - 5. Asphalt
  - 6. Wood
  - 7. Land clearing debris (not included in CWM calculator)
  - 8. Brick
  - 9. Other materials as approved in writing by Construction Manager

### 2.2 RECYCLABLE WASTE

- A. The following products shall be recycled to the greatest extent possible. Construction Waste Recycling shall be 75% percent by volume or greater with a minimum of FIVE (5) or more Waste Streams.
  - 1. Clean dimensional wood, palette wood
  - 2. Plywood, OSB, and particleboard
  - 3. Concrete
  - 4. Brick
  - 5. Concrete Masonry Units (CMU)
  - 6. Asphaltic Concrete
  - 7. Cardboard, paper, packaging
  - 8. Roofing materials
  - 9. Metals
  - 10. Gypsum Wallboard (unpainted) & plaster
  - 11. Paint
  - 12. Glass
  - 13. Plastics
  - 14. Carpet and pad remnants
  - 15. Beverage containers
  - 16. Insulation
  - 17. Electrical conduit



## PART 3 - EXECUTION

## 3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by Owner. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
  - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
  - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  - 2. Comply with Division 1 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.
- D. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.
- E. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner and Architect.
- F. Instruction: Provide on-site instruction of appropriate separation, handling and recycling, salvage, reuse and return methods to be used by all parties at the appropriate stages of the project.
- G. Meetings: Discuss trash/waste management goals, status and issues at project meetings.
- H. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return and trash disposal locations for use by all contractors and installers.
  - 1. At a minimum provide:

- a. Separate area for storage of materials to be reused on-site, such as wood cut-offs for blocking, ground masonry/asphalt for fill, etc... (See 3.1/K for more information)
    - b. For OFF-SITE Sorting - Separate dumpsters for at a minimum, construction waste and non-construction waste. You may choose to provide containers for each category of recyclable.
    - c. Recycling bins at worker lunch area required for both ON-Site and OFF-Site sorting options. Lunch wastes are not to be placed in the contracted off-site sorting companies provided dumpsters.
  2. Provide containers as required.
  3. Provide temporary enclosures around piles of separated materials to be recycled if applicable.
  4. Provide materials for barriers and enclosures that are nonhazardous, recyclable, or reusable to the maximum extent possible; reuse project construction waste materials if possible.
  5. Locate enclosures out of the way of construction traffic.
  6. Provide adequate space for pick-up and delivery and convenience to subcontractors.
  7. If an enclosed area is not provided, clearly lay out and label a specific area on-site.
  8. Keep recycling trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.
- I. Hazardous Wastes: Separate, store and dispose of hazardous wastes according to applicable regulations found in other sections in the specifications.
1. All quantities of wastes designated as hazardous are to be quantified and submitted for appropriate tracking. Hazardous wastes are not included in the projects overall CWM goals and will not negatively impact overall percentages, however, they must be tracked and quantified in cubic yards and submitted to LEED Consultant and Architect.
- J. Recycling: Separate, store, protect and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.
- K. Reuse of Materials On-Site: Set aside, sort and protect separated products in preparation for reuse on-site. For ALL materials reused on-site provide an accurate estimate of the total yardage reused on company letterhead and provide a short description/narrative of what the material was used for (i.e. wood blocking, fill, etc...). Also provide a dated photo to give an accurate depiction of the quantity claimed. Also provide an estimate by the Construction Manager of the materials \$ value if purchased new. This information shall be submitted on the Material Use Confirmation Form found in the division 1 section 018113 "Sustainable Design Requirements".

### 3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Receivers and Processors: Must have experience with a minimum of 5 documentable LEED projects. List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:
  - 1. Mixed Waste:
    - a. Pete and Pete Container Service, 4830 Warner Rd, Cleveland, OH 44125, 216-441-4422
    - b. Rosby Resource Recovery, 54 East Schaaf Road, Brooklyn Hts., OH 44131, 216-661-6102
    - c. Kurtz Bros., Inc., 5603 Canal Road Valley View, OH 44125, 216-641-7000
    - d. For mixed waste services ensure all supplier requirements are met to avoid contamination of loads.
  - 2. Asphalt, Concrete & site clearing debris:
    - a. Asphalt, Concrete and site clearing debris may be separately recycled if documentation is provided showing that at least 75% percent by volume will be diverted from the landfill. All Quantities removed from the project site are to be tracked and submitted for Overall Project Tracking. If self hauling or using a separate Demo Hauler, submit all quantities of waste in Cubic Yards, removed from the project site using the Form at End of Section.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include a list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.
  - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  - 4. Store components off the ground and protect from the weather.
  - 5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor or if utilizing an off-site sorting service contact contracted waste hauler to maintain regular pickups.

END OF SECTION 017419

***TO BE SUBMITTED WITH EACH PAY OUT APPLICATION***

**Contractor/Subcontractor:**

**Scope of Work Narrative:** \_\_\_\_\_

**Contractor/Subcontractor Signature of Agreement:**

[illegible]

**Total Yards of ALL Containers (B):** \_\_\_\_\_ **:Total ALL Recycled Yards (A)**

**Total Recycled Construction Waste** = (Total ALL Recycled Yards (A) / Total Yards of ALL Containers (B)): % (must equal required)

## SECTION 017700 - CLOSEOUT PROCEDURES

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Substantial Completion procedures.
  - 2. Final completion procedures.
  - 3. Warranties.
  - 4. Final cleaning.
  - 5. Repair of the Work.
- B. Related Requirements:
  - 1. Section 013233 "Photographic Documentation" for submitting final completion construction photographic documentation.
  - 2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.

## 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at final completion.

## 1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

## 1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

## 1.6 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
  - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
  - 1. Advise Owner of pending insurance changeover requirements.
  - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  - 3. Complete startup and testing of systems and equipment.
  - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
  - 5. Advise Owner of changeover in utility services.
  - 6. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  - 7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  - 8. Complete final cleaning requirements.
  - 9. Touch up paint and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

#### 1.7 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
  2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. Submit pest-control final inspection report.
  5. Submit final completion photographic documentation.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

#### 1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize items applying to each space by major element, including categories for utilities, equipment, and underground systems.
  2. Include the following information at the top of each page:
    - a. Project name.
    - b. Date.
    - c. Name of Architect and Construction Manager.
    - d. Name of Contractor.
    - e. Page number.
  3. Submit list of incomplete items in the following format:

- a. MS Excel electronic file. Architect, through Construction Manager, will return annotated file.
- b. PDF electronic file. Architect, through Construction Manager, will return annotated file.
- c. Web-based project software upload. Utilize software feature for creating and updating list of incomplete items (punch list).

## 1.9 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
  1. Submit by uploading to web-based project software site.
- E. Warranties in Paper Form:
  1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
  2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
  3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- F. Provide additional copies of each warranty to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.



1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

### PART 3 - EXECUTION

#### 3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
  1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    - c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    - h. Sweep concrete floors broom clean in unoccupied spaces.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

#### 3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair, or remove and replace, defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored,

provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
  - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

## SECTION 017823 - OPERATION AND MAINTENANCE DATA

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory manuals.
  - 2. Emergency manuals.
  - 3. Systems and equipment operation manuals.
  - 4. Systems and equipment maintenance manuals.
  - 5. Product maintenance manuals.
- B. Related Requirements:
  - 1. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

## 1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

## 1.4 CLOSEOUT SUBMITTALS

- A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:

1. Submit by uploading to web-based project software site. Enable reviewer comments on draft submittals.
  2. Submit three paper copies. Architect, through Construction Manager, will return two copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.
- E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

#### 1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
  2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
  - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
  - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

#### 1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  1. Title page.
  2. Table of contents.
  3. Manual contents.
- B. Title Page: Include the following information:
  1. Subject matter included in manual.
  2. Name and address of Project.
  3. Name and address of Owner.
  4. Date of submittal.
  5. Name and contact information for Contractor.
  6. Name and contact information for Construction Manager.
  7. Name and contact information for Architect.
  8. Name and contact information for Commissioning Authority.
  9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
  1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

#### 1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
  - 1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
  - 2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
  - 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

#### 1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  - 2. Performance and design criteria if Contractor has delegated design responsibility.
  - 3. Operating standards.
  - 4. Operating procedures.
  - 5. Operating logs.
  - 6. Wiring diagrams.
  - 7. Control diagrams.
  - 8. Piped system diagrams.
  - 9. Precautions against improper use.
  - 10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

## 1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product,

list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

- D. **Manufacturers' Maintenance Documentation:** Include the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
    - a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
  2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  3. Identification and nomenclature of parts and components.
  4. List of items recommended to be stocked as spare parts.
- E. **Maintenance Procedures:** Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
  2. Troubleshooting guide.
  3. Precautions against improper maintenance.
  4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training video recording, if available.
- F. **Maintenance and Service Schedules:** Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- G. **Spare Parts List and Source Information:** Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- H. **Maintenance Service Contracts:** Include copies of maintenance agreements with name and telephone number of service agent.
- I. **Warranties and Bonds:** Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.



1. Include procedures to follow and required notifications for warranty claims.
- J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  1. Do not use original project record documents as part of maintenance manuals.

#### 1.10 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- D. Product Information: Include the following, as applicable:
  1. Product name and model number.
  2. Manufacturer's name.
  3. Color, pattern, and texture.
  4. Material and chemical composition.
  5. Reordering information for specially manufactured products.
- E. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  1. Inspection procedures.
  2. Types of cleaning agents to be used and methods of cleaning.
  3. List of cleaning agents and methods of cleaning detrimental to product.
  4. Schedule for routine cleaning and maintenance.
  5. Repair instructions.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

## SECTION 017839 - PROJECT RECORD DOCUMENTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
  - 4. Miscellaneous record submittals.
- B. Related Requirements:
  - 1. Section 017300 "Execution" for final property survey.
  - 2. Section 017700 "Closeout Procedures" for general closeout procedures.

## 1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one set(s) of marked-up record prints.
  - 2. Number of Copies: Submit copies of record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit one paper-copy set(s) of marked-up record prints.
      - 2) Submit PDF electronic files of scanned record prints and one of file prints.
      - 3) Submit record digital data files and one set(s) of plots.
      - 4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:
      - 1) Submit three paper-copy set(s) of marked-up record prints.
      - 2) Submit PDF electronic files of scanned record prints and three set(s) of prints.
      - 3) Print each drawing, whether or not changes and additional information were recorded.

## c. Final Submittal:

- 1) Submit one paper-copy set(s) of marked-up record prints.
- 2) Submit record digital data files and three set(s) of record digital data file plots.
- 3) Plot each drawing file, whether or not changes and additional information were recorded.

- B. Record Specifications: Submit one paper copy of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit two paper copies and one annotated PDF electronic file and directory of each submittal.
1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit two paper copies and one annotated PDF electronic file and directory of each submittal.
- E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

## 1.4 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Accurately record information in an acceptable drawing technique.
    - c. Record data as soon as possible after obtaining it.
    - d. Record and check the markup before enclosing concealed installations.
    - e. Cross-reference record prints to corresponding photographic documentation.
  2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.

- g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made by Change Order or Construction Change Directive.
    - k. Changes made following Architect's written orders.
    - l. Details not on the original Contract Drawings.
    - m. Field records for variable and concealed conditions.
    - n. Record information on the Work that is shown only schematically.
  3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Format: Annotated PDF electronic file with comment function enabled.
  3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
  4. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect and Construction Manager.
    - e. Name of Contractor.

## 1.5 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
  5. Note related Change Orders and record Drawings where applicable.

- B. Format: Submit record Specifications as paper copy.

#### 1.6 RECORD PRODUCT DATA

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
  - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  - 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- C. Format: Submit record Product Data as annotated PDF electronic file and two paper copies.
  - 1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

#### 1.7 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file and two paper copies.
  - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

#### 1.8 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store record documents in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's and Construction Manager's reference during normal working hours.

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION 017839

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**SECTION 01 81 13 - SUSTAINABLE DESIGN REQUIREMENTS - LEED V4 & V4.1****PART 1 GENERAL****1.1 SUMMARY**

- A. Section includes general requirements and procedures for compliance with USGBC's LEED prerequisites and credits needed for Project to obtain **LEED Silver** certification based on USGBC's "LEED v4 / v4.1 for Building Design and Construction/Schools" (hereafter, LEED v4 / v4.1 BD+C/SCHOOLS).
  - 1. Specific requirements for LEED are also included in other Sections.
  - 2. Other LEED prerequisites and credits needed to obtain LEED certification depend on product selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
  - 3. A copy of LEED Project checklist is attached at end of this Section for information only.
    - a. Some LEED prerequisites and credits needed to obtain indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
- B. General requirements for sustainable design reporting.
  - 1. This project intends to be constructed using procedures and documentation complying with LEED V4 & V4.1 BD&C-SCHOOLS.

**1.2 ADMINISTRATIVE AND REPORTING REQUIREMENTS**

- A. Respond to questions and requests from Architect about USGBC's LEED prerequisites and credits that are Contractor's responsibility, that depend on product selection or product qualities, or that depend on Contractor's procedures, until USGBC has made its determination on Project's LEED certification application.
- B. A Sustainable Design Consultant has been employed by Architect to review Contractor's required sustainability certification documentation submittals, in addition to review of those submittals by Architect.
- C. ALL Contractors must familiarize themselves with the relevant reporting requirements and provide the necessary information and instruction to all subcontractors and installers.

**1.3 PREINSTALLATION MEETINGS**

- A. Preinstallation Conference: Conduct conference at Project site. Review sustainability goals, municipal and state sustainability requirements, LEED objectives, and action plans for meeting requirements.

