CITY OF BALTIMORE

BERNARD C. "JACK" YOUNG,
Mayor

DEPARTMENT OF RECREATION AND PARKS

CAPITAL DEVELOPMENT AND PLANNING
2600 Madison Avenue
Baltimore, Maryland 21217

ADDENDUM NO. 1

DATE: January 14, 2020

For
DRAWINGS, SPECIFICATIONS, PROPOSAL, CONTRACT AND BOND

For
MIDDLE BRANCH WELLNESS AND FITNESS
CONTRACT NO. RP 19808

FOR THE MAYOR AND CITY COUNCIL OF BALTIMORE

TO BIDDERS: THIS ADDENDUM IS HEREBY MADE A PART OF THE CONTRACT DOCUMENTS ON WHICH THE CONTRACT WILL BE BASED, AND IS ISSUED TO MODIFY, EXPLAIN AND/OR CORRECT THE ORIGINAL DRAWINGS AND SPECIFICATIONS.
PLEASE ATTACH THIS ADDENDUM TO YOUR CONTRACT DOCUMENTS AND ACKNOWLEDGE IT ON THE BID OR PROPOSAL PAGE WHERE INDICATED.

ALL QUESTIONS DUE BY JAN 21, 2020 AT 8 AM.
SEE ATTACHED FOR CHANGES TO THE SPECIFICATIONS

APPROVED:

Adam Boarman, RLA
CHIEF OF CAPITAL DEVELOPMENT
DEPARTMENT OF RECREATION AND PARKS

Reginald Moore
DIRECTOR OF RECREATION AND PARKS

01. The following documents have been issued as part of this Addendum #1.
(If a document sharing the title and/or page number was in the original advertised package, these documents will supersede those within the proposed contract.)

a. Replace Section 01 1000, page 93
b. Replace Section 02 3200, page 200
c. Insert Sections 02 7000, 02 7200, and 02 7300
d. Replace Section 07 5423
e. Replace Section 08 3416, pages 493-495
f. Replace Section 31 2300
g. Replace Environmental Management Plan, Pages 1541-1575
h. Replace Section 32 1200, pages 1591-1592
i. Replace Drawing AC.1 - Construction Types, Typical Details, & Diagrams
j. Replace Drawing L1.01 - Hardscape Enlargement Plan - Community Plaza

02. The following should be noted based on discussions at the January 7th pre-bid meeting:

a. All questions may be sent to lance.decker@baltimorecity.gov (project manager), and Benita.randolph@baltimorecity.gov (contract administrator). Note that Tamara Brown (tamara.brown@baltimorecity.gov) is the primary contact for all issues relating to MBE/WBE requirements.
b. A scan of the Pre-Bid sign in sheet is attached herein.

03. BCRP anticipates including the following as unit prices (or contingency items) on addendum #2:

a. Additional excavation : Cost per Cubic Yard.
b. Additional structural fill: Cost per Cubic Yard.
c. Lean Concrete, f'c = 2,000 psi.: Cost per cubic yard.
d. Cast in place concrete, f'c=3,000 psi.: Cost per cubic yard.
e. Reinforcing bar, ASTM A615: Cost per pound.
f. Settlement Platforms: Cost per Each, Furnished, installed, & removed
g. Vibrating Wire Piezometers: Cost per Each, Furnished, installed, & removed

04. *Answers to Bidder Questions:*

a. *Reference specification SC-6 page 19, regarding overtime reimbursement. Will there be a resident inspector on site full time?* YES

b. *Please confirm that only Volume 1 of 3 is to be turned in along with duplicate bid forms as well as other required documents.* CONFIRMED. Also, see revised L1.01 (attached).

c. *Please clarify Bid Form as there are two Schedule of Prices.* Page 36 requires the bid for Bid Item #101. Page 37 requires the "Total Base Bid", which, because only 1 bid item currently exists for the project, would be the same number as Bid Item #101.

d. *Reference section 01 10 00 Summary paragraph 1.6 and related documents. Please provide a more detailed sequence and phasing plan.* See revised 01 10 00. However the sequence, as written, is deemed sufficient to properly prioritize the owner's needs while offering flexibility to the General Contractor's work.

e. *Section 02 3200 1.2 B indicates the Soils Report is NOT part of this contract. Section 02 3200, including 1.2 B, has been revised (*See Addendum#1 attachments)

f. *Reference Geotech Report. Please confirm if drilling mud was used in soil borings? Please confirm if any borings had multiple attempts due to shallow refusal. Please clarify if proposed wick installation is to a depth of 30' from existing grade, approx.. El 20, or to a tip elevation of -30, approximate length 50'.* Drilling mud was not used. See geotechnical report and boring logs. Approximate Tip EL -30; see Plans. See Specifications Sections 027000, 027200, 027300, attached with Addendum #1.

g. *Please confirm GTA will have a full-time agent monitoring, testing and classifying excavated soils as either clean or dirty?* CONFIRMED

h. *Is it the intent of the documents that no excavated material is to leave the site?* YES

i. *The cost to remove/remediate contaminated soils is a big unknown that cannot be estimated. We request that the owner develop an allowance to be included in the bid with unit price for the removal of these soils based on the type of contaminates encountered.* Owner anticipates that no contaminated soils will be needed to be removed from the site, and that all impacted soils can be buried under the proposed cap. Therefore bidders should ***not*** include allowances in their bid for such work. In the unlikely event that work outside of the EMP, and/or Grading, provisions needs to occur it will be addressed as an addition to the contract at that time.

j. *The soils report indicates Stratum 1 to contain an existing 5' cap over the entire site. Can this material be mined in green areas for clean fill?* YES

k. *Can any ash encountered during excavation be placed in the mined areas and covered with the 2' cap as required?* YES

l. *Reference the EMP report. There are a number of references to Figure 5 of EMP. This figure is not included in the EMP report. Please provide.* A revised EMP is issued as part of Addendum #1 (see attached 31 2300).

m. *Please confirm that a surcharge with PVD's will be utilized for building area.* CONFIRMED, Specifications sections 027000, 027200, 027300 have been included with Addendum #1.

n. *If so will the water wicked from the ground need to be treated as a contaminate/hazardous material.* NO, It is anticipated that the amount of water wicked will be so little that it will not leave the site.

o. *Reference EMP Plan. Please confirm and/or clarify if any advanced/modified PPE is required for wick drain installation labor that will be in direct contact with subsoils.* Our Environmental Engineer has stated that he doesn't believe this will be necessary, however the term "Advanced" is unqualified here. More importantly, these decisions are the realm of the General Contractor and their Sub-contractors.

p. *Reference section 321200-3.4 Surface preparation. Will a primer coat be required?* A primer coat will NOT be required. See attached revised specification section 32 1200.

q. *Specification 05 1200 indicate both the steel manufacturer and installer be AISC Certified. We request that you remove this requirement and specify that both the steel erector and fabricator comply with all AISC requirements.* The requirement will stand, as per the advertised documents.

r. *AC.1 shows the various roof type constructions. a. A vapor barrier is shown but not specified in the roof specs; b. 061000-G is called for in the system. This refers to FR treated wood. Shouldn't this be some type of Dens-Deck material?* As indicated in specification section 07 5423 paragraph 2.2.B.4.h, Vapor barrier is specified in section 07 2500. See specification 07 2500 paragraph 2.2 for more information. Keynote 061000-G is for gypsum sheathing not FR treated wood, however, Roof Types on AC.1 have been updated with a revised keynote. See revised specification section 07 5423 paragraph 2.2.B.5 and revised sheet AC.1.

s. *There are two colors noted on the roof plan for the roof membrane. What are the colors?* The colors are indicated in specification section 075423. Paragraph 2.3.A. 4 and 5 have been clarified, see revised specification section 075423.

t. *Reference section 08 3416 Hydraulic Doors paragraph 3.7 Upgrade equipment. Are all upgrades required? Specification states as selected by the specifier.* Section 08 3416 paragraph 3.7 has been revised, paragraph 3.8 has been removed. See revised Specification section 08 3416.

u. *TOC indicates section 10 1453 Traffic Signage. Section is not in the body of the specification. Please provide.* *101453 Traffic Signage already included. See pp. 615-616.*

1.5 USE OF PREMISES

A. General: Contractor shall have limited use of premises for construction operations, as limited to the area of work required for new work shown on the construction documents, and for the time period required to perform said work.

B. Use of Site: Limit use of premises to areas within the Contract limits indicated, and for the time period required to perform said work. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways and Entrances: Keep loading areas, and entrances serving premises clear and available to Engineer, Engineer 's employees and contractors, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

    a. Schedule deliveries to minimize use of loading areas and entrances.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

2. Refer to drawings and specifications for further delineation of loading and staging areas, including but not limited to, C9.0, C9.01, C9.02, and specifications section 31 2300 with Environmental Management Plan.

3. Owner reserves the right to require contractor to vacate specific locations/portions of the project where construction is substantially complete. At that time Contractor will adjust construction fencing to match reduced construction site. Reference to C4.02 through C4.06 is recommended. This vacation is commensurate with contractor ceasing all use, and Owner assuming responsibility for conditions of, said location.

1.6 CONSTRUCTION SEQUENCE

A. Demolition shall be accomplished in a carefully planned phased manner in order to maintain the structural integrity of elements on-site that are existing to remain.

B. C*onstruction Schedule shall include anticipated Construction Sequence dates.* Refer to drawings C9.0 and C9.01 (Erosion and Sediment Control Plan), Spec. section 31 2300 with Environmental Management Plan, as well as any other Drawings or Specifications bearing on schedule for coordination.

C. Existing, Adjoining outdoor pool facility *will remain closed for the 2020 season and shall* open to the public Summer of 2021. Egress paths meeting local codes and Owner's requirements must be maintained beginning April 15th, 2021. Contractor to install a dividing fence between the existing outdoor pool and the construction site (location matching proposed 4' ornamental fence – see C4.06) by May 21st, 2021. If construction has progressed far enough to meet local codes, Contractor may choose to install the permanent ornamental fence to meet this requirement, however any damage to the permanent ornamental fence that occurs prior to Project Completion is the responsibility of the contractor and therefore would require rectification.

D. Once Contractor completes Grading Stage 1 (see C4.02), with minimum 60 days-notice Engineer can require Contractor to complete *temporary access* pavement section shown on *C4.05.* Contractor may choose to complete this even sooner, with all terms of the contract remaining in force.

SECTION 02 3200 - GEOTECHNICAL INVESTIGATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY ***ADDENDUM 1***

A. A Soils Report dated December 20, 2018, prepared by Rummel, Klepper & Kahl, LLP., *was used during the design phases, and is included in the project manual.*

1.3 SITE CONDITIONS

A. Site Information
   1. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings.
   2. It is to be expressly understood that the Engineer will not be responsible for interpretations or conclusions drawing there from by Contractor. Data is made available for convenience of Contractor.
   3. The locations of test borings at various points are shown in the report. While it is believed the results of the test boring accurately indicate the existing soil conditions below the surface at points and planes indicated, the Engineer, the Architect, and design Engineer assume no responsibility for the actual conditions which may be encountered in the execution of the contract.
   4. Additional test borings and other exploratory operations may be made by Bidder or Contractor at no cost to Engineer.