## **1.4 RELATED REQUIREMENTS**

- A. Section 01 74 19 – Construction Waste Management and Disposal.
- B. Section 01 81 19 – LEED Indoor Air Quality Management

## **1.5 DEFINITIONS**

- A. BUG Rating Method: The BUG rating of a fixture determines how much light trespass is produced by considering Backlight (B), Uplight (U), and Glare (G).
- B. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001. Certificates to include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
- C. Cradle to Cradle: Product certification assessing material health, material reutilization, renewable energy and carbon management, water stewardship, and social fairness.
- D. Declare: A product transparency disclosure that identifies material source, composition, and end-of-life procedures.
- E. Environmental Product Declaration (EPD): A transparency reporting tool communicating what a product is made of and the environmental impact.
- F. Extended Producer Responsibility: A waste management strategy promoting integration of the life-cycle costs associated with goods into the market price of products. Typically, this involves a take-back or recycling program run by manufacturer at the end of the product's lifespan.
- G. Health Product Declaration (HPD): Disclosure of products contents and associated health information.
- H. Indoor Air Quality (IAQ) Management Plan: Plan developed by the Contractor to provide a healthy indoor environment for workers and building occupants during construction. Plan must meet or exceed the recommendations of SMACNA (OCC) 'IAQ Guidelines for Occupied Buildings Under Construction'. See Section Indoor Air Quality Management for additional IAQ Requirements of the Project.
- I. Living Product Challenge: A product framework for manufacturers examining place, water, energy, health, materials, and equity in production of materials.
- J. Material Cost: The dollar value of materials being provided to the Project, after Contractor mark-ups, including transportation costs, taxes, fees, and shop labor, but EXCLUDING field equipment and field labor costs.
- K. Manufacturer Inventory: A published, complete content inventory for products.
- L. Product Lens: Transparency disclosure highlighting hazard information.
- M. Recycled Content: The recycled content value of a material assembly to be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Postconsumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
  2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Reutilization of materials (such as rework, regrind, or scrap, generated in a process and capable of being reclaimed within the same process that generated it) is excluded.
- N. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site. If only a fraction of a product or material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) contributes to the regional value.
- O. Solar Reflectance Index (SRI): The measure of a constructed surface's ability to stay cool in the sun by reflecting solar radiation and emitting thermal radiation. SRI values range from zero (solid black surface) to 100 (solid white surface). SRI value of a material is calculated according to ASTM E1980 and based on the aged tested values of solar reflectance and thermal emittance.
- P. Vertical Illuminance: Illuminance levels calculated at a point on a vertical service or plane.
- Q. WaterSense Label: The WaterSense label from the EPA specifies water efficiency and performance.
- R. Whole-Building Life-Cycle Assessment: The Life Cycle Assessment (LCA) is a methodology that evaluates the carbon and other environmental impacts of building materials over the projected lifespan of the building.

## 1.6 PRODUCT REPORTING SCOPE

- A. General: Product reporting scope for the purpose of achieving the selected sustainability certification level is limited to those items directly affecting ability to achieve targeted credits. See Part 1.7 Submittals for detailed submittal and documentation requirements. See Project LEED Checklist at end of this section for complete list of all credits anticipated for this Project.
- B. LEED Product Reporting Scope (for MR and EQ Credits): Will include any of the products specified in Divisions 2 through 10, 31, 32, and the following:
1. All paints, coatings, adhesives, and sealants that are used but not specified.
  2. All Flooring and associated adhesives that are used but not specified.
  3. All Composite wood that is permanently installed but not specified; and associated adhesives that are used but not specified.
  4. Plumbing and HVAC pipe insulation and associated adhesives that are used but not specified.
  5. Plumbing fixtures and associated adhesives that are used but not specified.
- C. LEED Product Reporting Scope (for EQ Credit only): May include any of the products in the following product categories, whether specified or not. Refer to Project LEED Checklist for Specific Category Criteria from the list below for credit EQ2 Low Emitting Materials. See project specific credit Checklist for breakdown of required criteria.

1. Interior paints and coatings.
2. Interior adhesives and sealants, including flooring adhesives.
3. Flooring.
4. Composite wood.
5. Ceilings.
6. Walls.
7. Insulation.

## **1.7 REFERENCE STANDARDS**

- A. BIFMA e3 - Furniture Sustainability Standard; Business and Institutional Furniture Manufacturers Association 2019.
- B. C2C (DIR) - C2C Certified Products Registry; Cradle to Cradle Products Innovation Institute Current Edition.
- C. GreenScreen (METH) - GreenScreen for Safer Chemicals Method v1.2; Clean Production Action Current Edition.
- D. HPDC (HPD-OLT) - Create an HPD On-Line Tool; Health Product Declaration Collaborative Current Edition.
- E. ILFI (DEC) - International Living Future Institute 'Declare' Program 2017.
- F. SMACNA (OCC) - IAQ Guidelines for Occupied Buildings Under Construction 2007.
- G. USGBC LEED v4-BD+C - LEED v4 for Building Design and Construction 2019.

## **1.8 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for additional submittal procedures requirements.
- B. General: Submit sustainable design submittals required by other Sections and throughout this Section.
- C. Sustainable design submittals are in addition to other submittals.
  1. If submitted item is identical to that submitted to comply with other requirements, include additional copy with other submittal as a record of compliance with indicated LEED requirements instead of separate sustainable design submittal. Mark additional copy "LEED Submittal."
- D. Project Materials Cost Data: Provide Schedule Of Values (SOV) indicating total cost for Materials & Labor broken out separately, used for Project. Include breakout of costs for the following categories of items:
  1. Complete Project SOV for ALL Divisions
  2. Accurate Material Only Cost (including markup, shipping, tax, etc....as charged to the project) information on all LEED Submittals
- E. Sustainable Design Action Plans: Provide preliminary submittals within 30 days of date established for commencement of the Work , indicating how the following requirements will be met:

1. List of proposed products with EPDs.
  2. List of proposed products complying with requirements for multi-attribute optimization.
  3. List of proposed products complying with requirements for sourcing of raw materials ( i.e. Recycled Content).
  4. List of proposed products complying with requirements for material ingredient reporting.
  5. List of proposed products complying with requirements for material ingredient optimization.
  6. Waste management plan complying with Section 01 74 19 "Construction Waste Management and Disposal."
  7. Construction IAQ management plan.
  8. IAQ Management & Assessment plan.
  9. Complete VOC Logs for EVERY Contractor and Subcontractor. All Divisions, No Exceptions Taken.
- F. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with sustainable design action plans.
1. Submit working BPDO Tracking Spreadsheet/Calculator with current cost/count/percentage of products that meet BPDO requirements for MR2 (EPD's), MR3 (Sourcing of Raw Materials) & MR4 (Material Ingredients).
  2. Submit working Low Emitting Materials Spreadsheet/Calculator with accurate list of every Adhesive, Sealant, Paint, Coating, Wall Panel, Ceiling, Insulation, Flooring and Composite Wood material used or planned for use on the project.
    - a. No Adhesive, Sealant, Paint, Coating, Wall Panel, Ceiling, Insulation, Flooring or Composite Wood material/product may be used on the project without prior LEED Review and Approval.
- G. QUALITY ASSURANCE
- H. LEED Coordinator: Engage an experienced LEED AP or LEED Green Associate to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.
- I. Summary of Key Sustainable Design Documentation Submittals:
1. Plumbing submittal packages showing all Flush and Flow rates AND WaterSense certifications for applicable fixtures. All fixtures to be Low Flow. Toilet & Urinal Flushvalves, Showerheads and
  2. Product Data and certification for WaterSense-labeled water fixtures.
  3. Mechanical submittal packages showing compliance with various LEED criteria.
  4. EPDs complying with LEED requirements.
  5. Documentation for products that comply with LEED requirements for Multi-Attribute Optimization/Embodied Carbon/LCA Optimization.
  6. Sustainability reports for products that comply with LEED requirements for sourcing of raw materials (i.e. Recycled Content).

7. Material ingredient reports for products that comply with LEED requirements for material ingredient reporting.
  8. Documentation for products that comply with LEED requirements for material ingredient optimization.
  9. Documentation complying with Section 01 74 19 "Construction Waste Management and Disposal."
  10. Product data for ALL adhesives and sealants used inside the weatherproofing system, indicating VOC content and laboratory test reports showing compliance with requirements for low-emitting materials.
  11. Product data for paints and coatings used inside the weatherproofing system, indicating VOC content and laboratory test reports showing compliance with requirements for low-emitting materials.
  12. Laboratory test reports for flooring, indicating compliance with requirements for low-emitting materials.
  13. Laboratory test reports for products containing composite wood or agrifiber products or wood glues, indicating compliance with requirements for low-emitting materials.
  14. Acoustical documentation for classroom materials showing an NRC of 0.70 or higher Ceiling Tile, Acoustic Deck, etc. for 100% of Ceiling area in ALL Classroom and Core Learning Spaces. (Applicable on all LEED Schools projects and see project Checklist for credit Enhanced Acoustics for all other projects types)
  15. Documentation for luminaires indicating BUG ratings, lumens emitted, and vertical illuminance values.
  16. Documentation for compliant paving materials indicating the SRI/SR.
  17. Documentation for compliant roofing materials indicating the SRI.
  18. Construction Indoor Air Quality (IAQ) Management:
    - a. Construction IAQ management plan.
    - b. Product data for temporary filtration media.
    - c. Product data for filtration media used during occupancy if applicable.
    - d. Construction Documentation: Fifteen (15) photographs at three different times during construction period, along with a brief description of SMACNA approach employed, documenting implementation of IAQ management measures, including protection of ducts and additional photos of on-site stored or installed absorptive materials.
- J. IAQ Assessment:
1. Signed statement describing the building air flush-out procedures, Total Volume of Outside Air delivered, Trend Logs from BAS confirming O.A., including dates when flush-out was begun and

- completed and statement that filtration media was replaced after flush-out (if Flushout is opted for).
2. Product data for filtration media used during flush-out and occupancy.
  3. Report from testing and inspecting agency indicating results of IAQ testing and documentation showing compliance with IAQ testing procedures and requirements.
- K. Sustainable Design Documentation: The scope of required documentation is specified in this section and in applicable individual specification sections. Refer to Project LEED Checklist for most current LEED anticipated credits.
- L. LEED v4 & 4.1 Prerequisites and Credits - Documentation is required for the following items. Refer to LEED Checklist at end of this Section for complete list of anticipated credits.:
1. Location and Transportation:
    - a. LT6 – Bicycle Facilities
      - 1) Submit cutsheets of Bike Racks complying with LEED Requirements.
    - b. LT8 – Green Vehicles
      - 1) Submit cutsheets of Level 2 Charging Stations complying with LEED Requirements.
  2. Sustainable Sites
    - a. SSp1 – Construction Activity Pollution Prevention
      - 1) Submit SWPPP Inspection Report Samples from multiple timeframes throughout the projects construction. A minimum sampling of 9+ reports are required for review and possible upload to LEED Online to confirm that all requirements have been met.
    - b. SS6 - Light Pollution Reduction
      - 1) Submit B.U.G. Lighting information and cutsheets for ALL Exterior light fixtures installed on the project.
  3. Water Efficiency
    - a. WEp2 & WE2 - Indoor Water Use Reduction
      - 1) Submit cutsheets for all Flush and Flow fixtures installed on the project showing Flush and Flow rates (gpf/gpm) for each fixture AND the required WaterSense certification label for all Toilet / Urinal Flush valves & Showerheads.
    - b. WE4 – Water Metering
      - 1) Submit cutsheets for all Water Sub-Meters installed on the project at locations identified in Mechanical and Plumbing drawings and specs.
  4. Energy and Atmosphere

- a. EA6 – Enhanced Refrigerant Management
  - 1) Submit cutsheets and complete submittal package for all Refrigerant containing equipment (HVAC, Kitchen Equipment, etc.).
- 5. Materials and Resources
  - 1) Use the Building Product Disclosure and Optimization (BPDO) Calculator spreadsheet software available from USGBC to track and document materials and products purchases and use. Use for documentation of USGBC LEED v4-BD+C MR Credits.
  - 2) Provide products and procedures necessary to obtain LEED credits indicated as Contractor's responsibility. Although other Sections may specify some requirements that contribute to these LEED credits, Contractor provides additional materials and procedures necessary to obtain LEED credits indicated.
- b. MRp1 - Storage & Collection of Recyclables
  - 1) Submit cutsheets of all Office Recycle bins, Recycle Stations and Large Scale Recycle Centers provided on the project.
- c. MR2 - Building Product Disclosure and Optimization - Environmental Product Declarations (EPD's). V4.1 Criteria Required.
  - 1) Submit Environmental Product Declarations (EPD's) complying with LEED reporting requirements.
    - a) Submit for at least **FORTY (40)** permanently installed products, sourced from at least **Five (5)** different manufacturers.
      - 1 Product-specific Type III EPDs are valued as one and one-half (1.5) of a product. Industry Wide (Generic) EPDs shall be valued as one (1) product and the Manufacturer must be listed as a Participating Company on the EPD to comply.
  - 2) Submit Environmental Product Declarations (EPD's) complying with LEED reporting requirements for Embodied Carbon / LCA Optimization.
    - a) Submit for at least **FIVE (5)** permanently installed products, sourced from at least **Three (3)** different manufacturers .
- d. MR3 - Building Product Disclosure and Optimization - Sourcing of Raw Materials. V4.1 Criteria Required.
  - 1) Submit Recycled Content data complying with LEED reporting requirements.
    - a) Building materials have recycled content such that postconsumer recycled content plus one-half of pre-consumer recycled content for Project constitutes a **Minimum of 30 Percent (30%) (2 points)** of cost of materials used for the Project.