1.4 WARRANTY

A. Neither the Engineer, the Architect, or the design Engineer, represent, warrant or guarantee that the materials actually encountered in the prosecution of the work, or any part thereof, will be of the same character as those indicated by the sample or logs of the test borings, and if the Contractor relies, for any purpose, upon the accuracy or completeness of said borings or log information, he does so at his own risk.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION

027000 – SETTLEMENT PLATFORM

Description:

The work of this section includes furnishing, installing, protecting and maintaining settlement monitoring platforms conforming to the design and at the locations shown on the Plans (coordinates of each instrument are show in Table 1 in the Construction Methods section of this special provision) or as directed by the Engineer. All labor, materials, equipment and incidentals necessary to complete this work shall be considered part of this item required to provide devices to observe ground movement during and after construction. The Contractor shall perform the monitoring, recording and reporting of the settlement.

Submittals:

1. Qualifying Experience

   The Contractor shall submit proof of three or more projects of similar size and complexity on which the firm and personnel assigned to the project have successfully installed similar instrumentation within the last three years. The Contractor shall present the following information for each project listed as a reference at or prior to any preconstruction meetings:

   1. Project Name, Location, Project Description, and Completion Date.
   2. Surface and Subsurface Conditions.
   3. Type and number of instruments installed.
   4. Installation equipment and techniques utilized when applicable.
   5. Provide names, current phone numbers, and current business addresses for the owner/designer, geotechnical consultant, and contract manager.

2. Settlement surveying and monitoring plan for review prior to construction. The plan shall identify the detailed location of settlement monitoring points, reference benchmarks, survey schedules and procedures and reporting formats.

3. Description of the surveying equipment to be used.

4. Settlement Plate Layout and Installation Details: Within two days after the installation of each settlement plate, the Contractor shall submit an installation record sheet including appropriate items from the following list.

   i. Project name.
   ii. Contract name and number.
   iii. Settlement plate number.
   iv. Material sizes and compositions.
   v. Planned location in horizontal position and elevation.
   vi. Planned orientation.
   vii. Personnel responsible for installation.
   viii. Date and time of start and completion.
   ix. Weather conditions at the time of installation.
   x. Notes of importance on the installation including problems encountered, delays, unusual features of the installation, and details of any events that may have a bearing on settlement plate behavior.

Schedule for Settlement Platform Installations and Readings:

The Contractor shall provide settlement monitoring platforms to monitor settlement of the surcharge embankment. The Contractor shall make regular readings of the settlement.

Settlement plates shall be read upon installation, again 24 to 72-hours after installation, and the day prior to fill placement, at least every other day during fill operations, and at least weekly thereafter for 60 days or as directed by the Engineer. The Engineer shall be advised of the results each week. Settlement monitoring may cease 60 days after fill placement is completed and after three consecutive readings indicate settlement has ceased, as approved by the Engineer.

Settlement plates shall be installed as shown on the plans (coordinates of each instrument are show in Table 1 in the Construction Methods section of this special provision) and according to Figure 1 herein. Settlement plates shall be located by repeatable survey (locations and elevations) and referenced to permanent benchmarks. Locations of benchmarks are to be determined by the Contractor and approved by the Engineer, and shall be located outside the zone of influence of the construction activity. Settlement plates shall be placed level and the risers shall be plumb.

The approximate locations of each instrument to be installed by the Contractor are shown on the project plans. Coordinates of each instrument are show in Table 1 in the Construction Methods section of this special provision. Other locations may need to be added as directed by the Engineer.

Protection of Instrumentation and Repair of Damage

a. The Contractor shall protect all instruments and appurtenant fixtures, leads, connections, and other components of instrumentation systems from damage due to construction operations.

b. If an instrument is damaged or made inoperative due to the Contractor's operations or the operation of subcontractors under the direction of the Contractor, the Contractor shall notify the Engineer immediately. The Engineer will be the sole judge of whether repair or replacement is required. For each instrument that is abandoned for these reasons, the Contractor shall replace that instrument at no additional cost to the Owner.

c. Should any instrument become damaged or inoperative through no fault of the Contractor, the damaged or inoperative instrument shall be repaired or replaced at the contract unit prices for that instrument.

d. The Engineer will advise the Contractor immediately upon discovery of damage to instruments as to the necessary schedule for replacement and the times of required access. Damaged instruments shall be repaired or replaced within 24 hours of initial damage. The Contractor's construction operations in the area of a damaged instrument(s) may be halted during repair or replacement of each damaged instrument at the request of the Engineer.

Materials:

Settlement Plates

a. Settlement plates are sub-surface displacement reference platforms placed on the prepared ground surface prior to embankment fill placement. Risers are extended from the settlement plate as the fill is placed. A casing is placed around the riser for protection. Settlement plates are monitored by optical survey methods to determine vertical displacements occurring during and after embankment construction.

b. The base plate shall be made from steel conforming to the requirements of ASTM A36. The riser pipe and outer casing shall be steel pipe conforming to the requirements of ASTM A53, Grade B, standard weight. The casing and the risers shall be as shown on the plan. The casing pipe shall have a minimum wall thickness of 0.375 inches. The riser pipe shall be galvanized and have a minimum wall thickness of 0.25 inches. Couplings, pipe caps, etc. shall conform to the requirements of ASTM A865. Threaded pipes shall be used for riser and casing pipe extensions.

c. Sand shall conform to the requirements of ASTM C33.

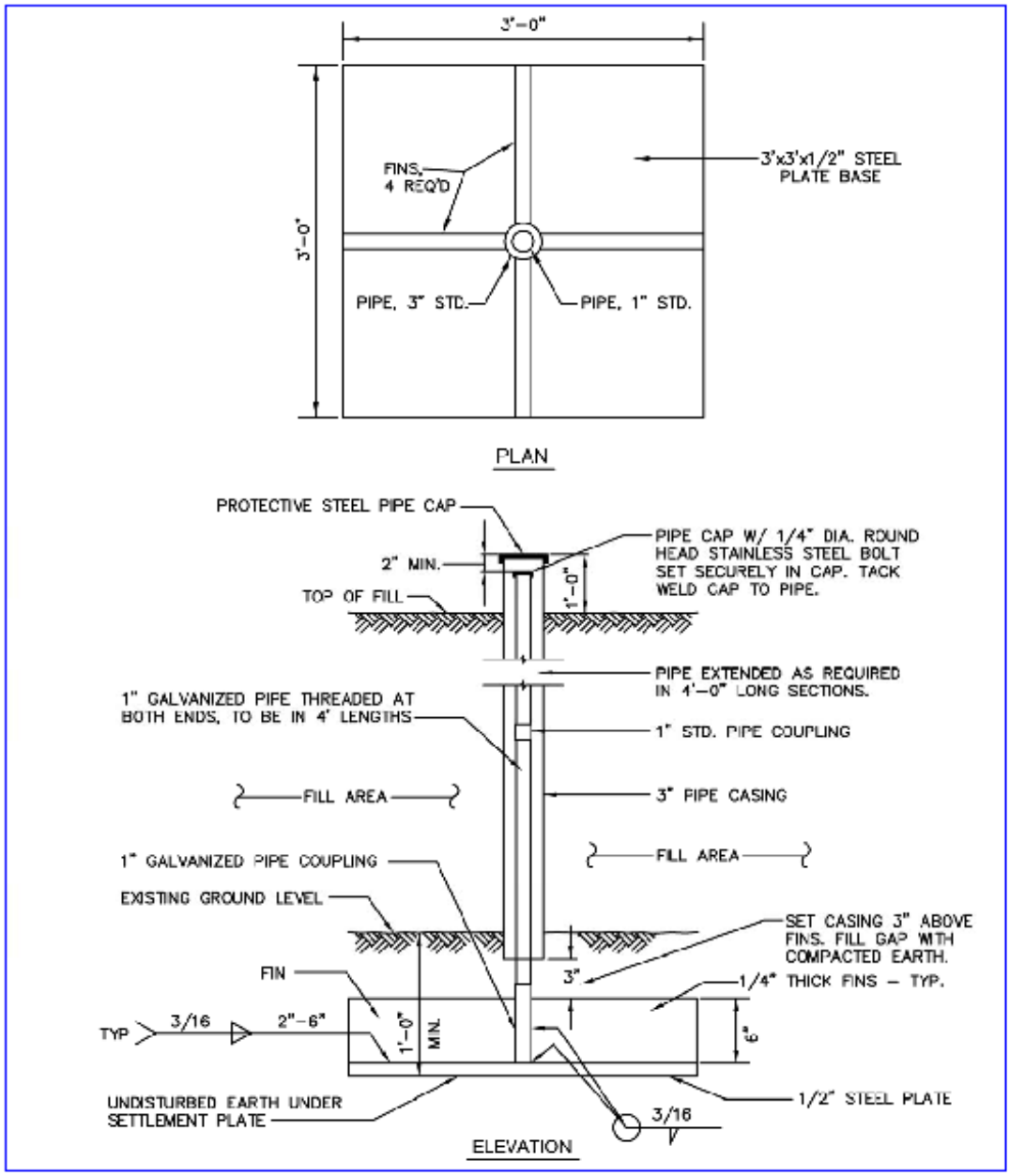

Figure 1: Settlement Plate Detail

Construction Methods:

1. Readings on the settlement platforms shall be performed by the Contractor. The Contractor is fully responsible for establishing benchmarks, submittals, and furnishing, installing and maintaining the settlement platforms.

2. The settlement platforms shall be installed as indicated on the plans (coordinates of each instrument are show in Table 1) after all clearing and grubbing and topsoil removal has been completed. The sand base shall be tamped to provide a firm, level, and unyielding bearing surface for the base plate. The riser pipe shall be marked in 1-foot increments and labeled at 5-foot increments to indicate the distances above the plate extending up through the embankment fill. Settlement plates shall be fabricated as indicated herein. The settlement plate locations shall be as directed in Table

Table 1 Location of Settlement Plates		
Settlement Plate	**Northing**	**Easting**
SP-1	-17854	2
SP-2	-17977	38
SP-3	-18070	79

3. The initial casing and riser pipes shall have a maximum length of 4 feet for each section. Spacers shall be provided between the riser pipe and the casing at a minimum of 4-foot intervals to ensure concentricity. The spacers shall not be directly attached to the riser pipe or otherwise installed that would impede the independent movement of the riser pipe.

4. As the height of fill above the settlement plate changes, the casing and riser pipes shall be increased or decreased in a maximum of 4-foot intervals to maintain the top of the riser pipe and casing above the embankment. As each additional length of pipe is added or removed, the pipe cap on the casing shall be immediately transferred to the top section on the settlement plate so as to prevent fill material from entering the casing. At other times, the cap shall only be removed to check settlement.

5. The casing pipe shall be marked by flags or other approved method to clearly show its location and to warn equipment operators and others of its location. The Contractor shall maintain the flags during the entire length of the Contract and replace those flags that are missing. At no time shall the settlement plate risers and casings extend higher than 5 feet above the ground surface elevation. Sections shall be added or removed as necessary during embankment construction to maintain the tops of the risers and casings at least 1-foot above the surface of the embankment.

6. The Contractor is responsible for maintaining the settlement plates in working order during the length of the surcharge period. Settlement Plates which are to be abandoned at the completion of the project shall have their riser pipes cut off two feet below subgrade level and capped. If an instrument is damaged, moved, or disturbed due to causes other than settlement, the Contractor shall repair, reset, or replace the damaged instrument at no additional cost to the Owner within three days after being damaged. The Engineer will be the sole judge of whether repair, resetting, or replacement is required. No additional fills shall be placed within fifty (50) feet of a damaged settlement platform until the damage has been corrected to the satisfaction of the Engineer. The Engineer may impose a work stoppage in the vicinity of the damaged instrument until it is again operational at no additional cost to the Owner. Any repairs or replacements required will be at the Contractor's expense.

7. By the end of the first work day in each week, the Contractor shall submit to the Engineer a description of the work performed during the previous week. This description shall include at a minimum: a plan view location of the placed embankment, the volume of embankment placed, and in-situ density test results.

8. The use of the settlement platforms for collecting data related to embankment foundation response will extend beyond the time of completion of the Contractor's embankment placement operations. The Contractor shall be responsible for assuring that all platforms are in working order until the time of completion of the surcharging period.

9. For vertical deformation monitoring, runs shall be performed by a single run beginning and ending on two different benchmarks installed in accordance with NGS standards. Settlement monitoring points shall be used as turning points or as intermediate foresights from two different turning points, allowing elevations to be adjusted and eliminating significant observational errors. The maximum length of line of sight shall be 150 feet, and the imbalance between backsight and foresight shall not exceed 30 feet. Allowable level loop misclosure shall not exceed ±0.033 times the square root of M feet (where M is the distance of the level run in miles) for a single run between two benchmarks. A formal initial reading on a settlement monitoring point will consist of the average of three elevations, from three independent level runs, which meet the closure specified herein. Elevations established subsequent to a formal initial reading shall be determined by a single run as specified herein. The least count (without estimation) of the rod and level combination shall read to 0.003 foot or less, such that the accuracy of an elevation measurement shall be ±0.01 foot (at 95 percent level of confidence).

10. Data shall be recorded in U.S. survey feet or inches.

11. Instruments used for vertical deformation monitoring shall have a minimum accuracy of plus or minus 0.005 of a foot (standard deviation for 3300 feet of double run leveling) and a minimum setting accuracy of plus or minus 1.0 arc seconds. Leveling rods shall be non-telescopic in design (i.e. “Chicago” style leveling rod). A bull’s eye bubble shall be used to plumb the leveling rod. The use of fiberglass rods will need approval of Engineer prior to use.

13. All data recorded by the Contractor shall be of the following form:
    a. Raw and reduced data shall be on summary tables in printed tabular format on 8-1/2 inch x 11 inch sheets of paper.
    b. Reduced data for up to six like instruments that are located in the same geographical area shall be plotted on the same graphical plot. Each plot shall be submitted on an 8-1/2 inch x 11 inch sheet or 11 inch by 17 inch sheet.
    c. Plots of deformation data at Settlement Monitoring Plates shall show absolute vertical deformation versus time with height or elevation of fill placed at time of reading. Plots of settlement plate data shall show absolute vertical deformation versus time and shall show the height or elevation of fill placed at the time of reading. Deformation plots shall also be provided in electronic data file format.
    d. Survey data reports prepared by the Contractor shall be signed and sealed by either a Professional Engineer or Professional Land Surveyor licensed in the State of Maryland.

Method of Measurement:
The number of Settlement Platforms measured will be the actual number of platforms set in place and/or maintained as shown on the Plans or as directed by the Engineer. No measurement for payment will be made for pipe extensions.

Basis of Payment:
Settlement Platforms will be paid for at the Contract unit price per Each, complete in place, which price shall be full compensation for all materials, tools, labor, and work incidental thereto including pipe extensions, steel plate, sand, couplings, spacers, welding, protection of the plate and pipe extensions during construction, all labor tools, equipment, and necessary incidentals to complete the work.

027200 – VIBRATING WIRE PIEZOMETER

Description:

The Work covered by this Section includes furnishing all necessary labor, equipment, and materials to install Vibrating Wire Piezometers, providing safe access for the Engineer and others for data collection, protecting instrumentation from damage, repairing certain types of instruments, and replacement costs for other instruments. The Contractor shall implement required remedial and precautionary measures based on the instrumentation data collected and evaluated by the Engineer.

Project Conditions

a. Prior to bidding, the Contractor shall visit and examine the work site and all conditions thereon and take into consideration all such conditions that may affect this work. Subsurface data collected from the site is available in a geotechnical report upon request.

b. Protection of Existing Structures: Protect existing structures, underground utilities, and other construction from any possible or potential damage during drilling operations.

Submittals:

a. Qualifying Experience

The Contractor shall submit proof of three or more projects of similar size and complexity on which the firm and personnel assigned to the project have successfully installed similar instrumentation within the last three years. The Contractor shall present the following information for each project listed as a reference at or prior to any preconstruction meetings:

1. Project Name, Location, Project Description, and Completion Date.

2. Surface and Subsurface Conditions.

3. Type and number of instruments installed.

4. Installation equipment and techniques utilized when applicable.

5. Provide names, current phone numbers, and current business addresses for the owner/designer, geotechnical consultant, and contract manager.

b. No instrumentation shall be delivered or installed on the site prior to the review and approval by the Engineer of the materials, products, and installation procedures. At least 45 calendar days prior to proceeding with the installation work, the Contractor shall submit to the Engineer for review the following:

1. Schedule and Procedures: Proposed schedule and procedures for instrumentation installation and performance of initial reading monitoring for the instruments. Detailed step-by-step procedure for installation, together with a sample installation record sheet. The procedures shall be bound and indexed. The installation procedures shall include:

- The method to be used for cleaning the inside of casing.

- The methods to be used for drilling of holes.

- Drill casing type and size.

- Depth increments for backfilling boreholes with sand and grout.

- Method for overcoming buoyancy of instrumentation components during grouting.

- Method for sealing of joints in pipes and inclinometer casing to prevent ingress of grout.

- Detailed step-by-step procedures for conducting all survey measurements to obtain initial readings to the specified accuracy, including types of surveying equipment.

2. Product Data: Manufacturer's catalog cuts, shop drawings, material specifications, installation and maintenance instructions, and other data pertinent to the work of this Section.

3. Within 2 workdays of receipt of each instrument at the site, the Contractor shall submit to the Engineer a copy of factory calibration, manufacturer's test equipment certification, completed copy of quality assurance checklist, and warranty for each portable readout unit.

4. Grout Mix: Material specifications and mix design for grout required for piezometer installations along with verification from a certified testing laboratory that this mix is in accordance with the requirements specified. The information shall include specifications for proposed grout mixes, including commercial names, proportions of admixtures and water, mixing sequence, mixing methods and duration, pumping methods and tremie pipe type, size and quantity.

5. Certifications: Manufacturer's certifications that products, materials, and equipment furnished meet the specified requirements.

6. Instrumentation layout and installation details: Within 5 days of installing each instrument the Contractor shall submit the following:

   - Instrument type, identification numbers and locations, with initial elevations, stations and offsets, and coordinates, as applicable for each instrument.

   - As-built installation details of each instrument, including depths, lengths, elevations, materials used, and dimensions of key elements.

   - A separate statement describing the procedure used for the installation of each instrument.

   - A log of subsurface data indicating the elevations of strata changes encountered in the borehole. Soil strata nomenclature shall conform to ASTM D3282 and D2488.

   - Other data pertinent to instrument installation.

Schedule for Installations and Readings:

Prior to installation of the instruments, the Contractor shall submit an installation schedule as described in this specification. The installation of all instruments shall generally precede the placement of embankment material by at least 14 days so that neutral, or initial, readings can be obtained. The Contractor shall notify

the Engineer within 24 hours of successful installation of each instrument.

The Contractor shall make neutral readings on each of the instruments within 72 hours of successful installation of the instrument and again 24 and 48 hours after the initial reading to verify the initial data. During fill placement readings shall be taken at least daily, and at least every 2-days during the quarantine period, or as directed by the Engineer. If data loggers are used, readings shall be set to be taken hourly.

Protection of Instrumentation and Repair of Damage

The Contractor shall take the following measures to protect the installed instrumentation and repair any damages that occur.

a. The Contractor shall protect all instruments and appurtenant fixtures, leads, connections, and other components of instrumentation systems from damage due to construction operations.

b. If an instrument is damaged or made inoperative due to the Contractor's operations or the operation of subcontractors under the direction of the Contractor, the Contractor shall notify the Engineer immediately. The Engineer will be the sole judge of whether repair or replacement is required. For each instrument that is abandoned for these reasons, the Contractor shall replace that instrument at no additional cost to the Owner.

c. Should any instrument become damaged or inoperative through no fault of the Contractor, the damaged or inoperative instrument shall be repaired or replaced at the contract unit prices for that instrument.

d. The Engineer will advise the Contractor immediately upon discovery of damage to instruments as to the necessary schedule for replacement and the times of required access. Damaged instruments shall be repaired or replaced within 24 hours of initial damage. The Contractor's construction operations in the area of a damaged instrument(s) may be halted during repair or replacement of each damaged instrument at the request of the Engineer.

Interpretation of Data and Implementation of Plans of Action:

The Engineer may require a temporary delay from planned construction schedules before a stage of fill placement is commenced and/or completed in a given area if the fill instrumentation readings indicate the potential for unstable conditions or if settlement is substantially more than predicted. Resumption of fill placement shall be at the direction of the Engineer when instrumentation readings indicate sufficient stability has been achieved to allow such continuation of filling.

All data recorded by the Contractor shall be of the following form:

a. Raw and reduced data shall be on summary tables in printed tabular format on 8-1/2-inch x 11-inch sheets of paper.

b. Reduced data for up to six like instruments that are located in the same geographical area shall be plotted on the same graphical plot. Each plot shall be submitted on an 8-1/2-inch x 11-inch sheet or 11-inch by 17-inch sheet.

c. Plots for Vibrating Wire Piezometers shall present piezometer data versus time with height or elevation of fill placed at time of reading.

d. Data reports prepared by the Contractor shall be signed and sealed by either a Professional Engineer or Professional Land Surveyor licensed in the State of Maryland.

Quality Control:

The following measures shall be followed prior to and during the installation of the piezometers to ensure proper installation and operation:

a. Control of Materials

1. The materials to be used in fulfilling the requirements of instrumentation work are subject to the approval of the Engineer. Approval of the materials to be used for instrumentation shall not relieve the contractor of the responsibility to provide instrumentation in accordance with these Specifications.

2. The Engineer will inspect, test, and approve the workmanship of the instrumentation equipment, prior to, and/or after installation.

b. Field Monitoring

1. The Engineer will approve the method of installation and maintenance of monitoring devices. Approval of the method of installation and maintenance of monitoring devices shall not relieve the Contractor of the responsibility to install and maintain the instruments in conformance with the Specifications.

2. Measurements and readings of the monitoring devices shall be performed by the Contractor.

3. The Engineer shall be notified of monitoring devices that become damaged or inoperable immediately after the time the Contractor becomes aware of such conditions.