- 1 Cost of postconsumer recycled content plus one-half of pre-consumer recycled content of an item to be determined by dividing weight of postconsumer recycled content plus one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
  - 2 If product is Extracted, Manufactured & Sourced within 100 miles of Project site, material cost can be doubled in the BPDO Calculator such that the material contributes up to 200% of the product cost.
  - 3 Do not include furniture, plumbing, mechanical and electrical components, and specialty items, such as elevators and equipment, in the calculation.
  - 4 Only products in Divisions 2-10, 31 & 32 are required to submit Recycled Content and Regional Information.
- e. MR4 - Building Product Disclosure and Optimization - Material Ingredients. V4.1 Criteria Required.
- 1) Material Ingredient Reporting: Submit Material Ingredient Reports complying with LEED reporting requirements for BOTH Option 1 and Option 2.
    - a) Option 1 - Submit at least **FORTY (40)** permanently installed products, sourced from at least **Five (5)** different manufacturers that comply with - Material Ingredient Reporting.
    - b) Option 2 - Submit at least **FIVE (5)** permanently installed products, sourced from at least **Three (3)** different manufacturers that comply with - Material Ingredient Optimization:
      - 1 Use the following, as is appropriate to locate documents necessary for Options 1 and 2:
      - 2 GBCI Database: Better Materials - <https://bettermaterials.gbci.org/>
      - 3 GreenScreen - v1.2 Benchmark reports.
      - 4 Manufacturers' inventories of ingredients.
      - 5 HPDC (HPD-OLT) Health Product Declarations.
      - 6 C2C (DIR) Cradle-to-Cradle certifications.
      - 7 C2C (DIR) Cradle-to-Cradle Material Health certifications.
      - 8 ILFI (DEC) 'Declare' product labels.
      - 9 C2C (DIR)Cradle-to-Cradle certifications.
      - 10 Other USGBC approved program.
- f. MR5 - Construction & Demolition Waste Management. V4 Criteria Required.
- 1) See Section 017419 Construction & Demolition Waste Management and Disposal for detailed LEED Requirements.
    - a) Submit a Construction & Demolition Waste Management Plan complying with LEED reporting requirements **Thirty (30)** days prior to Commencement of Work for a **Minimum 75 percent (75%)** Diversion and a **Minimum of 5 Material Streams**.

- b) Submit Monthly reports quantifying diversion of construction and demolition waste showing total Quantities in Cubic Yards of Waste Recycled versus Landfilled/Incinerated.
  - c) Submit a **Final Report** quantifying diversion of construction and demolition waste showing a **Minimum 75 percent (75%+)** total Waste Recycled / Diverted from Landfill/Incineration from a **Minimum of 5 Material Streams**.
- 6. Indoor Environmental Quality
  - a. EQp2 – No Smoking
    - 1) Smoking is not permitted within the building or within 25 ft. of entrances, operable windows, or outdoor-air intakes or on ANY SCHOOL GROUNDS.
  - b. EQ1 - Enhanced IAQ Strategies
    - 1) Submit cutsheets for all Integrated or Roll Out Walk Off Systems installed at building entry points.
    - 2) Submit Filtration Media cutsheets showing MERV 13 minimum at all Outdoor and Return Air filter locations.
  - c. EQ2 - Low-emitting Materials
    - 1) Use the Low-Emitting Materials Calculator spreadsheet software (available from USGBC) to track and document the following categories in compliance with all documentation requirements of USGBC LEED v4 & v4.1 BD+C Credits:
      - a) Interior paints and coatings applied on site:
        - 1 For field applications, 75 percent of paints and coatings meet the VOC emissions evaluation and 100 percent meet the VOC content (g/L) evaluations (table of VOC Content limits below). \*For projects in North America, methylene chloride and perchloroethylene may not be intentionally added in paints or coatings.
        - 2 Submit General Emissions Evaluation for Each unique product used.
        - 3 Submit VOC content data for all wet applied products.
        - 4 Submit Total Volume (gallons/liters/tubes/etc) of each wet applied product used on site.
        - 5 Submit using the “Low Emitting Materials Reporting Form” at end of this Section.
      - b) Interior adhesives and sealants applied on site (including flooring adhesives):
        - 1 For field applications, 75 percent of adhesives and sealants meet the VOC emissions evaluation and 100 percent meet the VOC content (g/L) evaluations (table of VOC Content limits below).
        - 2 Submit General Emissions Evaluation for Each unique product used.
        - 3 Submit VOC content requirements for all wet applied products.

- 4 Submit Total Volume (gallons/liters/tubes/etc) of each wet applied product used on site.
- 5 Submit using the “Low Emitting Materials Reporting Form” at end of this Section.

c) Flooring:

- 1 A minimum of 90 percent of flooring products meet the VOC emissions evaluation or inherently non-emitting sources\* criteria. The flooring product category includes all types of hard and soft surface flooring (carpet, ceramic, vinyl, rubber, engineered, solid wood, laminates), raised flooring, wall base, underlayments, and other floor coverings. Subflooring is excluded, but documented in the Composite Wood category.
- 2 \*Inherently non-emitting sources - Products that are inherently non-emitting sources of VOCs are: stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood) are considered fully compliant without any VOC emissions testing if they do not include integral organic-based surface coatings, binders, or sealants.
- 3 For the purposes of this credit, untreated and unfinished solid wood (not engineered wood) can also be considered non-emitting even though such materials will likely emit some amount of formaldehyde naturally.
- 4 Submit General Emissions Evaluation information for all flooring materials.
- 5 Submit VOC content requirements for all wet applied flooring adhesives.
- 6 Submit Total Volume (gallons/liters/tubes/etc) of each wet applied product used on site.
- 7 Submit using the “Low Emitting Materials Reporting Form” at end of this Section.

d) Composite wood:

- 1 A minimum of 75 percent of all composite wood meet the Formaldehyde emissions evaluation or salvaged and reused materials criteria. Composite wood materials include particleboard, MDF, hardwood veneer plywood, and structural composite wood. Submit composite wood evaluation information for all materials not covered by another product category.
- 2 Submit VOC content requirements for all wet applied adhesives.
- 3 Submit Total Volume (gallons/liters/tubes/etc) of each wet applied product used on site.
- 4 Submit using the “Low Emitting Materials Reporting Form” at end of this Section.

d. EQ3 - Construction Indoor Air Quality Management Plan

- 1) See Section 018119 Indoor Air Quality for detailed LEED Requirements.

- a) Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."
  - b) If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 01 50 00 "Temporary Facilities and Controls," install MERV 8 filter media at each return-air inlet for the air-handling system used during construction. Air Filter Change Logs, Dated Photos, Cutsheets of Temporary and Permanent Filtration Media are required if system is used at any time During Construction and at all times, after system startup, testing and balancing.
  - c) Replace air filters immediately prior to occupancy with new filters specified in Section 23 41 00 "Particulate Air Filtration." MERV 13 Minimum.
  - d) Submit an **Indoor Air Quality Management Plan** complying with all LEED requirements **Thirty (30)** days prior to Commencement of Work.
  - e) Submit Dated Photos showing implemented IAQ Measures complying with LEED Requirements throughout the duration of construction. A minimum of 30 photos from various phases of construction:
    - 1 Photos of Sealed and Protected Ductwork
    - 2 Photos of Protected Mechanical, Electrical and Lighting Equipment
    - 3 Photos of Protected Storage of Dry Absorptive Materials (Drywall, Ceiling Tile, Insulation, Flooring, etc...) Stored On Site
- e. EQ4 - Indoor Air Quality Assessment - V4.1 Criteria Testing Required
- 1) See Section 018119 Indoor Air Quality for additional information.
  - 2) Flush-Out: Project will achieve IAQ Assessment via Air-Quality Testing, below. Flushout is not required, however it is advisable to run a mini-flushout of the building with all systems set to a high percentage up to 100% Outdoor Air and maintain at least 60 deg F and a relative humidity no higher than 60 percent for a minimum of 2-3+ days PRIOR to the arrival of the Air Quality Testing Agency performing the Tests to purge the building of any existing contaminants and increase likelihood of passing all IAQ Test criteria.
  - 3) Air-Quality Testing: CM/CMR will engage testing agency to perform the following:
    - a) Conduct baseline IAQ testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in USGBC's "LEED v4.1 Reference Guide for Building Design and Construction."
    - b) Demonstrate that contaminant maximum concentrations listed in both tables below are not exceeded:

**Table 1. Particulate Matter and Inorganic Gases**

Contaminant (CAS#)	Concentration Limit (µg/m3)	Allowed Test Methods
Carbon monoxide (CO)	9 ppm; no more than 2 ppm above outdoor levels	ISO 4224 EPA Compendium Method IP-3 GB/T 18883-2002 for projects in China  Direct calibrated electrochemical instrument with accuracy of (+/- 3% of reading and resolution of 0.1 ppm).  NDIR CO Sensors with accuracy of 1% of 10 ppm full scale and display resolution of less than 0.1ppm
PM 10	ISO 14644-1:2015, cleanroom class of 8 or lower 50 µg/m3 Healthcare only: 20 µg/m3	Particulate monitoring device with accuracy greater of 5 micrograms/m3 or 20% of reading and resolution (5 min average data) +/- 5 µg/m3
PM 2.5**	12 µg/m3 or 35 µg/m3**	
Ozone	0.07 ppm	Monitoring device with accuracy greater of 5 ppb or 20% of reading and resolution (5 min average data) +/- 5 ppb ISO 13964 ASTM D5149 — 02 EPA designated methods for Ozone

\*\*Projects in areas with high ambient levels of PM2.5 (known EPA nonattainment areas for PM2.5, or local equivalent) must meet the 35 ug/m3 limit, all other projects should meet the 12 ug/m3 limit.

**Table 2. Volatile Organic Compounds**

Contaminant (CAS#)	Concentration Limit (µg/m3)	Allowed Test Methods
Formaldehyde 50-00-0	20 µg/m3 (16 ppb)	ISO 16000-3, 4; EPA TO-11a, EPA comp. IP-6 ASTM D5197-16
Acetaldehyde 75-07-0	140 µg/m3	
Benzene 71-43-2	3 µg/m3	ISO 16000-6 EPA IP-1, EPA TO-17, EPA TO-15 ISO 16017-1, 2; ASTM D6196-15
Hexane (n-) 110-54-3	7000 µg/m3	
Naphthalene 91-20-3	9 µg/m3	
Phenol 108-95-2	200 µg/m3	
Styrene 100-42-5	900 µg/m3	
Tetrachloroethylene 127-18-4	35 µg/m3	
Toluene 108-88-3	300 µg/m3	
Vinyl acetate 108-05-4	200 µg/m3	
Dichlorobenzene (1,4-) 106-46-7	800 µg/m3	

Xylenes-total 108-38-3, 95-47-6, and 106-42-3	700 µg/m <sup>3</sup>	
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- c) For each sampling point where the maximum concentration limits above are exceeded, take corrective action and retest for the non-compliant contaminants until requirements have been met.
- d) Consolidate all Test Results into Final Submission showing compliance with all Contaminants as required per LEED criteria.
- e) Air-sample testing to be conducted as follows:
  - 1 All measurements to be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside airflow rate for the occupied mode throughout the duration of the air testing.
  - 2 Building to have All interior finishes, such as millwork, doors, paint, carpet, acoustic tiles, and movable furnishings (e.g., workstations, partitions), must be installed, and major VOC punch list items must be finished.
  - 3 Number of sampling locations varies depending on the size of building and number of ventilation systems. Testing Agency shall provide a list of locations based on project floorplans, HVAC design and LEED Requirements. For each portion of building served by a separate ventilation system, the number of sampling points to not be less than one per 5000 sq. ft. For large open spaces, one sampling point per 50,000 sq. ft. may be used.
  - 4 Air samples to be collected between 3 and 6 ft. from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.
  - 5 \*\*Air Testing Agency to Confirm all testing criteria, limits and testing location requirements with most current LEED Addenda prior to completing on site tests.
- f. EQp3 Minimum Acoustic Performance (LEED Schools) / EQ9 Acoustic Performance, if applicable, for all other LEED Rating systems (See Project Specific LEED Checklist) -
  - 1) Submit cutsheets for all Ceiling Materials (Acoustic Ceiling Tile, Acoustic Deck, etc.) in all Classrooms and Core Learning Spaces for Schools and in all Regularly Occupied Spaces for all other LEED Rating Systems, showing Noise Reduction Coefficient (NRC) of 0.70 or better for 100% of All Ceiling Area (excluding diffusers, lighting, equipment, etc.).

**PART 2 PRODUCTS - NOT USED****PART 3 EXECUTION****3.1 PROCEDURES**

- A. Submit sustainable design documentation required of Contractor, using procedures defined under Submittals for Information in Section 01 30 00.
- B. Submit extra copy of sustainable design documentation to Architect for transmittal to Sustainable Design Consultant, unless otherwise indicated. LEED Submittals will say “LEED” in the Submittal Description.
- C. Where an item of sustainable design documentation is specified, fill out and submit electronically the appropriate form(s), and/or use appropriate software for submitting Progress Reports.
  - 1. Fill out one line for each different brand name product and each different manufacturer of a lot of commodity products.
  - 2. Where required attachments are specified, attach the documentation. In all cases LEED submittals **MUST** be submitted with Manufacturers Supporting Documentation of Sustainable Criteria.
- D. Each form must be signed by the entity capable of certifying the information.
  - 1. Certification signatures must be made by an officer of the company.
  - 2. For products, certification must be made by the manufacturer not the supplier.
  - 3. For custom fabricated products, certification by the fabricator is acceptable.
- E. Submit the completed forms in accordance with the requirements of Section 01 30 00, as information submittals.
  - 1. Give each form a unique submittal number. Include “LEED” in the name/description.
  - 2. Do not combine sustainable design documentation with shop drawing submittals.
- F. Submit forms applicable to work for which application for payment is being made, either prior to or concurrent with application for payment; payment will not be made until relevant forms have been submitted.
- G. For work covered by multiple applications for payment, the initial submittal of a form is sufficient for subsequent applications unless the nature of the product has changed.