4. The Contractor shall engage qualified technicians with at least three years' previous experience in the installation of the instruments specified herein. The Contractor shall provide the Engineer, for his approval, a description of the applicable experience of such personnel. Approval of the personnel shall be received prior to commencing with the installation.

c. Factory Calibration

A factory calibration shall be conducted on all instruments at the manufacturer's facility prior to shipment. Each factory calibration shall include a calibration curve with data points clearly indicated, and a tabulation of the data. Each instrument shall be marked with a unique identification number.

Factory calibrations of piezometers shall be made against a pressure gage traceable to the National Institute of Standards and Technology. The accuracy of the pressure gage shall not be less than twice the specified accuracy of the piezometers. Calibrations shall be made to full scale in two complete cycles, recording the reading in 10 equal increments during two loading and two unloading cycles.

d. Field Calibration

Upon receipt of the instruments at the project site the Contractor shall check all instruments

and perform field calibrations to ensure that they are functioning properly.

Materials:

Materials for the installation of the vibrating wire piezometers shall be in accordance with the following:

a. Vibrating wire piezometers shall be placed within the compressible soil layer(s) to monitor pore pressures during and after construction of the embankments. The piezometer's cable housing shall be extended as the fill is placed or the cable shall be extended outside the embankment area.

b. The piezometers shall be vibrating wire transducer type capable of measuring pore water pressures up to 100 psi. The piezometers shall be Model 4500 produced by Geokon, Inc., West Lebanon, New Hampshire; Model VW2100 produced by RST Instruments Ltd, Coquitlam, B.C., Canada; or an approved equal. Piezometers shall be supplied with thermistors built into the transducers to measure the temperature at the transducer location. A readout box shall be used to obtain pore pressure readings as required. This readout box shall be a Model GK-401 produced by Geokon, Inc., West Lebanon, New Hampshire; a Model VW2104; produced by RST Instruments Ltd, Coquitlam, B.C., Canada; or an approved equal.

c. Vibrating wire transducers shall have factory-attached cables of sufficient length to route to the terminal box without splicing. Cable shall be of same commercial source as the piezometers, and shall be 4-conductor, 22 gauge, with two (2) shielded twisted pairs, a common drain wire. Cable shall be attached to the piezometers through an integral bulkhead seal, consisting of an interior waterstop seal and cable entry seal. Seals shall be either O-rings or hermetic seals and must be tested and certified for water-tightness over the specified pressure range of the transducer.

d. The terminal box shall be a Model 4999-16VT as manufactured by Geokon Inc., Lebanon, New Hampshire; a Geomation 2300 produced by RST Instruments Ltd, Coquitlam, B.C., Canada; or an approved equal.

e. Surge protection circuit boards shall be installed on every lead wire connected into the terminal box to protect the vibrating wire piezometers. The surge protection circuit boards shall contain a combination of gas tube discharge rectifiers, solid state diode circuits, and coils to suppress electrical transients.

f. Grounding rods: 3/4-inch diameter by 10-feet long, copper clad steel as manufactured by copperweld; Blackburn; or approved substitute.

g. Ground cable: ASTM B8 copper, No. 4 AWG bare wire.

h. Cable identifications tags: Black Natvar 400 tubing with labels deeply embedded using Kingsley White Stamping Foil; Raychem thermofit marker; Alliance Industrial Products Co. white plastic marker with black code marking; Marked Flexrite Shrinkdown HT-105 tubing; Actioncraft heat-shrinkable polyolefin marker; or approved substitute.

i. The piezometers shall be installed with steel casing over the cable where traffic is likely to run over the casing. PVC casing may be used elsewhere.

Methods of Construction:

Equipment

The Contractor shall provide all necessary labor, material, and equipment, and perform all operations required for the installation of the instrumentation.

Installation

The vibrating wire piezometers shall be installed in boreholes at the locations and depths as specified in the following table.

Table 1 Location of Piezometers

Piezometer	Northing	Easting	Piezometer Elevation (ft)
PZ-S-1	-17948	-55	EL 0
PZ-S-2	-17977	108	EL 0
PZ-M-1	-17874	-28	EL -10
PZ-M-2	-17969	46	EL -10
PZ-M-3	-18040	146	EL -5
PZ-D-1	-17897	51	EL -20
PZ-D-2	-18086	7	EL -15

Piezometers can be installed in boreholes in single or multiple installations per hole, in cased or uncased holes. At locations requiring multiple installations per hole, one piezometer should be installed above the groundwater table and one below the groundwater table. Careful attention must be paid to borehole sealing techniques if pore pressures in a particular zone are to be monitored.

Boreholes should be drilled either without drilling mud or with a material that degrades rapidly with time, such as RevertJ. The hole should extend from 12 to 24 inches below the proposed piezometer location and should be washed clean of drill cuttings. The bottom of the boreholes should then be backfilled with clean fine sand to a point one foot below the piezometer tip. The piezometer can then be lowered into position. If applicable, any porous elements shall be saturated, and the piezometer filled with water prior to installation. The piezometer shall then be encapsulated in a canvas cloth bag containing clean, saturated silica sand, and having the diaphragm facing upwards prior to being lowered into position. While holding the instrument in position (a mark on the cable is helpful), clean sand should be placed around the piezometer and to a point one foot above it. The sand placed before and after the placement of the piezometer forms the collection zone.

Immediately above the sand layer (collection zone), the hole shall be grouted to a point no less than three feet above the collection zone using a special grout consisting of Portland cement, bentonite and water. The special grout shall be a non-shrink and non-metallic material and shall not contain calcium chloride or other salts, aluminum, or other harmful metals. When tested in accordance with ASTM C 827, the material shall show no shrinkage in the plastic state. When tested in accordance with ASTM C 109, the material shall show a seven-day strength of not less than 3.5 pounds per square inch (psi) and a 28-day strength of between 5.0 and 7.0 psi as measured on 2 inch cubes. The water used in the special grout shall be potable.

The cables for the vibrating wire piezometers shall be routed up through the boreholes and placed in trenches leading to the readout boxes. These trenches shall be a minimum of one foot deep and one foot wide. The cables shall be snaked in the trenches to include a minimum of 10 feet of additional cable length for every 100 feet of cable.

The Contractor is responsible for maintaining the vibrating wire piezometers in working order during the length of the Contract.

Method of Measurement:

The Vibrating Wire Piezometers will be measured per Each satisfactorily installed. Drilling of holes, temporary casing, terminal boxes and covers, and incidental items necessary for installation of the instruments and abandonment of instruments no longer required, including filling of holes with grout, will not be measured separately for payment. These costs will be considered incidental to these items.

Basis of Payment:

Vibrating Wire Piezometers will be paid for at the Contract unit price per Each, complete in place, which price shall be full compensation for all materials, tools, labor, and work incidental thereto including all labor, tools, equipment, and necessary incidentals to complete the work.

SECTION 027300
PREFABRICATED VERTICAL DRAINS

PART 1 – GENERAL

1.1 DESCRIPTION

The work covered under this specification includes all labor, materials, equipment and incidentals necessary for the installation of prefabricated vertical drains as required in the plans and as directed by the Engineer.

1.2 QUALITY CONTROL AND TESTING

The actual vertical drain to be used shall be at the option of the Contractor subject to approval of the Engineer.

The Contractor shall indicate the proposed source of the materials prior to delivery to site. The Contractor shall also submit samples and Manufacturer's certificates to verify the physical, mechanical and hydraulic properties of the drain to be used for the Engineer's approval.

The Contractor shall submit a 3-foot sample of the vertical drain material to the Engineer prior to usage and shall allow three weeks for the Engineer to evaluate the material. The sample shall be stamped or labeled by the Manufacturer as being representative of the drain material having the specified trade name. Approval of the sample material by the Engineer shall be required prior to site delivery of the drain material.

PART 2 – MATERIALS

2.1 MATERIALS

Prefabricated vertical drains shall be of newly manufactured materials from an approved Manufacturer and consist of a polymer core enclosed within an external non-woven filter jacket.

The filter jacket shall be capable of resisting all bending, punching and tensioning subjected during installation and the design life of the drain.

The core shall be made of continuous plastic fabricated to facilitate drainage along the axis of the drain.

The prefabricated vertical drain shall be resistant against rotting, mildew, bacterial or insect action, salts, acids, alkalis, solvents or other constituents in the groundwater.

2.2 TRANSPORTATION AND STORAGE

The vertical drain material shall be labeled or tagged for sample identification and other quality control purposes. The Manufacturer shall identify each roll by individual roll number, date of manufacture and product identification of the jacket and core.

During transportation and storage the drain shall be wrapped in heavy paper, opaque plastic or other or similar heavy duty protection covering. The drain shall be protected from sunlight, mud, dirt, dust, debris and other detrimental substances during transportation and storage on site.

All materials which are damaged during transportation, handling or storage and do not meet the minimum requirements of the vertical drain specifications shall be rejected by the Engineer.

No payment of any kind shall be made on the rejected product.

PART 3 – CONSTRUCTION

3.1 EQUIPMENT

Prefabricated Vertical Drain (PVD) shall be installed with approved modern equipment of a type which will cause a minimum of disturbance to the soil during installation and maintain the mandrel in a vertical position. The PVD's shall be installed using a mandrel or sleeve that will be advanced through the compressible soils to the required depth using constant load, or constant rate of advancement methods only.

Prior to installation, the Contractor shall demonstrate that the equipment is in proper working condition, and provides a minimum of 60,000 lbs of static push force when setting on firm ground. Hydraulic jetting shall not be permitted for installation of the drains, however limited amounts of water to lubricate the mandrel in highly plastic soils will be allowed with the Engineers approval.

The mandrel shall protect the PVD material from tears, cuts and abrasion during installation and shall be withdrawn after the installation of the drain. The drain shall be provided with an "anchor plate" or rod at the bottom of the mandrel to cover the mandrel end and prevent soil from entering the mandrel during installation. The anchor plate or rod shall be sufficient to anchor the drain at the required depth during mandrel removal. The mandrel shall be shaped to minimize disturbance to the soil, having a uniform and smooth exterior shape, without projections of any kind. The maximum projected cross sectional area shall be 80 cm^2 (12 in^2), including stiffening ribs.

3.2 APPROVAL

Four weeks prior to the beginning of trial PVD installation, the Contractor shall submit full details of the materials, equipment, sequence, plan showing the locations of the prefabricated vertical drains, and method proposed for PVD installation to the Engineer for review and approval. Approval by the Engineer of installation sequence and methods shall not relieve the Contractor of his responsibility to install drains in accordance with the requirements of the plans and specifications.

Prior to production installation the Contractor shall demonstrate that the equipment, method, and materials produce a satisfactory installation in accordance with these specifications. For this purpose, the Contractor will be required to install 2 trial drains at locations designated by the Engineer. Trial drains will be paid at the contract unit price unless the drain is improperly installed.

Approval by the Engineer of the method or equipment used to install the trial drains shall not constitute, necessarily, acceptance for the remainder of the project. If, at any time, the Engineer considers that the method of installation does not produce a satisfactory installation, the Contractor shall alter his method and/or equipment as necessary to comply with these specifications.

3.3 INSTALLATION PROCEDURE

Prefabricated vertical drains shall be located, numbered, and staked (or located by other suitable means) by the Surveyor using a baseline and benchmark indicated by the Engineer. The Contractor shall take all reasonable precautions to preserve stakes (or other markers) and is responsible for any necessary relocation of marking devices. The as- installed location of the PVD's shall not vary by more than 150 mm (6 inches) from the Contractor's approved location plan.