**END OF SECTION 01 81 13**

# Building Product Disclosure and Optimization Reporting Form - LEED V4®

Project:	<b>Massillon – Eastside PK-3</b>	Date:
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Please provide one of this form for each item which is different, for example if "Hollow Metal Doors" are listed and two manufacturers were used, provide this form for each manufacturer of the item with separate material values and other information required below.

Contractor & Contact Phone #: \_\_\_\_\_

Item Supplied (Manuf. & Make/Model): \_\_\_\_\_

Applicable Spec Section #: \_\_\_\_\_

Material Only \$ Cost of Material (as Charged to Project including all markup, tax, freight, etc., everything except onsite labor cost): \$ \_\_\_\_\_

## **MR2 – BPDO Environmental Product Declarations**

Are EPD sheets attached? YES or NO

EPD Program Operator (example: UL, ASTM, Manufacturer, etc.): \_\_\_\_\_

What type of EPD is it (circle one)? -Product Specific- -Industry-Wide Generic- -Product Specific Type III-

Does the EPD address Reductions in Embodied Carbon? YES or NO

## **MR3 – BPDO Sourcing of Raw Materials**

- Recycled Content:
  - » Post-Industrial/Pre-Consumer Recycled content of item: \_\_\_\_\_
  - » Post-Consumer Recycled content of item: \_\_\_\_\_
- Regional Content Multiplier
  - » Location of raw material Extraction & Mileage from Project Site: \_\_\_\_\_
  - » Location of Manufacture & Mileage from Project Site: \_\_\_\_\_
  - » Location of Purchase (including Distribution) & Mileage from Project Site: \_\_\_\_\_

## **MR4 – BPDO Material Ingredients**

Material Ingredient Reporting is attached? YES or NO

Material Ingredient Report Type (circle one)? -Green Screen- -Globally Harmonized System- -Declare-  
-Health Product Declaration- -Cradle to Cradle- -Other-

Contractor Signature: \_\_\_\_\_ Date: \_\_\_\_\_

I verify that the item listed above was used in the project & the information provided is accurate to the best of my knowledge.





# Low Emitting Materials Reporting Form - LEED V4 ©

Project:	<b>Massillon – Eastside PK-3</b>	Date:
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IT IS MANDATORY to provide one of these sheets for EVERY Adhesive, Sealant, Paint, Coating, Flooring, Ceilings, Walls, Thermal & Acoustic Insulation, Composite Wood within your scope of work. All Trades, All Divisions, NO EXCEPTIONS

Contractor & Contact Phone #: \_\_\_\_\_

Item Supplied (Manuf. & Make/Model): \_\_\_\_\_

Applicable Spec Section #: \_\_\_\_\_

Material Only \$ Cost of Material (as Charged to Project including all markup, tax, freight, etc., everything except onsite labor cost): \$ \_\_\_\_\_

## Inherently Non-Emitting

Is the Material Inherently Non-Emitting: Stone, Ceramic, Powder-Coated Metals, Plated or Anodized Metals, Glass, Concrete, Clay, Brick, Unfinished or Untreated Solid Wood Flooring? YES or NO

## General Emissions Evaluation - (ALL Paints & Coatings, Adhesives & Sealants, Flooring, Ceilings, Walls, Thermal & Acoustic Insulation)

Does the product meet the CDPH Standard Method V1.1-2010? YES or NO

CDPH certification backup attached? YES or NO

TVOC as shown on the provided Documentation: -0.5 mg/m3 or less- -between 0.5 and 5.0 mg/m3- -5.0 mg/m3 or more-

## Interior Applied Paints & Coatings (CARB, SCAQMD Rule 1113)

VOC Contents in g/L for Paints & Coatings (attach MSDS/Data sheet): \_\_\_\_\_ g/L

VOC Limit in g/L for the Paints & Coating (see reference table): \_\_\_\_\_ g/L

Does product meet the requirements? YES or NO

Any Intentionally Added Methylene Chloride or Perchloroethylene? YES or NO *If YES product is banned from use.*

For Wet Applied Products – Total Volume (L) of Product Installed: \_\_\_\_\_

## Interior Applied Adhesives & Sealants (SCAQMD 1168)

VOC Contents in g/L for Adhesives & Sealants (attach MSDS/Data sheet): \_\_\_\_\_ g/L

VOC Limit in g/L for the Adhesives & Sealants (see reference tables): \_\_\_\_\_ g/L

Does product meet the requirements? YES or NO

Any Intentionally Added Methylene Chloride or Perchloroethylene? YES or NO *If YES product is banned from use.*

For Wet Applied Products – Total Volume (L) of Product Installed: \_\_\_\_\_

## Flooring

Does the product meet the VOC Emissions Evaluation OR Inherently Non-Emitting Sources exemption? YES or NO

Supporting backup documentation attached to confirm compliance? YES or NO

*\*Subflooring must be included in Composite Wood category.*

*\*Wet Applied Flooring must be included in Paints & Coatings category.*

## Composite Wood

Does the product meet the TSCA or CARB ATCM for Ultra-Low Emitting Formaldehyde resins (ULEF)? YES or NO

Is the product Urea Formaldehyde Free or No Added Urea Formaldehyde (UFF or NAUF)? YES or NO

Supporting backup documentation attached to confirm compliance? YES or NO

Contractor Signature: \_\_\_\_\_ Date: \_\_\_\_\_

I verify that the item listed above was used in the project & the information provided is accurate to the best of my knowledge.



# Low-Emitting Materials Reference Sheet - LEED V4 / 4.1

Paints & Coatings - Either CARB 2007 'OR' SCAQMD Rule 1113 whichever is more beneficial. Adhesives & Sealants - SCAQMD Rule 1168.

Paints & Coatings	CARB 2007	SCAQMD Rule 1113, Feb 5, 2016
	Max VOC (g/L)	
Basement specialty coatings	400	
Bond breakers	350	350
Colorant - Architectural coatings, excluding IM		50
Colorant - Solvent-based IM		600
Colorant - Waterborne IM		50
Concrete - Curing compounds	350	<del>400</del>
Concrete - Curing compounds - roads/bridges		350
Concrete/Masonry sealers	100	
Concrete surface retarder		50
Driveway sealer	50	50
Dry-fog coatings	150	<del>50</del>
Faux finishing coatings - Clear topcoat	350	<del>400</del>
Faux finishing coatings - Decorative coatings	350	350
Faux finishing coatings - Glazes	350	350
Faux finishing coatings - Japan	350	350
Faux finishing coatings - Trowel applied	350	<del>50</del>
Fire-proofing coatings		150
Fire resistive coatings	350	
Flats	50	50
Floor coatings	100	<del>50</del>
Form release compound	250	<del>400</del>
Graphic arts (sign) coatings	500	<del>200</del>
Industrial Maintenance (IM) coatings	250	<del>400</del>
IM coatings - color indicating safety		480
IM coatings - High temperature IM	420	420
IM coatings - Non-sacrificial anti-graffiti		100
IM coatings - Zinc-rich IM primers	340	100
Low solids coatings	120	120
Magnesite cement coatings	450	450
Mastic coatings/texture	100	100
Metallic pigmented coatings	500	<del>450</del>
Multi-Color coatings	250	250
Non-flat coatings	100	<del>50</del>
Non-flat coatings - High Gloss	150	
Pre-treatment wash primers	420	420
Primers, sealers, and undercoaters	100	100
Reactive penetrating sealers	350	350
Recycled coatings	250	250
Roof coatings	50	50
Roof coatings, aluminum	400	<del>400</del>
Roof coatings, bituminous	50	
Roof primers, bituminous	350	350
Rust preventative coatings	250	<del>400</del>
Sacrificial anti-graffiti coatings		50
Shellac - Clear	730	730
Shellac - Pigmented or Opaque	550	550
Specialty primers, sealers/undercoaters	100	100
Stains	250	<del>400</del>
Stone consolidants	450	450
Swimming pool coatings - Repair	340	340
Swimming pool coatings - Other	340	340
Tile and stone sealers		100
Traffic coatings	100	100
Tub and tile refinish coatings	420	420
Waterproofing membranes	250	
Waterproofing sealers		100
Waterproofing concrete/masonry sealers		100
Wood coatings - varnish	275	275
Wood coatings - sanding sealers	275	275
Wood coatings - lacquer	275	275
Wood conditioners		100
Wood preservatives	350	350

Low-Emitting Materials Reporting Form KEY	
Interior Paints & Coatings	General emissions evaluation and VOC content
Interior Adhesives & Sealants	General emissions evaluation and VOC content
Flooring	General emissions evaluation or Inherently nonemitting
Composite Wood	Composite wood evaluation or Inherently nonemitting
Ceilings, Walls, Thermal & Acoustic Insulation	General emissions evaluation or Inherently nonemitting
Furniture	Furniture evaluation or Inherently nonemitting

Adhesives & Sealants	SCAQMD Rule 1168, Oct 6, 2017
	Max VOC (g/L)
<u>Adhesives for Architectural Applications</u>	
Building envelope membrane adhesive	250
Carpet pad adhesives	50
Ceramic glass, porcelain, & stone tile adhesive	65
Cove base adhesives	50
Dry wall and panel adhesives	50
Multi-purpose construction adhesives	70
Roofing- single ply roof membrane adhesive	250
Roofing- all other roof adhesives	250
Rubber floor adhesives	60
Structural glazing adhesives	100
Structural wood member adhesive	140
Subfloor adhesive	50
VCT and asphalt tile adhesives	50
Wood flooring adhesive	100
All other indoor floor covering adhesives	50
All other outdoor floor covering adhesives	50
<u>Specialty Applications</u>	
Computer diskette manufacturing adhesive	350
Contact adhesive	80
Edge glue adhesive	250
ABS welding cement	325
ABS to PVC transition cement	510
CPVC welding cement	490
PVC welding cement	510
All other plastic cement welding cements	100
Rubber Vulcanization Adhesive	250
Special purpose contact adhesive	250
Thin metal laminating adhesive	780
Tire tread adhesive	100
Top and trim adhesive	250
Waterproof resorcinol glue	170
All other adhesives	250
<u>Substrate Specific Applications</u>	
Metal substrate-specific adhesives	30
Plastic foam substrate-specific adhesives	50
Porous material (except wood) adhesives	50
Wood substrate-specific adhesives	30
Fiberglass substrate-specific adhesives	80
Reinforced plastic composite adhesives	200
<u>Sealants for Architectural Applications</u>	
Clear, paintable, & immediately water-resistant sealant	250
Foam insulation	250
Grout	250
Roadway sealant	250
Non-staining plumbing putty	250
Potable water sealant	250
Roofing - single ply roof membrane sealant	450
Roofing - all other roof sealants	300
All other architectural sealants	50
Marine deck sealant	760
All other sealants	420
<u>Adhesive Primers</u>	
Plastic adhesive primers	550
Pressure sensitive adhesive primers	250
Traffic marking tape adhesive primers	150
Vehicle glass adhesive primers	250
All other adhesive primers	250
<u>Sealant Primers</u>	
Architectural non-porous sealant primer	250
Architectural porous sealant primer	775
Modified bituminous sealant primer	500
Marine deck sealant primer	760
All other sealant primers	750



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## ADHESIVES, SEALANTS, PAINTS & COATINGS LOG – LEED v4/4.1

<b>Project Name:</b> <span style="color: red;"><b>Massillon – Eastside PK-3</b></span>	Note: To aid in the record keeping of adhesives, sealants, paints and coatings used on the job this form is to be filled out and is to include every Adhesive, Sealant, Paint & Coating product used by each contractor. Each contractor and/or sub is required to fill out this form for their work and submit to the LEED Consultant
<b>Contractor/Sub Name &amp; Contact Info:</b>	

Spec Section	Paint, Coating, Adhesive, Sealant Brand	Paint, Coating, Adhesive, Sealant Name	VOC Contents (g/L)	Description of Use (window sealant, flat primer, adhesive, etc)	Volume Used (L)	General Emission Evaluation Attached (Y/N)

As the responsible party I declare that only the adhesives, sealants, paints and coatings listed above were used on this project by my subs and/or employees. I further certify that all adhesives, sealants, paints and coatings were submitted to the architect for approval and were approved as LEED Compliant prior to installation in the project building. Product data or MSDS sheets for each adhesive, sealant, paint and coating are attached to this form.

Name (printed) \_\_\_\_\_

Signature \_\_\_\_\_



## ACCESSORY MATERIAL VOC CONTENT CERTIFICATION FORM

Project Name: **Massillon – Eastside PK-3**

### 1.1 Use of This Form:

- A. Because installers are allowed and directed to choose accessory materials suitable for the applicable installation, there is a possibility that such accessory materials might contain VOC contents in excess of that permitted, especially where such materials have not been explicitly specified.
- B. Contractor is required to obtain and submit this form from each installer of work on this project.
- C. For each product category listed, circle the correct words in brackets: either [HAS] or [HAS NOT].
- D. If any of these accessory materials has been used, attach to this form product data and MSDS sheet for each such product FOR APPROVAL PRIOR TO USE.

### 1.2 VOC content restrictions are specified in Section 01 81 13.

### 1.3 PRODUCT CERTIFICATION

- A. I certify that the installation work of my firm on this project:
  - 1. [HAS] [HAS NOT] required the use of any ADHESIVES.
  - 2. [HAS] [HAS NOT] required the use of any SEALANTS.
  - 3. [HAS] [HAS NOT] required the use of any PAINTS OR COATINGS.
  - 4. [HAS] [HAS NOT] required the use of any COMPOSITE WOOD/AGRIFIBER PRODUCTS.
- B. Product data and MSDS sheets are attached for any line above marked [HAS].