Drains that are more than 150 mm (6 inches) from the Contractor's approved location plan or are damaged or improperly installed, shall be rejected and abandoned in place.

PVD's shall be installed from the working surface to the depth shown on the drawings, or to such depth as directed by the Engineer who may vary the depths, spacings, or the number of drains to be installed, and may revise the plan limits for this work as necessary.

Drains may be terminated if refusal is encountered at a depth less than design depth. The refusal length of each drain may vary based on the geological formations encountered over the site. Refusal shall be defined as installation of the drain to the non-compressible layer underlying the compressible layer to be consolidated. Through the use of the soils logs taken at the project site the Engineer shall define the compressible layer versus the non-compressible layer. The PVD installation equipment will indicate refusal when the tip of the mandrel meets resistance and stops or slows at the approximate depth of the non-compressible layer. The finished depth of the drain shall not extend more than 0.3 m (1 ft) into the non-compressible layer.

During installation the Contractor shall provide the Engineer with suitable means of determining the depth of the advancing drain at any given time and the length of the drain installed at each location. The drain material shall be cut neatly at its upper end with 100 mm to 200 mm (4 to 8 inches) protruding above the working surface. If the PVD is to connect to prefabricated horizontal drainage system, sufficient PVD material shall be left to make the connection.

The Contractor shall supply to the Engineer at the end of each working day a summary of the total amount of PVD installed that day.

Equipment for installing PVD shall be plumbed prior to installing each drain and shall not deviate from the vertical more than 1 in 50 during installation of any drain.

The installation shall be performed without any damage to the drain during advancement or retraction of the mandrel. In no case will alternate raising or lowering of the mandrel during advancement be permitted. Raising of the mandrel will only be permitted after completion of a drain installation.

Installation of the drains should be coordinated with the placement of geotechnical instrumentation as indicated on the plans. Special care should be taken to install drains in such a manner so as not to disturb instrumentation already in place. The replacement of instrumentation damaged or rendered nonfunctional as a result of the Contractor's activities will be the responsibility of the Contractor.

3.4 EXPERIENCE

As a minimum experience requirement, the Contractor shall have successfully completed five prefabricated vertical drain installation projects of similar size and depths totaling no less than 10,000,000 linear feet installed. The five projects shall be identified by project name, location, project description, size, completion date, and contract manager.

3.5 PRE-AUGERING/OBSTRUCTIONS

The Contractor shall be responsible for penetrating any overlying material as necessary to install the drains.

Where obstructions are encountered below the working surface which cannot be penetrated by the installation equipment, the Contractor shall complete the drain from the elevation of the working surface to the obstruction, and notify the Engineer prior to installing any more drains. At the direction of the Engineer and under his review, the Contractor shall attempt to install a new drain within 2 feet horizontally from the obstructed drain. A maximum of two attempts shall be made as directed by the Engineer. If the drain still cannot be installed to the design tip elevation, the

drain location shall be abandoned and the installation equipment shall be moved to the next location, or other action shall be taken as directed by the Engineer.

The Contractor shall be paid for all obstructed drains at the contract unit price, less any allowance for drain above the working surface, unless the
drain is improperly installed.

The Contractor shall be responsible for penetrating overlying fill material as necessary to satisfactorily install the PVD. The Contractor may use augering, spudding, or other approved methods to loosen the soil and any obstruction material prior to installation of the PVDs. The procedure for penetrating such material shall be at the approval of the Engineer; however, such approval shall not relieve the Contractor of his responsibility to clear obstructing material in accordance with these specifications.

If augering is the selected method, the augers shall have a minimum outside diameter equal to the largest horizontal dimension of the mandrel, shoe or anchor, whichever is greater. Augering shall not extend more than 2 ft. into the underlying compressible material. Augers or spuds must be capable of penetrating 40 ft. below the working surface to facilitate the installation to the depths indicated in the plans.

3.6 SPLICING

Splicing of the PV drain material shall be done by stapling in a workmanlike manner so as to ensure structural and hydraulic continuity of the drain. At the splice, the jacket that passes through the installation rig first shall be external to the trailing portion.

A maximum of one splice per drain will be permitted without specific permission from the Engineer.

The jacket and core shall be overlapped a minimum of 6-inches at any splice.

PART 4 – MEASUREMENT AND PAYMENT

4.1 METHOD OF MEASUREMENT

Mobilization will be paid for by lump sum.

Prefabricated Vertical Drains will be measured and paid for as the number of linear feet satisfactorily installed, or abandoned as directed by the Engineer, from the tip elevation to the level of the working surface, plus the allowable length of PVD protruding above the working surface.

Obstruction clearance will be measured and paid for as the number of linear feet from the working surface to the depth penetrated by the auger, spud, drill, or punch.

4.2 BASIS OF PAYMENT

Mobilization shall include the cost of furnishing of all equipment and materials necessary to properly execute the work.

The unit bid price for Prefabricated Vertical Drains shall include the cost of survey and stakeout, installing PVDs, and furnishing all labor, tools, and incidentals necessary to complete the work.

The unit bid price for obstruction clearance shall include the cost of satisfactorily clearing obstructions to facilitate the installation of the PVDs, disposal of spoils, any required backfilling and furnishing all labor, tools, and incidentals necessary to complete the work.

SECTION 07 5423 - THERMOPLASTIC-POLYOLEFIN ROOFING (TPO)

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Adhered system with thermoplastic roofing membrane.

B. Insulation, flat and tapered.

C. Flashings.

D. Commencement of work by General Contractor shall constitute acknowledgement by General Contractor that this specification can be satisfactorily executed, under the project conditions and with all necessary prerequisites for warranty acceptance by roofing membrane manufacturer. No modification of the Contract Sum will be made for failure to adequately examine the Contract Documents or the project conditions.

1.2 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.

B. ASTM C209 - Standard Test Methods for Cellulosic Fiber Insulating Board.

C. ASTM C473 - Standard Test Methods for Physical Testing of Gypsum Panel Products.

D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

E. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.

F. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

G. ASTM C1549 - Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.

H. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.

I. ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.

J. ASTM D1621 - Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.

K. ASTM D1622/D1622M - Standard Test Method for Apparent Density of Rigid Cellular Plastics.

L. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.

M. ASTM D6878/D6878M - Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing.

N. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

O. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C.

P. FM 4470 - Approval Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for use in Class 1 and Noncombustible Roof Deck Construction.

1.3 SUBMITTALS

A. Product Data:
   1. Provide membrane manufacturer's printed data sufficient to show that all components of roofing system, including insulation and fasteners, comply with the specified requirements and with the membrane manufacturer's requirements and recommendations for the system type specified; include data for each product used in conjunction with roofing membrane.
   2. Where UL or FM requirements are specified, provide documentation that shows that the roofing system to be installed is UL-Classified or FM-approved, as applicable; include data itemizing the components of the classified or approved system.
   3. Installation Instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.

B. Samples: Submit samples of at least the following:
   1. Sample of roof membrane.
   2. Sample of walkway pads.

C. Shop Drawings: Provide:
   1. The roof membrane manufacturer's standard details customized for this project for all relevant conditions, including flashings, base tie-ins, roof edges, terminations, expansion joints, penetrations, and drains.
   2. For tapered insulation, provide project-specific layout and dimensions for each board.

D. Specimen Warranty: Submit prior to starting work.

E. Installer Qualifications: Letter from manufacturer attesting that the roofing installer meets the specified qualifications.

F. Pre-Installation Notice: Copy to show that manufacturer's required Pre Installation Notice (PIN) has been accepted and approved by the manufacturer.

G. Executed Warranty.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Roofing installer shall have the following:
   1. Current approval, license, or authorization as applicator by the manufacturer.
   2. At least five years experience in installing specified system.
   3. Capability to provide payment and performance bond to Engineer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact and legible.

B. Store materials clear of ground and moisture with weather protective covering.

C. Keep combustible materials away from ignition sources.

1.6 WARRANTY

A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

B. Warranty: Provide manufacturer's system warranty covering membrane, roof insulation, and other indicated components of the system, for the term indicated.
   1. Limit of Liability: No dollar limitation.
   2. Warranty Term: 20 years.
   3. Scope of Coverage: Repair leaks in the roofing system and damage caused by:
      a. Ordinary wear and tear of the elements.
      b. Manufacturing defect in Firestone brand materials.
      c. Defective workmanship used to install these materials.
      d. Damage due to winds up to 55 mph.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer - Roofing System: Firestone Building Products LLC, Carmel, IN: www.firestonebpco.com/#sle.
   1. Roofing systems manufactured by others are acceptable provided the roofing system is completely equivalent in materials and warranty conditions and the manufacturer meets the following qualifications:
      a. Specializing in manufacturing the roofing system to be provided.
      b. Minimum ten years of experience manufacturing the roofing system to be provided.

B. Manufacturer of Insulation and Cover Boards: Same manufacturer as roof membrane.

2.2 ROOFING SYSTEM DESCRIPTION

A. Roofing System: Thermoplastic polyolefin (TPO) single-ply membrane.
   1. Membrane Attachment: Fully adhered.
   2. Comply with applicable local building code requirements.

B. Roofing System Components: Listed in order from the top of the roof down:
   1. Membrane: Thickness 0.072 inch, minimum. Factory fabricated into largest sheets possible.
   2. Base Sheet Over Insulation: Mechanically attached.
   3. Insulation Cover Board: High density polyisocyanurate; mechanically attached.
   4. Insulation:
      a. Maximum Board Thickness: 3 inches; use as many layers as necessary; stagger joints in adjacent layers.

b. Tapered: Slope as indicated; provide minimum R-value at thinnest point; place tapered layer on bottom.
c. Total R-value of 30, minimum.
d. Top Layer: Polyisocyanurate foam board, non-composite; mechanically fastened.
e. Intermediate Layer(s), If Any: Polyisocyanurate foam board, non-composite; loose-laid, no attachment.
f. Bottom Layer: Polyisocyanurate foam board, non-composite; mechanically fastened.
g. Crickets: Tapered insulation of same type as specified for top layer; slope as indicated.
h. Vapor Barrier: As specified in 07 2500.

5. Deck Cover Board: Gypsum-based board, 1/2 inch thick; mechanically fastened. ***ADDENDUM 1***
6. Base Sheet: Fire-rated coated glass fiber slip sheet, loose-laid.

2.3 MEMBRANE MATERIALS

A. Membrane: Flexible, heat weldable sheet composed of thermoplastic polyolefin polymer and ethylene propylene rubber; complying with ASTM D6878/D6878M, with polyester weft inserted reinforcement and the following additional characteristics:
1. Thickness: 0.060 inch plus/minus 10 percent, with coating thickness over reinforcement of 0.024 inch plus/minus 10 percent.
2. Puncture Resistance: 265 lbf, minimum, when tested in accordance FTM 101C Method 2031.
3. Solar Reflectance: 0.79, minimum, when tested in accordance with ASTM C1549.
4. Color 1: White. Refer to drawings for locations. ***ADDENDUM 1***
5. Color 2: Gray. Refer to drawings for locations. Gray not required to meet solar reflectance minimum above. ***ADDENDUM 1***

B. Slip Sheet: Coated glass fiber mat; qualified as part of Class A assembly over combustible and non-combustible decks, complying with ASTM D828 tensile testing.