### 1.4 CERTIFIED BY: (Installer/Manufacturer/Supplier Firm)

Firm Name: \_\_\_\_\_

Print Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Contact (Phone / Email): \_\_\_\_\_ (officer of company)

Date: \_\_\_\_\_



# LEED v4 for BD+C: Schools

## Project Checklist

Y ? N

Y	1	Credit	Integrative Process	1
<b>3</b>	<b>0</b>	<b>12</b>	<b>Location and Transportation</b>	<b>15</b>
	0	Credit	LEED for Neighborhood Development Location	15
1		Credit	Sensitive Land Protection	1
	2	Credit	High Priority Site	2
1	4	Credit	Surrounding Density and Diverse Uses	5
	4	Credit	Access to Quality Transit	4
	1	Credit	Bicycle Facilities	1
	1	Credit	Reduced Parking Footprint	1
1		Credit	Green Vehicles	1
<b>3</b>	<b>2</b>	<b>7</b>	<b>Sustainable Sites</b>	<b>12</b>
Y		Prereq	Construction Activity Pollution Prevention	Required
Y		Prereq	Environmental Site Assessment	Required
1		Credit	Site Assessment	1
	2	Credit	Site Development - Protect or Restore Habitat	2
	1	Credit	Open Space	1
	1	2	Rainwater Management	3
	2	Credit	Heat Island Reduction	2
1		Credit	Light Pollution Reduction	1
	1	Credit	Site Master Plan	1
1		Credit	Joint Use of Facilities	1
<b>5</b>	<b>3</b>	<b>4</b>	<b>Water Efficiency</b>	<b>12</b>
Y		Prereq	Outdoor Water Use Reduction	Required
Y		Prereq	Indoor Water Use Reduction	Required
Y		Prereq	Building-Level Water Metering	Required
2		Credit	Outdoor Water Use Reduction	2
2	3	2	Indoor Water Use Reduction	7
	2	Credit	Cooling Tower Water Use	2
1		Credit	Water Metering	1
<b>17</b>	<b>4</b>	<b>10</b>	<b>Energy and Atmosphere</b>	<b>31</b>
Y		Prereq	Fundamental Commissioning and Verification	Required
Y		Prereq	Minimum Energy Performance	Required
Y		Prereq	Building-Level Energy Metering	Required
Y		Prereq	Fundamental Refrigerant Management	Required
5		1	Enhanced Commissioning	6
9	2	5	Optimize Energy Performance	16
	1	Credit	Advanced Energy Metering	1
2		Credit	Demand Response	2
	3	Credit	Renewable Energy Production	3
1		Credit	Enhanced Refrigerant Management	1
	2	Credit	Green Power and Carbon Offsets	2

Project Name: **Massillon Eastside - 1 Paul E Brown Dr SE**

Date: 3/14/2023

<b>8</b>	<b>0</b>	<b>5</b>	<b>Materials and Resources</b>	<b>13</b>
Y		Prereq	Storage and Collection of Recyclables	Required
Y		Prereq	Construction and Demolition Waste Management Planning	Required
	5	Credit	Building Life-Cycle Impact Reduction	5
2		Credit	Building Product Disclosure and Optimization - EPD's	2
2		Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
2		Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2		Credit	Construction and Demolition Waste Management	2
<b>10</b>	<b>0</b>	<b>6</b>	<b>Indoor Environmental Quality</b>	<b>16</b>
Y		Prereq	Minimum Indoor Air Quality Performance	Required
Y		Prereq	Environmental Tobacco Smoke Control	Required
Y		Prereq	Minimum Acoustic Performance	Required
2		Credit	Enhanced Indoor Air Quality Strategies	2
3		Credit	Low-Emitting Materials	3
1		Credit	Construction Indoor Air Quality Management Plan	1
2		Credit	Indoor Air Quality Assessment	2
1		Credit	Thermal Comfort	1
1	1	Credit	Interior Lighting	2
	3	Credit	Daylight	3
	1	Credit	Quality Views	1
	1	Credit	Enhanced Acoustic Performance	1
<b>5</b>	<b>1</b>	<b>0</b>	<b>Innovation</b>	<b>6</b>
4	1	Credit	Innovation	5
1		Credit	LEED Accredited Professional	1
<b>1</b>	<b>2</b>	<b>1</b>	<b>Regional Priority</b> (High Priority, Dense&Diverse, Rain Mgmt, Renewable E, LCA, Enhanced IAQ)	<b>4</b>
	1	Credit	Regional Priority: Rainwater Management??	1
1		Credit	Regional Priority: Enhanced IAQ	1
	1	Credit	Regional Priority: Surrounding Density & Diverse Uses - Infill/Adjacent	1
	1	Credit	Regional Priority:	1

**52** **13** **45** **TOTALS** Possible Points: **110**

**Certified:** 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

**SECTION 018119 - INDOOR AIR QUALITY****PART 1 GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 00 and Division 01 Specification Sections, apply to this section.
- B. Indoor Air Quality Management required throughout this section and during all work must comply with LEED V4/V4.1 at all times.

**1.2 SECTION INCLUDES**

- A. Construction procedures to promote adequate indoor air quality after construction.

**1.3 PROJECT GOALS**

- A. See Section 018113 – Sustainable Design Requirements, for overall project goals relating to LEED, environmental and energy criteria.
- B. Dust and Airborne Particulates: Prevent deposition of dust and other particulates in HVAC ducts and equipment, other mechanical equipment and lighting.
  - 1. Cleaning of any newly installed ductwork is not contemplated under this Contract and if required is the responsibility of the HVAC contractor. All new ductwork shall be wrapped and protected as outlined in part 3 below. Determination and identification of ductwork contamination requiring cleaning will be by Owner, Architect or Commissioning Agent.
- C. Airborne Contaminants: Procedures and products have been specified to minimize indoor air pollutants.
  - 1. Furnish products meeting the specifications and VOC content limits outlined in 018113.
  - 2. Avoid construction practices that could result in contamination of installed products leading to indoor air pollution.
- D. Ventilation: HVAC system has been designed to achieve the minimum requirements for ventilation specified in ASHRAE 62.1.

**1.4 REFERENCES**

- A. Building Air Quality: A Guide for Building Owners & Facility Managers; EPA 1991
- B. ASHRAE Std 52.2 - Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size; 2007.
- C. ASHRAE Std 62.1 - Ventilation For Acceptable Indoor Air Quality; 2007.
- D. ASHRAE Std 129 - Measuring Air-Change Effectiveness; 1997 (Reaffirmed 2002).
- E. ASTM E 779 - Standard Test Method for Determining Air Leakage Rate by Fan Pressurization; 2003.

- F. CA (EESR) - 2005 California Energy Efficiency Standards Residential Alternative Calculation Method (ACM) Approval Manual, Chapter 7;  
[www.energy.ca.gov/title24/2005standards/residential\\_acm](http://www.energy.ca.gov/title24/2005standards/residential_acm).
- G. SMACNA (OCC) - IAQ Guideline for Occupied Buildings Under Construction; 1995.

## 1.5 DEFINITIONS

- A. Absorptive Materials: Gypsum board, acoustical ceiling tile and panels, carpet and carpet tile, fabrics, fibrous insulation, and other similar products.
- B. Contaminants: Gases, vapors, regulated pollutants, airborne mold and mildew, and the like, as specified.
- C. Particulates: Dust, dirt, and other airborne solid matter.
- D. Wet Work: Concrete, plaster, coatings, and other products that emit water vapor or volatile organic compounds during installation, drying, or curing.

## 1.6 SUBMITTALS

- A. See Division 1 Sections - Administrative Requirements and/or Submittal Requirements, for submittal procedures.
- B. LEED Submittals: Submit all submittals required in this section in accordance with procedures specified in Division 1 Sections Administrative Requirements and/or Submittal Requirements.
- C. Indoor Air Quality Management Plan: Describe in detail, measures to be taken to promote adequate indoor air quality upon completion; must meet or exceed SMACNA IAQ Guidelines for Occupied Buildings Under Construction, 2<sup>nd</sup> edition 2007, ANSI/SMACNA 008-2008, Chapter 3.
  - 1. IAQ Management Plan has been provided and it is the responsibility of each contractor to read, understand, sign and return a copy of the plan to the LEED Consultant and Construction Manager for their records.
  - 2. The plan identifies potential sources of odor and dust.
  - 3. The plan identifies construction activities likely to produce odor or dust.
  - 4. The plan identifies areas of project potentially affected, especially occupied areas.
  - 5. The plan evaluates potential problems by severity and describe methods of control.
  - 6. The plan describes construction ventilation to be provided, including type and duration of ventilation, use of permanent HVAC systems, types of filters and schedule for replacement of filters.
  - 7. The plan describes cleaning and dust control procedures.
  - 8. The plan describes coordination with commissioning procedures.
- D. Filter Information: Provide model number and manufacturer for each filter along with list of locations of use and dates of all filter installation, changes, and removal. Take dated photos of filter changes to show LEED compliance. Utilize the "HVAC & Grille Filter Change Log" found at the end of this section to track and keep record of all filter changes and photos taken to show compliance.

## 1.7 QUALITY ASSURANCE

- A. HVAC Contractor is responsible for the cost of cleaning all ductwork should they become contaminated due to negligence or improper work when wrapping and protecting inlets, outlets and/or plenum spaces during construction. General Contractor shall not reimburse or compensate HVAC contractor for any amount of the cost of Duct Cleaning if required.
- B. Owner, Architect, Commissioning Agent and/or General Contractor will perform an inspection to determine if duct cleaning is required at the cost of the HVAC contractor. To avoid incurring this cost all ducts, inlets, outlets and plenum spaces should be kept clean and sealed at ALL times.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Low VOC Materials: See other sections (018113) for specific requirements for materials with low VOC content.
- B. Auxiliary Air Filters:
  - a. MERV 13 Permanent Filters = minimum required at all units, supply and outdoor air intakes.
  - b. MERV 8 Filters = minimum required at all return air grilles when system is used during construction. If system is not used during construction all return air grilles are to be covered and protected with plastic or with a MERV 8 filter at all times.

## PART 3 EXECUTIONS

### 3.1 CONSTRUCTION PROCEDURES

- A. Prevent the absorption of moisture and humidity by absorptive materials by:
  - 1. Sequencing the delivery of such materials so that they are not present in the building until wet work is completed and dry.
  - 2. Delivery and storage of such materials in fully sealed moisture-impermeable packaging.
  - 3. Provide sufficient ventilation for drying within reasonable time frame.
  - 4. Store absorptive materials on pallets or other via other methods to prevent moisture from the floor from migrating into the material.
  - 5. Provide Dated Photos of the stored and protected Dry Absorptive Materials to document requirements per LEED V4/V4.1.
- B. Begin construction ventilation when building is substantially enclosed.
- C. New HVAC equipment and ductwork may NOT be used for ventilation during construction. Where outlined in other sections that HVAC equipment can NOT be used the following procedure applies. Coordinate use of all HVAC equipment with Owner.
  - 1. Provide temporary ventilation equivalent to 1.5 air changes per hour, minimum.
  - 2. Exhaust directly to outside, filter as required.
  - 3. Seal new HVAC air inlets and outlets IMMEDIATELY after duct installation or prior to their arrival onsite whichever is easier.
    - a. Seal ends of ducts with plastic sheathing completely as to not allow contaminants to



- enter the system.
- b. Ducts and/or grilles are to remain sealed until owner grants permission for system to be used.
- 4. If owner allows HVAC system to be used for any phase of construction up to final cleaning, each return air grille is to be provided with a MERV 8 filter, to prevent contamination of system.
- 5. Return grilles shall be provided with continuous protection with duct seals or MERV 8 filters. Return ducts shall in no case, be left unprotected.
- 6. Dated photos are required to document installation of During Construction filters. Include all model and serial numbers of new filters on the provided "HVAC & Grille Filter Change Log" provided at end of this section, that will be submitted upon completion. A Filter Change Log is Required showing dates of filter changes during construction if system is to be used during construction.
- 7. All duct marking is to be with wax pencils or chalk. Spray paint, lacquers and varnishes are NOT to be used.
- D. Do not store construction materials or waste in mechanical or electrical rooms.
- E. Prior to use of return air ductwork without intake filters, clean up and remove dust and debris generated by construction activities.
  - 1. Inspect duct intakes, return air grilles, and terminal units for dust & debris.
  - 2. Clean plenum spaces, including top sides of lay-in ceilings, outsides of ducts, tops of pipes and conduit.
  - 3. Clean tops of doors and frames.
  - 4. Clean mechanical and electrical rooms, including tops of pipes, ducts, and conduit, equipment, and supports.
  - 5. Clean return plenums of air handling units.
  - 6. Remove intake filters last, after all cleaning is complete.
  - 7. Dated photos are required to document cleaned rooms and changes of old filters to new filters. Include all model and serial numbers of new filters on the provided "HVAC & Grille Filter Change Log" provided at the end of this section, that will be submitted upon completion.
- F. Do not perform any dust generating construction work after starting use of return air ducts without MERV 8 filters at each return and MERV 8 or better filters at each unit.
- G. Use other relevant recommendations of SMACNA IAQ Guidelines for Occupied Buildings Under Construction for avoiding unnecessary contamination due to construction procedures.
- H. HVAC Contractor is responsible for the cost of cleaning all ductwork should they become contaminated due to negligence or improper work when wrapping and protecting inlets, outlets and plenum spaces during construction. General Contractor shall not reimburse or compensate HVAC contractor for any amount of the cost of Duct Cleaning if required.
- I. Owner, Architect, Commissioning Agent and/or General Contractor will perform an inspection to determine if duct cleaning is required at the cost of the HVAC contractor. To avoid incurring this cost all ducts, inlets, outlets and plenum spaces should be kept clean and sealed at ALL times.
- J. Project will achieve EQ4 Indoor Air Quality Assessment via Air Quality Testing. See Section 018113 for complete requirements of Air Testing that shall be provided on the project.
- K. See Project LEED Checklist in section 018113 for complete list of all credits anticipated for the Project.