C. Membrane Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

D. Curb and Parapet Flashing: Same material as membrane, with encapsulated edge which eliminates need for seam sealing the flashing-to-roof splice; precut to 18 inches wide.

E. Formable Flashing: Non-reinforced, flexible, heat weldable sheet, composed of thermoplastic polyolefin polymer and ethylene propylene rubber.
1. Thickness: 0.060 inch plus/minus 10 percent.
2. Tensile Strength: 1550 psi, minimum, when tested in accordance with ASTM D638 after heat aging.
3. Elongation at Break: 650 percent, minimum, when tested in accordance with ASTM D638 after heat aging.
4. Tearing Strength: 12 lbf, minimum, when tested in accordance with ASTM D1004 after heat aging.
5. Color: White.
6. Acceptable Product: UltraPly TPO Flashing by Firestone.

F. Tape Flashing: 5-1/2 inch nominal wide TPO membrane laminated to cured rubber polymer seaming tape, overall thickness 0.065 inch nominal; TPO QuickSeam Flashing by Firestone.

G. Bonding Adhesive: Neoprene and SBR rubber blend, formulated for compatibility with the membrane other substrate materials, including masonry, wood, and insulation facings; UltraPly Bonding Adhesive by Firestone.

H. Pourable Sealer: Two-part polyurethane, two-color for reliable mixing; Pourable Sealer by Firestone.

I. Seam Plates: Steel with barbs and Galvalume coating; corrosion-resistance complying with FM 4470.

J. Termination Bars: Aluminum bars with integral caulk ledge; 1.3 inches wide by 0.10 inch thick; Firestone Termination Bar by Firestone.

K. Cut Edge Sealant: Synthetic rubber-based, for use where membrane reinforcement is exposed; UltraPly TPO Cut Edge Sealant by Firestone.

L. General Purpose Sealant: EPDM-based, one part, white general purpose sealant; UltraPly TPO General Purpose Sealant by Firestone.

M. Molded Flashing Accessories: Unreinforced TPO membrane pre-molded to suit a variety of flashing details, including pipe boots, inside corners, outside corners, etc.; UltraPly TPO Small and Large Pipe Flashing by Firestone.

N. Roof Walkway Pads: Non-reinforced TPO walkway pads, 0.130 inch by 30 inches by 40 feet long with patterned traffic bearing surface; UltraPly TPO Walkway Pads by Firestone.

2.4 ROOF INSULATION AND COVER BOARDS

A. Polyisocyanurate Board Insulation: Closed cell polyisocyanurate foam with black glass reinforced mat laminated to faces, complying with ASTM C1289 Type II Class 1, with the following additional characteristics:
   1. Thickness: As indicated elsewhere.
   2. Size: 48 inches by 96 inches, nominal.
      a. Exception: Insulation to be attached using adhesive or asphalt may be no larger than 48 inches by 48 inches, nominal.
   3. R-value (LTTR):
      a. 1.0 inch Thickness: 6.0, minimum.
      b. 1.25 inch Thickness: 7.5, minimum.
      c. 1.5 inch Thickness: 9.0, minimum.
      d. 1.75 inch Thickness: 10.5, minimum.
      e. 2.0 inch Thickness: 12.1, minimum.
      f. 3.0 inch Thickness: 18.5, minimum.
      g. 4.0 inch Thickness: 25.0, minimum.
   4. Compressive Strength: 20 psi when tested in accordance with ASTM C1289.
   5. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
   6. Recycled Content: 19 percent post-consumer and 15 percent pre-consumer (post-industrial), average.

B. High Density Polyisocyanurate Cover Board: Non-combustible, water resistant, high density closed cell polyisocyanurate core with coated glass mat facers, with the following characteristics:
   1. Size: 48 inches by 96 inches, nominal.
   2. Thickness: 1/2 inch.

3. Thermal Value: R-value of 2.5, when tested in accordance with ASTM C518 and ASTM C177.
4. Surface Water Absorption: 3 percent, maximum, when tested in accordance with ASTM C209.
5. Compressive Strength: 120 psi, when tested in accordance with ASTM D1621.
6. Density: 5 pcf, when tested in accordance with ASTM D1622/D1622M.
7. Factory Mutual approved for use with FM 1-60 and 1-90 rated roofing assemblies.
8. Mold Growth Resistance: Passing ASTM D3273.

C. Gypsum-Based Cover Board: Non-combustible, water resistant gypsum core with embedded glass mat facers, complying with ASTM C1177/C1177M, and with the following additional characteristics:
1. Size: 48 inches by 96 inches, nominal.
a. Exception: Board to be attached using adhesive or asphalt may be no larger than 48 inches by 48 inches, nominal.
2. Thickness: As indicated elsewhere.
3. Surface Water Absorption: 2.5 g, maximum, when tested in accordance with ASTM C473.
4. Spanning Capability: Recommended by manufacturer for following minimum flute spans:
5. Surface Burning Characteristics: Flame spread index of 0 (zero), smoke developed index of 0 (zero), when tested in accordance with ASTM E84.
6. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
7. Factory Mutual approved for use with FM 1-60 and 1-90 rated roofing assemblies.
8. Mold Growth Resistance: Zero growth, when tested in accordance with ASTM D3273 for minimum of 4 weeks.

D. Insulation Fasteners: Type and size as required by roof membrane manufacturer for roofing system and warranty to be provided; use only fasteners furnished by roof membrane manufacturer.

PART 3 EXECUTION

3.1 GENERAL

A. Install roofing, insulation, flashings, and accessories in accordance with roofing manufacturer's published instructions and recommendations for the specified roofing system. Where manufacturer provides no instructions or recommendations, follow good roofing practices and industry standards. Comply with federal, state, and local regulations.

B. Obtain all relevant instructions and maintain copies at project site for duration of installation period.

C. Do not start work until Pre-Installation Notice has been submitted to manufacturer as notification that this project requires a manufacturer's warranty.

D. Perform work using competent and properly equipped personnel.

E. Temporary closures, which ensure that moisture does not damage any completed section of the new roofing system, are the responsibility of the applicator. Completion of flashings, terminations, and temporary closures shall be completed as required to provide a watertight condition.

F. Install roofing membrane only when surfaces are clean, dry, smooth and free of snow or ice; do not apply roofing membrane during inclement weather or when ambient conditions will not allow

proper application; consult manufacturer for recommended procedures during cold weather. Do not work with sealants and adhesives when material temperature is outside the range of 60 to 80 degrees F.

G. Protect adjacent construction, property, vehicles, and persons from damage related to roofing work; repair or restore damage caused by roofing work.
   1. Protect from spills and overspray from bitumen, adhesives, sealants and coatings.
   2. Particularly protect metal, glass, plastic, and painted surfaces from bitumen, adhesives, and sealants within the range of wind-borne overspray.
   3. Protect finished areas of the roofing system from roofing related work traffic and traffic by other trades.

H. Until ready for use, keep materials in their original containers as labeled by the manufacturer.

I. Consult membrane manufacturer's instructions, container labels, and Material Safety Data Sheets (MSDS) for specific safety instructions. Keep all adhesives, sealants, primers and cleaning materials away from all sources of ignition.

3.2 EXAMINATION

A. Examine roof deck to determine that it is sufficiently rigid to support installers and their mechanical equipment and that deflection will not strain or rupture roof components or deform deck.

B. Verify that surfaces and site conditions are ready to receive work. Correct defects in the substrate before commencing with roofing work.

C. Examine roof substrate to verify that it is properly sloped to drains.

D. Verify that the specifications and drawing details are workable and not in conflict with the roofing manufacturer's recommendations and instructions; start of work constitutes acceptable of project conditions and requirements.

3.3 PREPARATION

A. Take appropriate measures to ensure that fumes from adhesive solvents are not drawn into the building through air intakes.

B. Prior to proceeding, prepare roof surface so that it is clean, dry, and smooth, and free of sharp edges, fins, roughened surfaces, loose or foreign materials, oil, grease and other materials that may damage the membrane.

C. Fill all surface voids in the immediate substrate that are greater than 1/4 inch wide with fill material acceptable insulation to membrane manufacturer.

D. Seal, grout, or tape deck joints, where needed, to prevent bitumen seepage into building.

3.4 VAPOR RETARDER

A. Before installing insulation install vapor retarder directly over the deck.

B. Ensure that all penetrations and edge conditions are sealed to prevent moisture and air drive into the roofing system.

3.5 INSULATION AND COVER BOARD INSTALLATION

A. Install insulation in configuration and with attachment method(s) specified in PART 2, under Roofing System.

B. Install insulation in a manner that will not compromise the vapor retarder integrity.

C. Install only as much insulation as can be covered with the completed roofing system before the end of the day's work or before the onset of inclement weather.

D. Lay roof insulation in courses parallel to roof edges.

E. Neatly and tightly fit insulation to all penetrations, projections, and nailers, with gaps not greater than 1/4 inch. Fill gaps greater than 1/4 inch with acceptable insulation. Do not leave the roofing membrane unsupported over a space greater than 1/4 inch.

F. Mechanical Fastening: Using specified fasteners and insulation plates engage fasteners through insulation into deck to depth and in pattern required by membrane manufacturer.

3.6 SINGLE-PLY MEMBRANE INSTALLATION

A. Beginning at low point of roof, place membrane without stretching over substrate and allow to relax at least 30 minutes before attachment or splicing; in colder weather allow for longer relax time.

B. Lay out the membrane pieces so that field and flashing splices are installed to shed water.

C. Install membrane without wrinkles and without gaps or fishmouths in seams; bond and test seams and laps in accordance with membrane manufacturer's instructions and details.

D. Install membrane adhered to the substrate, with edge securement as specified.

E. Adhered Membrane: Bond membrane sheet to substrate using membrane manufacturer's recommended bonding material, application rate, and procedures.

F. Edge Securement: Secure membrane at all locations where membrane terminates or goes through an angle change greater than 2 in 12 inches using mechanically fastened reinforced perimeter fastening strips, plates, or metal edging as indicated or as recommended by roofing manufacturer.
   1. Exceptions: Round pipe penetrations less than 18 inches in diameter and square penetrations less than 4 inches square.
   2. Metal edging is not merely decorative; ensure anchorage of membrane as intended by roofing manufacturer.

3.7 FLASHING AND ACCESSORIES INSTALLATION

A. Install flashings, including laps, splices, joints, bonding, adhesion, and attachment, as required by membrane manufacturer's recommendations and details.

B. Metal Accessories: Install metal edgings, gravel stops, and copings in locations indicated on the drawings, with horizontal leg of edge member over membrane and flashing over metal onto membrane.
   1. Follow roofing manufacturer's instructions.
   2. Remove protective plastic surface film immediately before installation.

3. Install water block sealant under the membrane anchorage leg.
4. Flash with manufacturer's recommended flashing sheet unless otherwise indicated.
5. Where single application of flashing will not completely cover the metal flange, install additional piece of flashing to cover the metal edge.
6. If the roof edge includes a gravel stop and sealant is not applied between the laps in the metal edging, install an additional piece of self-adhesive flashing membrane over the metal lap to the top of the gravel stop; apply seam edge treatment at the intersections of the two flashing sections.
7. When the roof slope is greater than 1:12, apply seam edge treatment along the back edge of the flashing.