END OF SECTION



## HVAC & Grille Filter Change LOG

Project Name: **Massillon – Eastside PK-3**

HVAC Contractor Name: \_\_\_\_\_

Note: To aid in the record keeping of filter changes during the course of the job. This form is to be filled out and shall include every filter change performed by the Mechanical Contractor. ALL filters must be changed after the building substantial completion and immediately prior to occupancy.

<b><i>Date Installed or Changed</i></b>	<b><i>Filter Manufacturer</i></b>	<b><i>Model #</i></b>	<b><i>MERV Rating</i></b>	<b><i>Location of Installed Filter</i></b>	<b><i>Was Photo Taken</i></b> <small><i>(a minimum of 30+ dated photos must be taken and submitted over the course of the project)</i></small>

As the responsible party I declare that all ductwork, grilles and returns were adequately protected and/or had filters installed before any of the mechanical systems were used and immediately after any ductwork was installed. I further certify that ALL filters were changed as is required per the IAQ Requirements of the project (see specifications). I further certify that all filter information provided regarding the manufacturer, model #, MERV rating and location of install provided above is accurate.

Name (printed)

Signature

Date

## SECTION 019113 - COMMISSIONING REQUIREMENTS

## PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

## 1.2 SUMMARY

- A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components.
- B. Related Sections:
1. Division 07 Section "Commissioning of Thermal and Moisture Protection Systems" for commissioning process activities for the building envelope, systems, equipment and components.
  2. Division 22 Section "Commissioning of Plumbing Systems" for commissioning process activities for plumbing systems, equipment, and components.
  3. Division 23 Section "Commissioning of Mechanical Systems" for commissioning process activities for HVAC&R systems, assemblies, equipment, and components.
  4. Division 26 Section "Commissioning of Electrical Systems" for commissioning process activities for electrical systems, equipment, and components.

## 1.3 DEFINITIONS

- A. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- B. CxA: Commissioning Authority.
- C. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

## 1.4 SYSTEMS TO BE COMMISSIONED

- A. Division 07 – The following building envelope systems will be commissioned in this project.
- Roofing
  - Wall structures i.e. masonry, metal panels, etc.
  - Mock-up review
  - Envelope water and air tightness
  - Door, window and louver installation

- Thermographic Imaging if specified
- Building pressurization test if specified

B. Division 22 - The following plumbing systems will be commissioned in this project.

- Domestic Hot Water System

C. Division 23 - The following mechanical system will be commissioned in this project.

- Hydronic Piping (Chilled and Heating)
- Pumps
- Rooftop Air-handling Units (RTU)
- Dedicated Outside Air-handling Units
- Split Systems
- Cabinet Unit Heaters
- Unit Heaters
- Testing, Adjusting and Balancing work
- VAV Units
- Fans (Exhaust and Supply)
- Building Automation System (controlled devices, control loops and system integration)

D. Division 26 - The following electrical system will be commissioned in this project.

- The electrical system down to the panel level
- Thermographic imaging of power panels
- Lighting Controls / Occupancy Sensors
- Emergency Generator
- Automatic Transfer Switch

## 1.5 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of each Contractor, including Project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
- B. Members Appointed by Owner:
1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process.
    - a. The CxA is: The Brewer-Garrett Company
  2. Representatives of the facility user and operation and maintenance personnel.
  3. Architect and engineering design professionals.

## 1.6 OWNER'S RESPONSIBILITIES

- A. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

## 1.7 CxA'S RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Provide commissioning plan.
- C. Convene commissioning team meetings.
- D. Provide project-specific pre-functional checklists and commissioning functional test procedures for actual HVAC&R systems, assemblies, equipment, and components to be furnished and installed as part of the construction contract and fall within the CxA's scope of work.
- E. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 10 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the owner's project requirements. When a random sample does not meet the requirement, the CxA will report the failure in the Issues Log.
- F. Prepare and maintain the Issues Log.
- G. Witness systems, assemblies, equipment, and component startup.
- H. Verify testing, adjusting, and balancing of work is complete.
- I. Direct and witness the functional testing of systems, assemblies, equipment, and components to insure proper functioning prior to owner occupancy.
- J. Compile test data, inspection reports, and certificates; include them in the systems manual and commissioning process report.

## 1.8 CONTRACTORS' RESPONSIBILITIES

- A. The purpose of this section is to specify the contractors' and their sub-contractors' responsibilities in the commissioning process.
- B. Commissioning requires the participation of CMR OR HIS SUBCONTRACTOR to ensure that all systems are operating in a manner consistent with the Contract Documents. CMR OR HIS SUBCONTRACTOR shall be familiar with all parts of the commissioning plan issued by the CxA and shall execute all commissioning responsibilities assigned to them in the Contract Documents.
- C. All Contractors. The general commissioning responsibilities applicable to each of the contractors are as follows (all references apply to commissioned equipment only):
  - 1. Construction and Acceptance Phases

- a. Include and itemize the cost of commissioning in the contract price.
- b. Attend a commissioning kick-off meeting and other meetings necessary to facilitate the Cx process.
- c. Provide a copy of the O&M manuals, cut sheets, and shop drawing submittals of commissioned equipment, through normal channels, to the CxA for review.
- d. Provide additional requested documentation, prior to normal O&M manual submittals, to the CxA for development of start-up and functional testing procedures.
  - 1) Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting, emergency, and maintenance procedures, full details of any owner-contracted tests, equipment performance diagrams, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation, start-up and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Agent.
- e. Contractors shall assist (along with the design engineers) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
- f. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures and the pre-functional checklists from the CxA for all commissioned equipment. Submit to CxA for review and approval prior to startup.
- g. Perform, complete, and clearly document all full start-up and initial checkout plans, providing a typed copy electronically to the CxA. These documents should be returned to the CxA within two weeks of the start-up of the equipment.
- h. Review, comment, and accept the specific functional performance test procedures provided by the CxA; samples of which are included in Part 4. CMR OR HIS SUBCONTRACTOR shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during the tests.
- i. Address current A/E punch list items before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.
- j. Provide skilled technicians to execute starting of equipment and to execute the functional performance tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
- k. Respond to Commissioning Issues Log items that are relevant to your scope of work within one week of notification.
- l. Correct deficiencies (differences between specified and observed performance) as interpreted by the CxA, CMR, and A/E and retest the equipment.
- m. Provide information requested by the CxA for final commissioning documentation.
- n. Provide measuring instruments to record test data, and provide data acquisition equipment to record data for the complete range of testing for the required test period.
- o. Provide documentation requested by the CxA regarding owner training and adjust training as directed by the CxA to best meet the needs of the owner's operating personnel. Training to use expert qualified personnel, as specified.

- p. Coordinate with equipment manufacturers to determine specific requirements to maintain the validity of the warranty.
  - 2. Warranty Period
    - a. Execute seasonal or deferred functional performance testing, witnessed by the CxA.
    - b. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.
- D. General Trades Contractor. The responsibilities of the General Trades contractor, during construction and acceptance phases in addition to those listed in (C) are:
  - 1. Include Commissioning in preinstall meetings for Fluid Applied Membrane, Roofing, and Wall mock-up.
  - 2. Conduct water infiltration testing if contract requires.
- E. Mechanical Contractor. The responsibilities of the HVAC mechanical contractor, during construction and acceptance phases in addition to those listed in (C) are:
  - 1. Provide startup for all HVAC equipment, including the building automation control system.
  - 2. Assist with the TAB contractor and CxA by:
    - a. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.
    - b. Providing temperature and pressure taps according to the Construction Documents for TAB and commissioning testing.
  - 3. List and clearly identify on the as-built drawings the locations of all air-flow stations.
  - 4. Prepare a preliminary schedule for pipe system testing, flushing and cleaning, equipment start-up and TAB start and completion for use by the CxA. Update the schedule as appropriate.
  - 5. Notify the CMR or CxA depending on protocol, when pipe system testing, flushing, cleaning, startup of each piece of equipment and TAB will occur. Be responsible to notify the CMR or CxA, ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the CxA has the scheduling information needed to efficiently execute the commissioning process.
- F. Controls Contractor. The commissioning responsibilities of the controls contractor, during construction and acceptance phases in addition to those listed in (C) are:
  - 1. Sequences of Operation Submittals. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications. They shall include:
    - a. An overview narrative of the system (1 or 2 paragraphs) generally describing its purpose, components and function.
    - b. All interactions and interlocks with other systems.



- c. Detailed delineation of control between any packaged controls and the building automation system, listing what points the BAS monitors only and what BAS points are control points and are adjustable.
  - d. Written sequences of control for packaged controlled equipment. (Equipment manufacturers' stock sequences may be included, but will generally require additional narrative).
  - e. Start-up sequences.
  - f. Warm-up mode sequences.
  - g. Normal operating mode sequences.
  - h. Unoccupied mode sequences.
  - i. Shutdown sequences.
  - j. Capacity control sequences and equipment staging.
  - k. Temperature and pressure control: setbacks, setups, resets, etc.
  - l. Detailed sequences for all control strategies, e.g., economizer control, optimum start/stop, staging, optimization, demand limiting, etc.
  - m. Effects of power or equipment failure with all standby component functions.
  - n. Sequences for all alarms and emergency shut downs.
  - o. Seasonal operational differences and recommendations.
  - p. Initial and recommended values for all adjustable settings, setpoints and parameters that are typically set or adjusted by operating staff; and any other control settings or fixed values, delays, etc. that will be useful during testing and operating the equipment.
  - q. Schedules, if known.
  - r. To facilitate referencing in testing procedures, all sequences shall be written in small statements, each with a number for reference. For a given system, numbers will not repeat for different sequence sections, unless the sections are numbered.
2. Control Drawings Submittal
- a. The control drawings shall have a key to all abbreviations.
  - b. The control drawings shall contain graphic schematic depictions of the systems and each component.
  - c. The schematics will include the system and component layout of any equipment that the control system monitors, enables or controls, even if the equipment is primarily controlled by packaged or integral controls.
  - d. Provide a full points list with at least the following included for each point:
    - 1) Controlled system
    - 2) Point abbreviation
    - 3) Point description
    - 4) Display unit
    - 5) Control point or setpoint (Yes / No)
    - 6) Monitoring point (Yes / No)
    - 7) Intermediate point (Yes / No)
    - 8) Calculated point (Yes / No)

**Key:**

Point Description:	DB temp, airflow, etc.
Control or Setpoint:	Point that controls equipment and can have its setpoint changed (OSA, SAT, etc.)
Intermediate Point:	Point whose value is used to make a calculation which then controls equipment (space temperatures that are averaged to a virtual point to control reset).

Monitoring Point:	Point that does not control or contribute to the control of equipment, but is used for operation, maintenance, or performance verification.
Calculated Point:	“Virtual” point generated from calculations of other point values.

3. The Controls Contractor shall keep the CxA informed of all changes to this list during programming and setup.
4. An updated as-built version of the control drawings and sequences of operation shall be included in the final controls O&M manual submittal.
5. Assist and cooperate with the TAB contractor in the following manner:
  - Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).
    - a. For a given area, have all required pre-functional checklists, calibrations, startup and selected functional tests of the system completed and approved by the CxA prior to TAB.
    - b. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.
6. Assist and cooperate with the CxA in the following manner:
  - a. Using a skilled technician who is familiar with this building, execute the functional testing of the controls system.
  - b. Assist in the functional testing of all equipment specified as part of the commissioning scope. Provide two-way radios during the testing.
  - c. Execute all control system trend logs specified.
7. The controls contractor shall prepare a written plan indicating in a step-by-step manner, the procedures that will be followed to test, checkout and adjust the control system prior to functional performance testing. At minimum, the plan shall include for each type of equipment controlled by the automatic controls:
  - a. System name.
  - b. List of devices.
  - c. Step-by-step procedures for testing each controller after installation, including:
    - 1) Process of verifying proper hardware and wiring installation.
    - 2) Process of downloading programs to local controllers and verifying that they are addressed correctly.
    - 3) Process of performing operational checks of each controlled component.
    - 4) Plan and process for calibrating valve and damper actuators and all sensors.
    - 5) A description of the expected field adjustments for transmitters, controllers and control actuators should control responses fall outside of expected values.
  - d. A copy of the log and field checkout sheets that will document the process. This log must include a place for initial and final read values during calibration of each

- point and clearly indicate when a sensor or controller has “passed” and is operating within the contract parameters.
  - e. A description of the instrumentation required for testing.
  - f. Indicate what tests on what systems should be completed prior to TAB using the control system for TAB work. Coordinate with the CxA and TAB contractor for this determination.
8. Provide a signed and dated certification to the CxA and CMR upon completion of the checkout of each controlled device, equipment and system prior to functional testing for each piece of equipment or system, that all system programming is complete as to all respects of the Contract Documents, except functional testing requirements.
  9. Beyond the control points necessary to execute all documented control sequences, provide monitoring, control and virtual points as specified in the commissioning plan.
  10. List and clearly identify on the as-built duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

G. TAB Contractor. The duties of the TAB contractor, in addition to those listed in (C) are:

1. Six weeks prior to starting TAB, submit to the CMR the qualifications of the site technician for the project, including the name of the contractors and facility managers of recent projects the technician on which was lead.
2. Submit the outline of the TAB plan and approach for each system and component to the CxA, CMR and the controls contractor six weeks prior to starting the TAB. This plan will be developed after the TAB has some familiarity with the control system.
3. The submitted plan will include:
  - a. Certification that the TAB contractor has reviewed the construction documents and the systems with the design engineers and contractors to sufficiently understand the design intent for each system.
  - b. An explanation of the intended use of the building control system. The controls contractor will comment on feasibility of the plan.
  - c. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
  - d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
  - e. Final test report forms to be used.
  - f. Detailed step-by-step procedures for TAB work for each system and issue: terminal flow calibration (for each terminal type), diffuser proportioning, branch / submain proportioning, total flow calculations, rechecking, diversity issues, expected problems and solutions, etc. Criteria for using air flow straighteners or relocating flow stations and sensors will be discussed. Provide the analogous explanations for the water side.
  - g. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
  - h. Details of how *total* flow will be determined (Air: sum of terminal flows via BAS calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations. Water: pump curves, circuit setter, flow station, ultrasonic, etc.).
  - i. The identification and types of measurement instruments to be used and their most recent calibration date.