C. Scuppers: Set in sealant and secure to structure; flash as recommended by manufacturer.

D. Roofing Expansion Joints: Install as shown on drawings and as recommended by roofing manufacturer.

E. Flashing at Walls, Curbs, and Other Vertical and Sloped Surfaces: Install weathertight flashing at all walls, curbs, parapets, curbs, skylights, and other vertical and sloped surfaces that the roofing membrane abuts to; extend flashing at least 8 inches high above membrane surface.
   1. Use the longest practical flashing pieces.
   2. Evaluate the substrate and overlay and adjust installation procedure in accordance with membrane manufacturer's recommendations.
   3. Complete the splice between flashing and the main roof sheet with specified splice adhesive before adhering flashing to the vertical surface.
   4. Provide termination directly to the vertical substrate as shown on roof drawings.

F. Roof Drains:
   1. Taper insulation around drain to provide smooth transition from roof surface to drain. Use specified pre-manufactured tapered insulation with facer or suitable bonding surface to achieve slope; slope not to exceed manufacturer's recommendations.
   2. Position membrane, then cut a hole for roof drain to allow 1/2 to 3/4 inch of membrane to extend inside clamping ring past drain bolts.
   3. Make round holes in membrane to align with clamping bolts; do not cut membrane back to bolt holes.
   4. Apply sealant on top of drain bowl where clamping ring seats below the membrane
   5. Install roof drain clamping ring and clamping bolts; tighten clamping bolts to achieve constant compression.

G. Flashing at Penetrations: Flash all penetrations passing through the membrane; make flashing seals directly to the penetration.
   1. Pipes, Round Supports, and Similar Items: Flash with specified pre-molded pipe flashings wherever practical; otherwise use specified self-curing elastomeric flashing.
   2. Pipe Clusters and Unusual Shaped Penetrations: Provide penetration pocket at least 2 inches deep, with at least 1 inch clearance from penetration, sloped to shed water.
   3. Structural Steel Tubing: If corner radii are greater than 1/4 inch and longest side of tube does not exceed 12 inches, flash as for pipes; otherwise, provide a standard curb with flashing.
   4. Flexible and Moving Penetrations: Provide weathertight gooseneck set in sealant and secured to deck, flashed as recommended by manufacturer.
   5. High Temperature Surfaces: Where the in-service temperature is, or is expected to be, in excess of 180 degrees F, protect the elastomeric components from direct contact with the hot surfaces using an intermediate insulated sleeve as flashing substrate as recommended by membrane manufacturer.

3.8 FINISHING AND WALKWAY INSTALLATION

A. Install walkways at access points to the roof, around rooftop equipment that may require maintenance, and where indicated on the drawings.

B. Walkway Pads: Adhere to the roofing membrane, spacing each pad at minimum of 1.0 inch and maximum of 3.0 inches from each other to allow for drainage.
   1. If installation of walkway pads over field fabricated splices or within 6 inches of a splice edge cannot be avoided, adhere another layer of flashing over the splice and extending beyond the walkway pad a minimum of 6 inches on either side.
   2. Prime the membrane, remove the release paper on the pad, press in place, and walk on pad to ensure proper adhesion.

3.9 FIELD QUALITY CONTROL

A. Inspection by Manufacturer: Provide final inspection of the roofing system by a Technical Representative employed by roofing system manufacturer specifically to inspect installation for warranty purposes (i.e. not a sales person).

B. Perform all corrections necessary for issuance of warranty.

3.10 CLEANING

A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.

B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of manufacturers of components and surfaces.

C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.11 PROTECTION

A. Where construction traffic must continue over finished roof membrane, provide durable protection and replace or repair damaged roofing to original condition.

END OF SECTION

2. Touch-up damaged coating and finishes and repair minor damage.
3. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned, and apply touch up of compatible air drying primer.

C. Final Adjustments:
1. Lubricate Hinges, verify recommended clear opening adjustments open and closed to operate easily, free from warp, twist, or distortion and fitting weathertight for the entire perimeter.
2. Check and readjust operating finish hardware items, leaving vertical “One Piece” doors undamaged and in complete and proper operating condition.

3.5 DEMONSTRATION

A. Startup Services: Engage a qualified -authorized service representative to perform startup services and to train Engineer’s maintenance personnel as specified below:
1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls & equipment.
2. Train Engineer's maintenance personnel on procedures and schedules related to startup and shut down, operating , troubleshooting, servicing, and preventative maintenance.
3. Review data in the installation & maintenance manuals.

3.6 WARRANTY

A. The Contractor shall warrant the door to be free of defects in accordance with the General Conditions, except the warranty shall be extended by manufacturer’s 2 - year written warranty against defects in materials and workmanship, against problems which arise through normal anticipated usage of the door during the warranty period. The warranty shall be signed by the manufacturer.

3.7 UPGRADE EQUIPMENT

A. Provide the following upgrade equipment:
1. Top Limit Override Safety Switches
a. Upper override switch that disconnects power to door if upper limit fails or if limits are overridden. This safety feature is designed to prevent the door from traveling beyond it’s recommended clear opening height. If the door passes its full clear opening height, it will activate the override and stop the door automatically
2. Electric Photo Eye Sensors
a. Electric Photo Eye Sensors mounted near floor level prevent or stop & reverse the door when an obstruction brakes the detection beam. If the beam is broken, door will reverse to a fully open position.
3. Emergency Operation - Auxiliary Backup System
a. Auxiliary Operated Backup
1) The door shall be capable of being auxiliary operated in the event of a power outage.
2) Include disconnect device to prevent motor from operating when manually operating door.
3) Manual opp. of door shall be designed to avoid damage to doors, safety edges, and electrical system.
4) Provide safety operating instructions : Observe all safety precautions according to the manufacturer's precautions.
4. Radio Control System consisting of the following:
a. 3-channel coaxial receiver to open, close, and stop door per operator.

b. Multifunction remote control transmitter. (Quantity of 2 per door). Important :When the operator takes his hand off the remote control transmitter, the door immediately stops regardless of its opening / closing position.

END OF SECTION

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SECTION 31 2300 - EXCAVATING, FILLING & GRADING

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

A. Requirements of the Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections apply to all work under this section.

B. All materials and construction methods shall be in accordance with the City of Baltimore "Standard Specifications for Material, Highways, Bridges, Utilities, and Incidental Structures," 2006 edition, hereinafter referred to as the "Standard Specifications," City of Baltimore Standard Details March 2008 and as amended on the drawings.

C. Requirements of the herein attached, "Environmental Management Plan (EMP)," shall supersede work outlined under this general section.

D. Throughout the specifications, types of materials may be specified by manufacturer's name and catalogue number in order to establish standards of quality and performance and not for the purpose of limiting competition. Alternate methods and/or materials may be submitted to the Engineer for consideration. Those judged to be equal to that specified will receive written approval.

1.2 DESCRIPTION SUMMARY

A. This Section includes the following:
   1. Backfilling operation to bring the existing site to grade.
   2. Preparing and grading sub grades to slabs-on-grade, walks, pavements, turf and grass, and exterior plants (landscaping).
   3. Excavating and backfilling for buildings and structures.
   4. Drainage and moisture-control fill course for slabs-on-grade.
   5. Subbase course for walks and pavements.
   6. Subsurface drainage backfill for walls and trenches.
   7. Excavating and backfilling trenches within building lines.
   8. Excavating and backfilling for underground utilities and appurtenances.
   9. Excavating and backfilling contaminated soils as outlined in the attached "Soil Management Plan."

B. Related Sections:
   1. Section 0115 00: Temporary Utilities
   2. Section 033300: Cast-in-Place Concrete
   3. Section 311000: Site Clearing
   4. Section 329000: Planting

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation:

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.

2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and surface pavement in a paving system.

C. Bedding course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe

D. Borrow Soil: Satisfactory soil material imported from off-site when sufficient approved soil material is not available from on-site excavations.

E. Drainage Fill: Course of washed granular material supporting slab-on-grade placed to cut off upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevation and to lines and dimensions indicated, and the reuse or disposal of materials removed.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by the Engineer. Authorized additional excavation and replacement will be paid for according to the Contract provisions for changes in Work.

2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.

3. Unauthorized Excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Engineer. Unauthorized excavation, as well as remedial work directed by the Engineer shall be at the Contractor's expense.

4. Additional excavation: When excavation has reached required subgrade elevations, the contractor will notify the independent testing agency who will make an inspection of conditions and submit inspection report for review and approval the Engineer (authority having jurisdiction). The Contractor is responsible to attain the testing agency and coordinate the scheduling of the inspections such that there is no delay in the Project. If the Inspection Agency determines that bearing material at required subgrade elevations are unsuitable, continue excavation until suitable bearing materials are encountered and replace excavated material as directed by them

5. An independent agency, acceptable to authorities having jurisdiction,

G. Fill: Soil materials used to raise existing grades.

H. Recycled Material: Recycled Material shall contain a minimum of 90% post-consumer material.

I. Rock Excavation in Trench Excavation and Pits, including continuous wall footings and individual column footings, shall consist of:
   1. The removal of/and disposal of solid rock, ledge rock, rock hard cementitious materials and/or boulders ½ cubic yards or more in volume in trench excavations less than 10 feet in width and pits less than 30 feet in either length or width.
   2. Excavation of materials that required the use of:
      a. Excavating equipment which exceeds standard Earth Excavating Equipment as defined herein.
      b. Systematic drilling.
      c. Hand-held or backhoe mounted pneumatic hammers
      d. Blasting.

3. Blasting will only be permitted after receiving permission from the Engineer and local authorities. The Contractor shall obtain special liability insurance to protect all parties, including the Engineer from all claims resulting from any blasting.

J. Rock Excavation in open excavation (all excavations other than trench excavation and pit excavation) shall consist of the following:
   1. The removal and disposal of solid rock, ledge rock, rock hard cementitious material and/or boulders 2 cubic yards or more in volume.
   2. Excavation of materials that requires the use of:
      a. Excavation equipment which exceeds standard Earth Excavation Equipment as defined herein.
      b. Systematic drilling.
      c. Hand-held or backhoe mounted pneumatic hammers.
   3. Blasting will not be permitted.

K. The Contractor is advised that minimum standard earth excavation equipment is defined as follows:
   1. For Trench Excavation as defined herein: 250 H.P., track mounted, hydraulic excavator with a 3-foot rock bucket.
   2. For Open Excavation as defined herein: 280 H.P. crawler dozer with a single shank ripper.

L. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.

M. Subbase Course: The layer between the subgrade and base course in a paving system or the layer placed between the subgrade and surface of a pavement or walk

N. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

O. Utilities include on-site underground pipes, conduits, ducts, and cable, as well as underground services within building lines.

1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for the following:
   1. Each type of warning tape.
   2. Filter fabric and geotextiles.
   3. Recycled materials.
   4. Requirements for local material source.