- j. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and provide methods to verify this.
  - k. Confirmation that TAB understands the outside air ventilation criteria under all conditions.
  - l. Details of whether and how minimum outside air cfm will be verified and set, and for what level (total building, zone, etc.).
  - m. Details of how building static and exhaust fan / relief damper capacity will be checked.
  - n. Proposed selection points for sound measurements and sound measurement methods.
  - o. Details of methods for making any specified coil or other system plant capacity measurements.
  - p. Details of any TAB work to be done in phases (by floor, etc.), or of areas to be built out later.
  - q. Details regarding specified deferred or seasonal TAB work.
  - r. Details of any specified false loading of systems to complete TAB work.
  - s. Details of all exhaust fan balancing and capacity verifications, including any required room pressure differentials.
  - t. Details of any required interstitial cavity differential pressure measurements and calculations.
  - u. Plan for hand-written field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
  - v. Plan for formal progress reports (scope and frequency).
  - w. Plan for formal deficiency reports (scope, frequency and distribution).
- 4. A running log of events and issues shall be kept by the TAB field technicians. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to the CxA and CMR least twice a week.
  - 5. Communicate in writing to the controls contractor all setpoint and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.
  - 6. Provide a draft TAB report within two weeks of completion. A copy will be provided to the CxA. The report will contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations by AABC, NEBB or ASHRAE Standard 111.
  - 7. Provide the CxA with any requested data, gathered, but not shown on the draft reports.
  - 8. Provide a final TAB report for the CxA with details, as in the draft.
  - 9. Conduct functional performance tests and checks on the original TAB as specified for TAB in the commissioning plan.
- H. Plumbing Contractor. The responsibilities of the plumbing contractor, during construction and acceptance phases in addition to those listed in (C) are:
- 1. Provide pressure test reports for all piping systems to be commissioned.
  - 2. Provide certificate for piping used in medical gas piping systems.
- I. Electrical Contractor. The responsibilities of the electrical contractor, during construction and acceptance phases in addition to those listed in (C) are:

1. Provide equipment test reports for all electrical systems to be commissioned.
2. Conduct Thermographic imaging of the power panels in one of two ways:
  - a. Conduct with in-house qualified resources or
  - b. Contract with a qualified third party company
3. Assist commissioning with the checkout of the lighting control system.
4. Include commissioning in the standby power Generator in the initial startup and in the final full load test.
5. Include commissioning in the renewable energy systems initial startup and in the final full load test.

#### 1.9 COMMISSIONING DOCUMENTATION

- A. Contractor to provide the following information to the CxA for inclusion in the Systems Manual:

1. A plan for delivery and review of submittals, O&M manuals, and other documents and reports.
2. Detailed manufacturer installation and start-up, operating, troubleshooting, emergency, and maintenance procedures, fan and pump curves, full factory testing reports, if any, and full warranty information, including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the Commissioning Authority.
3. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase.
4. Process and schedule for completing pre-functional checklists and manufacturer's pre-start and startup checklists for systems, assemblies, equipment, and components to be verified and tested.
5. Certificate of completion certifying that installation, pre-start checks, and startup procedures have been completed.
6. Certificate of readiness certifying that systems, subsystems, equipment, and associated controls are ready for testing.
7. Test and inspection reports and certificates.
8. Corrective action documents.
9. Verification of testing, adjusting, and balancing reports.

#### 1.10 SUBMITTALS

- A. Certificates of readiness.
- B. Certificates of completion of installation, prestart, and startup activities.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

## 3.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the CMR OR HIS SUBCONTRACTOR contractor for the equipment being tested. For example, the HVAC contractor shall ultimately be responsible for all standard testing equipment for the HVAC system, controls system and TAB work.
- B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, shall be included in the base bid price and left on site, except for stand-alone data logging equipment that may be used by the CxA.
- C. Data logging equipment and software required to test equipment will be provided by the CxA, but shall not become the property of the Owner.
- D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances noted elsewhere in the specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

## 3.2 START-UP, PREFUNCTIONAL CHECKLISTS AND INITIAL CHECKOUT

- A. The following procedures apply to all equipment to be commissioned, according to Section 1.4.
- B. Pre-functional checklists are important to ensure that the equipment and systems are hooked up and operational. It ensures that functional performance testing (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full pre-functional checkout. No sampling strategies are used. The pre-functional testing for a given system must be successfully completed prior to formal functional performance testing of equipment or subsystems of the given system. Representative test formats and examples are found in the Part 4.
- C. Start-up and Initial Checkout Plan
  - 1. The CxA shall guide the commissioning team members responsible for startup of any equipment in developing detailed start-up plans for all equipment. The primary role of

the CxA in this process is to ensure that there is written documentation that each of the manufacturer-recommended procedures have been completed. Parties responsible for pre-functional checklists and startup are identified in the commissioning scoping meeting and in the checklist forms

2. The CxA adapts, if necessary, the representative pre-functional checklists and procedures. The checklists indicate required procedures to be executed as part of startup and initial checkout of the systems and the party responsible for their execution.
3. These checklists and tests are provided by the CxA to the Contractor.
4. The CMR OR HIS SUBCONTRACTOR contractor responsible for the purchase of the equipment develops the full start-up plan by combining (or adding to) the CxA's checklists with the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan. The full start-up plan could consist of something as simple as:
  - a. The CxA's pre-functional checklists.
  - b. The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.
  - c. The manufacturer's normally used field checkout sheets.
5. The CMR OR HIS SUBCONTRACTOR submits the full startup plan to the CxA for review and approval.
6. The CxA reviews and approves the procedures and the format for documenting them, noting any procedures that need to be added.

D. Sensor and Actuator Calibration.

1. All field-installed temperature, relative humidity, CO, CO<sub>2</sub> and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated. All test instruments shall have had a certified calibration within the last 12 months. Sensors installed *in* the unit at the factory with calibration certification provided need not be field calibrated.
2. All procedures used shall be fully documented on the pre-functional checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.

E. Execution of Pre-functional Checklists and Startup.

1. Four weeks prior to startup, the CMR OR HIS SUBCONTRACTOR and vendors schedule startup and checkout with the CxA. The performance of the pre-functional checklists, startup and checkout are directed and executed by the CMR OR HIS SUBCONTRACTOR or vendor. When checking off pre-functional checklists, signatures may be required of other CMR OR HIS SUBCONTRACTOR for verification of completion of their work.
2. The CxA shall observe, at minimum, the procedures for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as

- approved by the CxA). In no case will the number of units witnessed be less than four on any one building, nor less than 20% of the total number of identical or very similar units.
3. For lower-level components of equipment, (e.g., VAV boxes, sensors, controllers), the CxA shall observe a sampling of the pre-functional and start-up procedures. The sampling procedures are identified in the commissioning plan.
  4. The CMR OR HIS SUBCONTRACTOR and vendors shall execute startup and provide the CxA with a signed and dated copy of the completed start-up and pre-functional tests and checklists.
  5. Only individuals that have direct knowledge and witnessed that a line item task on the pre-functional checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

F. Deficiencies, Non-Conformance and Approval in Checklists and Startup.

1. The CMR OR HIS SUBCONTRACTOR shall clearly list any outstanding items of the initial start-up and pre-functional procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CxA within two days of test completion.
2. The CxA reviews the report and submits either a non-compliance report or an approval form to the CMR . The CxA shall work with the CMR OR HIS SUBCONTRACTOR and vendors to correct and retest deficiencies or uncompleted items. The CxA will involve the CMR OR HIS SUBCONTRACTOR and others as necessary. The installing CMR OR HIS SUBCONTRACTOR or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CMR OR HIS SUBCONTRACTOR as soon as outstanding items have been corrected and resubmit an updated start-up report and a Statement of Correction on the original non-compliance report. When satisfactorily completed, the CxA recommends approval of the execution of the checklists and startup of each system to the CMR OR HIS SUBCONTRACTOR using a standard form.

### 3.3 FUNCTIONAL PERFORMANCE TESTING

- A. The general list of equipment to be commissioned is found in Part 1.4. The parties responsible to execute each test are listed with each test.
- B. Functional testing is intended to begin upon completion of a system. Functional testing may proceed prior to the completion of systems or sub-systems at the discretion of the CxA and CMR OR HIS SUBCONTRACTOR. Beginning system testing before full completion does not relieve the Contractor from fully completing the system, including all pre-functional checklists as soon as possible.
- C. Objectives and Scope
  1. The objective of functional performance testing is to demonstrate that each system is operating according to the documented design intent and Contract Documents. Functional testing facilitates bringing the systems from a state of substantial completion



to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation and functioning of the systems.

2. In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.

D. Development of Test Procedures

1. When final equipment selections have been determined (by contractor submittals), the CxA shall review the submittals and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. With input from Cx team members, the CxA shall finalize the preliminary test procedures included in this spec section and create forms to verify and document proper operation of each piece of equipment and system. Each CMR OR HIS SUBCONTRACTOR or vendor responsible to execute a test, shall provide assistance to the CxA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CxA shall provide a copy of the test procedures to the CMR OR HIS SUBCONTRACTOR(s) who shall review the tests for feasibility, safety, equipment and warranty protection.
2. The purpose of any given specific test is to verify and document compliance with the stated criteria of acceptance given on the test form.
  - Representative test formats and examples are found in the Part 4. The test procedure forms developed by the CxA shall include (but not be limited to) the following information:
    - a. System and equipment or component name(s)
    - b. Equipment location and ID number
    - c. Unique test ID number, and reference to unique pre-functional checklist and start-up documentation ID numbers for the piece of equipment
    - d. Date
    - e. Project name
    - f. Participating parties
    - g. A copy of the specification section describing the test requirements
    - h. A copy of the specific sequence of operations or other specified parameters being verified
    - i. Formulas used in any calculations
    - j. Required pre-test field measurements
    - k. Instructions for setting up the test.
    - l. Special cautions, alarm limits, etc.
    - m. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
    - n. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
    - o. A section for comments
    - p. Signatures and date block for the CxA

E. Test Methods

1. Functional performance testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers.
2. Simulated Conditions. Simulating conditions (not by an overwritten value) shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.
  - Overwritten Values. Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
3. Simulated Signals. Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
4. Altering Setpoints. Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the AC compressor lockout work at an outside air temperature below 55F, when the outside air temperature is above 55F, temporarily change the lockout setpoint to be 2F above the current outside air temperature.
5. Indirect Indicators. Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification is completed during pre-functional testing.
6. Setup. Each function and test shall be performed under conditions that simulate actual conditions as close as is practically possible. The CMR OR HIS SUBCONTRACTOR executing the test shall provide all necessary materials, system modifications, etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the CMR OR HIS SUBCONTRACTOR shall return all affected building equipment and systems, due to these temporary modifications, to their pre-test condition.

F. Coordination and Scheduling.

1. The CMR OR HIS SUBCONTRACTOR shall provide sufficient notice to the CxA regarding their completion schedule for the pre-functional checklists and startup of all equipment and systems. The CxA will coordinate functional tests with assistance from the CMR OR HIS SUBCONTRACTOR. The CxA shall direct, witness, document and approve the functional testing of all equipment and systems. The CMR OR HIS SUBCONTRACTOR shall execute the tests.
  - In general, functional testing is conducted after pre-functional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved by the CxA before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before

functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems is checked.

- G. Test Equipment. Refer to section 3.1 for test equipment requirements.
- H. Problem Solving. The CxA will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the CMR OR HIS SUBCONTRACTOR and A/E.

### 3.4 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

- A. Documentation. The CxA shall witness and document the results of all functional performance tests using the specific procedural forms developed for that purpose. The CxA will include the filled out forms in the O&M manuals.
- B. Non-Conformance.
  - 1. The CxA will record the results of the functional test on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the CMR OR HIS SUBCONTRACTOR on a standard non-compliance form.
  - 2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.
  - 3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues.
  - As tests progress and a deficiency is identified, the CxA discusses the issue with the executing contractor and the Cx Team.
    - a. When there is no dispute on the deficiency and the CMR OR HIS SUBCONTRACTOR accepts responsibility to correct it:
      - 1) The CxA documents the deficiency and the CMR OR HIS SUBCONTRACTOR response and intentions and they go on to another test or sequence. A copy is provided to the CMR and CxA. The CMR OR HIS SUBCONTRACTOR corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CxA.
      - 2) The CxA reschedules the test and the test is repeated.
    - b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:

- 1) The deficiency shall be documented on the non-compliance form with the CMR OR HIS SUBCONTRACTOR response and a copy given to the owner with copies to the Project Team.
  - 2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the Owner.
  - 3) The CxA documents the resolution process.
  - 4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CxA. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved.
4. Cost of Retesting.
- a. The cost for the CMR OR HIS SUBCONTRACTOR to retest a pre-functional or functional test, if they are responsible for the deficiency, shall be theirs. If they are not responsible, any cost recovery for retesting costs shall be negotiated with the Owner
  - b. For a deficiency identified, not related to any pre-functional checklist or start-up fault, the following shall apply: The CxA will direct the retesting of the equipment once at no “charge” to the CMR OR HIS SUBCONTRACTOR for their time. However, the CxA’s time for a second retest will be charged to the CMR OR HIS SUBCONTRACTOR.
  - c. The time for the CxA to direct any retesting required because a specific *pre-functional* checklist or start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be backcharged to the CMR OR HIS SUBCONTRACTOR.
- Refer to the sampling section of part 3.6 for requirements for testing and retesting identical equipment.
5. The Contractor shall respond in writing to the CxA through the CMR OR HIS SUBCONTRACTOR at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.
6. The CxA retains the original non-conformance forms until the end of the project.
- C. Failure Due to Manufacturer Defect. If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform to the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CxA or PM. In such case, the CMR OR HIS SUBCONTRACTOR shall provide the Owner with the following:
1. Within one week of notification from the CMR OR HIS SUBCONTRACTOR or PM, the CMR OR HIS SUBCONTRACTOR or manufacturer’s representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CMR or PM within two weeks of the original notice.
  2. Within two weeks of the original notification, the CMR OR HIS SUBCONTRACTOR or manufacturer shall provide a signed and dated, written explanation of the problem, cause

- of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
3. The PM will determine whether a replacement of all identical units or a repair is acceptable.
  4. Two examples of the proposed solution will be installed by the CMR OR HIS SUBCONTRACTOR, and the CMR OR HIS SUBCONTRACTOR will be allowed to test the installations for up to one week, upon which the CMR or PM will decide whether to accept the solution.
  5. Upon acceptance, the CMR OR HIS SUBCONTRACTOR and/or manufacturer shall replace or repair all identical items, at their expense and extend the warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.
- D. Approval. The CxA notes each satisfactorily demonstrated function on the test form. Formal approval of the functional test is made later after review by the CxA.

### 3.5 DEFERRED TESTING

- A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be delayed upon approval of the PM. These tests will be conducted in the same manner as the seasonal tests as soon as possible.
- B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CxA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate CMR OR HIS SUBCONTRACTOR, with facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and as-builds due to the testing will be made.

## PART 4 - SAMPLE CHECKLISTS AND TEST FORMS

## AIR HANDLING UNIT CHECKLIST

### 1. Model verification

Equip Tag →							
Manuf.							
Model							
Serial #							
Supply Fan	Capacity						
	Volts/phase						
	Amps/HP						
	# of Belts						
	Belt Size						
	# of Fuses						
	Fuse Size						
	# of Filters						
	Filter Size						
	# of Filters						
	Filter Size						
Relief Fan	Capacity						
	Volts/phase						
	Amps/HP						
	# of Belts						
	Belt Size						
	# of Fuses						
Energy Wheel	Capacity						
	Volts/phase						
	Amps/HP						
	# of Belts						
	Belt Size						
	# of Fuses						
	Fuse Size						

### 2. Installation Checks

	Equip Tag →						
<b>Cabinet and General Installation</b>							
Permanent labels affixed, including for fans							
Casing condition good: no dents, leaks, door gaskets installed							
Access doors close tightly - no leaks							
Boot between duct and unit tight and in good condition (supply and return air)							
Vibration isolation equipment installed & released from shipping locks							
Maintenance access acceptable for unit and components							
Instrumentation installed and labeled according to specification (thermometers, pressure gages, flow meters, etc.)							

## AIR HANDLING UNIT CHECKLIST

Equip Tag →						
Clean up of equipment completed						
Filters installed and replacement type and efficiency permanently affixed to housing						
<b>Valves, Piping and Coils</b> (see full piping checklists)						
Pipes properly labeled						
Pipes properly insulated						
Strainers in place and clean						
All coils are clean and fins are in good condition						
All condensate drain pans clean and slope to drain, per spec						
Condensate drain trap installed appropriate for use at the units static pressure						
Valves properly labeled						
Valves installed in proper direction						
<b>Fans and Dampers</b>						
Supply fan and motor alignment correct						
Supply fan belt tension & condition good						
Supply fan protective shrouds for belts in place and secure						
Supply fan area clean						
Supply fan and motor lube lines installed and lubed						
Return/exhaust fan and motor alignment correct						
Return/exhaust fan belt tension & condition good						
Return/exhaust fan protective shrouds for belts in place and secure						
Return/exhaust fan area clean						
Return/exhaust fan and motor lube lines installed and lubed						
Heat wheel fan and motor alignment correct						
Heat wheel fan belt tension & condition good						
Heat wheel fan protective shrouds for belts in place and secure						
Heat wheel fan area clean						
Heat wheel fan and motor lube lines installed and lubed						
Filter pressure differential measuring device installed and functional (Magnehelic, inclined manometer, etc.)						
All dampers close tightly						
All damper linkages have minimum play						
<b>Electrical and Controls</b>						
Power disconnects in place and labeled						
All electric connections complete						
Safeties in place and operable						
Low temperature (freeze stat) sensor properly installed and operable						
Smoke detector(s) in place						
All control devices and wiring complete and labeled						

### 3. Operational Checks (Theses augment mfr's list. This is not the functional performance testing.)

Equip Tag →						
Supply fan rotation correct						
Return/exhaust fan rotation correct						
Return /exhaust fan has no unusual noise or vibration						
Supply fan has no unusual noise or vibration						
Heat wheel has no unusual noise or vibration						
All dampers (outside air, return air, heat wheel bypass, relief air, etc.) stroke fully without binding						
All heating and chilled water valves stroke fully and easily						
The HOA switch properly activates and deactivates the unit						

## PUMPS CHECKLIST

### 1. Model verification

Equip Tag	Manufacturer	Model #	Serial #	RPM	Volts/Ph/A

### 2. Installation Checks

Equip Tag #						
Label Permanently affixed (I.D. Tag on pump, starter and disconnect switch by contractor)						
Pumps mounted securely						
Vibration isolation devices installed and functional						
Pump alignment verified correct						
Temperature and pressure gauges installed						
Verify pump and valve lubrication						
Maintenance access acceptable for unit and components						
All electrical connections complete						
All control devices and wiring complete						

### 3. Operational Checks

The HOA switch properly activates and deactivates the unit						
Pump rotation verified correct						
No unusual noise or vibration						
No leaking apparent around fittings or seals						

**Notes:**



## AIR HANDLING UNIT FUNCTIONAL TEST

Date: \_\_\_\_\_

### 1. Testing Parameters

Equip Tag →							
Outside Air Temp (deg F)							
Supply Air Set Point (deg F)							
Static Air Discharge Set Point (inches of W.C.)							
Static Air Low Limit Set Point (inches of W.C.)							
Static Air High Limit Set Point (inches of W.C.)							
Dirty Filter Set Point (inches of W.C.)							
Chilled Water Available (yes/no)							
Heating Water Available (yes/no)							
Supply Air	CFM						
	VFD (hz)						
Return/Exhaust Air	CFM						
	VFD (hz)						
Outside Air	CFM						

### 2. Installation Checks

Equip Tag →							
<b>Cabinet and General Installation</b>							
Permanent labels affixed, including for fans							
Casing condition good: no dents, leaks, door gaskets installed							
Access doors close tightly – no leaks							
Boot between duct and unit tight and in good condition (supply and return air)							
Vibration isolation equipment installed & released from shipping locks							
Maintenance access acceptable for unit and components							
Instrumentation installed and labeled according to specification (thermometers, pressure gages, flow meters, etc.)							
Clean up of equipment completed							
Filters installed and replacement type and efficiency permanently affixed to housing							
<b>Valves, Piping and Coils</b>							
Pipes properly labeled							
Pipes properly insulated							
Strainers in place and clean							
All coils are clean and fins are in good condition							
All condensate drain pans clean and slope to drain, per spec							
Condensate drain trap installed appropriate for use at the units static pressure							
Valves properly labeled							
Valves installed in proper direction							
<b>Fans and Dampers</b>							
Supply fan and motor alignment correct							
Supply fan belt tension & condition good							
Supply fan protective shrouds for belts in place and secure							

## AIR HANDLING UNIT FUNCTIONAL TEST

Equip Tag →						
Supply fan area clean						
Supply fan and motor lube lines installed and lubed						
Return/exhaust fan and motor alignment correct						
Return/exhaust fan belt tension & condition good						
Return/exhaust fan protective shrouds for belts in place and secure						
Return/exhaust fan area clean						
Return/exhaust fan and motor lube lines installed and lubed						
Heat wheel fan and motor alignment correct						
Heat wheel fan belt tension & condition good						
Heat wheel fan protective shrouds for belts in place and secure						
Heat wheel fan area clean						
Heat wheel fan and motor lube lines installed and lubed						
Filter pressure differential measuring device installed and functional (Magnehelic, inclined manometer, etc.)						
All dampers close tightly						
All damper linkages have minimum play						
<b>Electrical and Controls</b>						
Power disconnects in place and labeled						
All electric connections complete						
Safeties in place and operable						
Low temperature (freeze stat) sensor properly installed and operable						
Smoke detector(s) in place						
All control devices and wiring complete and labeled						

## 3. Operational Checks

Equip Tag →						
Supply fan rotation correct						
Return/exhaust fan rotation correct						
Return /exhaust fan has no unusual noise or vibration						
Supply fan has no unusual noise or vibration						
Heat wheel has no unusual noise or vibration						
<b>Shut unit down by the BAS (go unoccupied)</b>						
Outside air dampers are closed						
Exhaust air dampers are closed						
Relief air dampers above and below energy wheel are closed						
All fans are stopped						
Energy wheel is stopped						
Return air dampers are full open						
Cooling valve is closed						
Heating valve is open						
<b>With BAS set to unoccupied mode, generate the call for heat (heating season)</b>						
Verify supply fan start						
Exhaust fan remains shut down						
Heat wheel remains shut down						
Outside air dampers remains closed						
Return dampers remain open						
Bypass dampers remain closed						
Heat and cooling valves operate						

## AIR HANDLING UNIT FUNCTIONAL TEST

Equip Tag →						
<b>With BAS set to unoccupied mode, generate the call for cooling (cooling season)</b>						
Verify supply fan start						
Exhaust fan remains shut down						
Heat wheel remains shut down						
Outside air dampers remains closed						
Return dampers remain open						
Bypass dampers remain closed						
Heat and cooling valves operate						
<b>While shut down operate the following devices</b>						
Outside air damper strokes fully without binding						
Minimum outside air damper strokes fully without binding						
Return air damper strokes fully without binding						
Heat wheel outside air bypass damper strokes fully without binding						
Heat wheel return air bypass damper strokes fully without binding						
Exhaust air damper strokes fully without binding						
Heating water valves stroke fully and easily						
Chilled water valves stroke fully and easily						
The supply fan HOA switch properly activates and deactivates the motor						
The return fan HOA switch properly activates and deactivates the motor						
The energy wheel HOA switch properly activates and deactivates the motor						
<b>Have BAS place unit in Morning Warm-up Mode</b>						
Verify supply fan is on						
Verify exhaust fan is off						
Heat wheel is off						
Outside air dampers are closed						
Return air dampers are open						
Heat wheel bypass dampers are closed						
Heating or cooling valve opens						
<b>Have BAS place unit in Economizer Mode</b>						
Verify supply fan is on						
Verify exhaust fan is on						
Heat wheel is (on/off) [verify with unit sequence of operation]						
Outside air dampers are open full						
Return air dampers are closed						
Heat wheel bypass air dampers are (open/closed) [verify with unit sequence]						
Heating valve closes and cooling valve closes						
<b>Have BAS place unit in Occupied Mode (cooling season) Lower discharge supply air temperature (via lowering set-point or raising space temperature average)</b>						
Verify supply fan is on						
Verify exhaust fan is on						
Heat wheel is on						
Outside air dampers are at minimum						
Return air dampers modulate						
Heat wheel bypass air dampers are closed.						
Cooling valve opens and heating valve closes unless in dehumidification mode						
<b>Have BAS place unit in Occupied Mode (heating season). Raise discharge supply air temperature (via raising set-point or lowering space temperature average)</b>						
Verify supply fan is on						

## AIR HANDLING UNIT FUNCTIONAL TEST

Equip Tag →						
Verify exhaust fan is on						
Heat wheel is on						
Outside air dampers are at minimum						
Return air dampers modulate						
Heat wheel bypass air dampers are closed						
Heating valve opens and cooling valve closes unless in dehumidification mode						
<b>Manually shut down supply fan at the VFD</b>						
Return/ relief fan shuts down						
Heat wheel shuts down						
<b>High Static - With units running, utilizing a Magnehelic, simulate an increase in discharge air static pressure.</b>						
Verify that BAS indicates an alarm condition at 4" WG.						
<b>Low Static - With units running, utilizing a Magnehelic, simulate a decrease in discharge air static pressure.</b>						
Verify that BAS indicates an alarm condition at 4" WG.						
<b>Filter Differential Pressure - Set pressure across the filter to simulate dirty filters.</b>						
Verify that BAS indicates an alarm condition.						
<b>Place the unit into "heat wheel defrost"</b>						
The outside air heat wheel bypass damper should go to open.						
The heat wheel should continue to run						
The return heat wheel bypass damper should close.						
<b>Trip the Freeze protection safety device.</b>						
The system alarms						
All fans stop						
The OA dampers close						
The relief dampers close						
The return air dampers open						
The heating valve opens						
The cooling valve closes						

Notes:

1	The exterior general appearance is good, clean, no damage, and un obstructed.
2	Vibration isolation is installed/released
3	There is adequate maintenance access
4	The interior equipment is clean.
5	The equipment tag is attached
6	Verify there is no unusual noise or vibration.
7	Is the sensor location O.K.?

[illegible]

1	Record Set-point prior to testing
2	Adjust set-point until it is 5°F above space temperature. Does fan start?
3	Does heat valve open?
4	Is warm air delivered?
5	Does speed switch function properly? (not for unit heaters)
6	Lower set-point to a satisfied condition. Does fan shut off?
7	Record final temperature setting.

CABINET HEATERS  
UNIT HEATERS  
RADIANT PANELS  
FUNCTIONAL TEST

[illegible]

CABINET HEATERS  
UNIT HEATERS  
RADIANT PANELS  
FUNCTIONAL TEST

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END OF SECTION 019113

SAMPLE