C. Test Reports: In addition to test reports required under field quality control, submit the following:
   1. Laboratory analysis of each soil material proposed for fill and backfill from on-site and borrow sources, including classification per ASTM D2487.
   2. One moisture density curve for each soil material, per AASHTO T-180.
   3. Reports of actual unconfined compressive strength and/or results of bearing tests of each stratum tested.
   4. All support of excavation submittals must be accompanied by working drawings and design calculations. The drawings and calculations must be signed and sealed by a professional engineer licensed in the state of Maryland.

1.5 QUALITY ASSURANCE

A. Codes and Standards: Perform earthwork complying with requirements of Authorities having jurisdiction.

B. Testing and Inspection Service: The Contractor will employ a qualified independent geotechnical engineering testing agency to classify proposed on-site and borrow soils to verify that soils comply with specified requirements and to perform required field and laboratory

testing during earthwork operations and to check bearing capacities of excavated footings to confirm required bearing capacity prior to installation of reinforcing steel and concrete. All testing and reports shall be provided at no additional cost to the Engineer.

C. Pre-excavation Conference: Before commencing earthwork, meet with representatives of the governing authorities and the Engineer at Project site. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

1.6 PROJECT CONDITIONS

A. Backfilling below-grade areas: The backfilling operation required to bring actual grades to the grade elevations shown on the drawings as existing grades.
   1. The borrow material shall be removed and then either stored or disposed. If the testing agency verifies that the borrow material complies with these specifications for backfill material, then the Contractor may use it to backfill this area to grade.
   2. Any additional backfill material necessary to complete this operation shall comply with these specifications.
   3. This backfilling operation shall be the first earthwork operation performed on site after establishment of the sediment control devices.

B. Site Information: Data in subsurface investigation reports was used for the basis of the design. The data in the subsurface investigation report is not a part of the Contract. Conditions are not intended as representations or warranties of accuracy or continuity between soil borings. The Engineer, or Engineers will not be responsible for interpretations or conclusions drawn from this data by the Contractor.
   1. Additional test borings and other exploratory operations may be performed by the Contractor, at the Contractor's option; however, no change in the Contract Sum will be authorized for such additional exploration.

C. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Engineer and then only after acceptable temporary utility services have been provided. If existing utilities are indicated to be abandoned, the Contractor shall remove such utility, if necessary, at no additional cost to the Owner.
   1. Provide a minimum 48-hours-notice to the Engineer and receive written notice to proceed before interrupting any utility.

D. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.

E. Should uncharted or incorrectly charted, piping or other utilities be encountered during excavation, consult utility Engineer immediately for directions. Cooperate with Engineer and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility Engineer.

F. Protection of Persons and Property: Barricade open excavations occurring as part of this work and post with warning lights. Open excavation within the roadways shall be plated and shall be posted with warning devices in accordance with the Manual of Uniform Traffic Control Devices.
   1. Perform excavation by hand within dripline of large trees to remain. Protect root systems from damage or dry out to the greatest extent possible. Maintain moist condition for root system and cover exposed roots with moistened burlap.
   2. Work which affects the public right-of-way shall be in accordance with the Baltimore City requirements and regulations.

G. Moisture Sensitive Soils:
   1. The on-site founding materials are moisture sensitive and will be easily disturbed by excessive construction activity.
   2. The exposed founding materials shall be protected against detrimental changes in engineering qualities as a result of disturbance from rain or frost.
   3. Surface runoff shall be drained away from the excavations and not allowed to pond.

4. If possible, concrete shall be placed in the footings the same day the excavations are made, or the founding materials may be covered by mud mats in order to protect the founding soil from becoming saturated due to forecasted precipitation and/or disturbed due to excessive construction activity during the placement of steel reinforcement.
5. The presence of moisture sensitive fine-grained soils poses the potential for high moisture content. Soils may be found to be at or near their plastic limit; consequently, the on-site soils may require discing, aeration, and/or manipulation to achieve efficient compaction.
6. Any regions exhibiting poor drainage characteristics, and low lying areas, shall be expected to display moisture contents which are excessively high for normal earthwork operations.
7. Any standing water shall be drained or pumped into approved sediment control facilities prior to commencement of earthwork.
8. Excavations near to subgrade and all fills should be protected from traffic of heavy equipment, including heavy compaction equipment, when on-site soils exhibit high moisture contents, in order to minimize pumping and a generalized deterioration of these materials.

H. The Contractor is solely responsible for the protection of the sub-grade until it receives final surface treatment and shall maintain the sub-grade as suitable and acceptable to the Engineer. He shall be completely responsible for restoration or replacement of the sub-grade due to moisture damage, construction traffic, or any other cause. Repair or replacement of the sub-grade shall be performed at no additional cost to the Engineer.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations. Classification of materials shall be made by the Engineers independent testing agency.
   1. Provide subbase and backfill manufactured and of primary raw materials extracted or recovered within 500 mile radius of Project Site.

B. Satisfactory Soil Materials: ASTM D 2487 soil classified as SM , SC, SP, GM, GC, and GP and having a liquid limit less than 35 and a plasticity index less than 20; free of rock or gravel large than 4 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter. However, materials used as backfill behind below-grade walls or retaining walls should have classifications of Sandy SILT (ML), or more granular, in accordance with ASTM D 2487, and should have at least 30 percent by weight of soil particles retained on the No. 200 sieve. Based on the boring results, the majority of the on-site material may be usable as structural fill, provided that its moisture content is within +/-2 percent of the optimum moisture content.

C. Unsatisfactory Soil Materials: ASTM D 2487 soil classification groups CL, MH, CH, OL, OH, and PT.

D. Backfill and Fill Materials: Satisfactory soil materials.

E. Subbase and Base Material: naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, ASTM D 2940. Graded aggregate for subbase courses shall meet the requirements for G A S/B as shown in Table 312300-1. Recycled concrete (RC-6) should not be used under the building and stormwater management facilities, but may be used for the parking lot.

Table 312300-1			
SIEVES		MASS PERCENT PASSING	
Mm	Standard	BRG S/B	G A S/B
100	4 in.		
90	3.5 in.		
63	2.5 in.	100	
50	2 in.		100, ± 3
37.5	1.5 in.		90 - 100, ± 5
25	1 in.	90 - 100	
19	¾ in.		
12.5	½ in.	60 - 100	
9.5	3/8 in.		
4.75	#4		30 - 60, ± 10
2.36	#8		
2.0	#10	35 - 90	
0.60	#30		
0.425	#40	20 - 55	
0.075	#200	5 - 25	0 - 12, ± 5

F. Engineered Fill: Subbase or base materials

G. Bank Run Gravel for subbases: Bank Run Gravel for subbase courses shall meet the requirements for BRG S/B as shown in Table 312300-1.

H. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, AASHTO M43, coarse aggregate grading size 57, with 100 percent passing a 1 inch sieve and not more than 5 percent passing a No. 8 sieve.

I. Filtering Material: Evenly graded mixture of natural or crushed gravel or crushed stone and natural sand, with 100 percent passing a 1inch sieve and 0 to 5 percent passing a No. 50 sieve.

J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

K. Recycled Content of Backfill: Provide recycled concrete (RC-6) for temporary roads, subbase, pipe bedding, and fill material, except under the building slab. Recycled aggregates shall contain a minimum of 90% post-consumer aggregate content.

L. Regional Materials: Provide aggregate and sand products manufactured and of primary raw materials extracted or recovered within 500 mile radius of Project Site.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep.

1. Tape Colors: Provide tape colors to utilities as follows:
   a. Red: Electric
   b. Yellow: Gas, oil, steam, and dangerous materials
   c. Orange: Telephone and other communications
   d. Blue: Water Systems
   e. Green: Sewer Systems

B. Filter Fabric: Manufacturer's standard nonwoven previous geotextile fabric of polypropylene, nylon, or polyester fibers, or a combination.

1. Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D4759 and the referenced standard test method in parentheses:
   a. Grab Tensile Strength (ASTM D 4362): 100lb.
   b. Apparent Opening Size (ASTM D 4751): #100 U.S. Standard sieve.
   c. Permeability (ASTM 4491): 150 gallons per minute per sq. ft.

2.2 CONTROLLED LOW-STRENGTH MATERIAL

A. Controlled Low-Strength Material: Self-compacting, low-density, flowable concrete material produced from the following:

1. Portland Cement: ASTM C 150, Type I Type II or Type III.
2. Fly Ash: ASTM C 618, Class C or F.
3. Normal-Weight Aggregate: ASTM C 33, 3/8-inch nominal maximum aggregate size.
4. Foaming Agent: ASTM C 869.
5. Water: ASTM C 94.
6. Air-Entraining Admixture: ASTM C 260.

PART 3 EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

D. Tree protection is specified in the Division 31 Section 31 10 00 - "Site Clearing."

3.2 DEWATERING

A. Prevent surface water and subsurface or groundwater from entering excavations, from ponding on prepared subgrades, and from flooding project site and surrounding area.

B. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

C. All pumped water shall be disposed of as approved by the Engineer and comply with local codes, ordinances and authority having jurisdiction. Provide and maintain pumps, well points,

and sumps, suction and discharge lines, and other dewatering system components necessary to convey water away from excavations.

D. Provide adequate pumps, well points, and other equipment, appurtenances, power, drains, material, and labor necessary to do all pumping needed to keep the excavations, pits, trenches, and all spaces included in the area of the swimming pool and building dry during the casting of mats, footings, slabs, and walls, and at such other times as the progress of the work may demand.

E. During excavation and placing of mats, footings, slabs, and walls, ground water shall be maintained a minimum of one foot below the levels of their bottoms. The dewatering system shall maintain such levels until the backfilling is completed and the removal of the dewatering equipment will not cause or endanger any construction, as determined by the Engineer.

F. The dewatering system shall also be adequate to remove storm water from the excavations and prevent accumulation of surface water within the construction area.

3.3 BACKFILLING BELOW-GRADE AREAS

A. Completely fill below-grade areas and void resulting from the demolition of the site improvements and pavements with compacted fill, as described below, to the grades as shown as existing grades on the drawings.
   1. Use satisfactory soil materials, as defined by ASTM D 2487, consisting of SM , SC, SP, GM, GC, and GP having a liquid limit less than 35 and a plasticity index less than 20; free of rock or gravel large than 4 inches in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter. However, materials used as backfill behind below-grade walls or retaining walls should have classifications of Sandy SILT (ML), or more granular, in accordance with ASTM D 2487, and should have at least 30 percent by weight of soil particles retained on the No. 200 sieve.
   2. Prior to placement of compacted structural fill, the fill subgrade should be stripped of organic layers and then proof rolled under the observation of the Engineers Testing Agency. A minimum 35-ton dump truck should be used for proof rolling. Areas of subgrade that exhibit pumping or contain organic material should be removed down to firm, natural soils. Any additional loose or unsuitable soils found should be removed and replaced with compacted fill.
   3. Place fill materials in horizontal layers not exceeding 8 inches in loose depth. Compact each layer to a density not less than 92% of the maximum dry density when tested in accordance with ASTM D-1557, Modified Proctor. In building and pavement areas, the top 12 inches of fill should be compacted to 98% of the maximum density when tested in accordance with ASTM D-1557, Modified Proctor. Fill materials should be placed at moisture contents within +2 points of the optimum moisture content. No compacted fill shall be placed unless a soils technician is present to monitor fill compaction.

B. Testing Agency shall verify compliance of borrow material at both the in-situ location and after the material has been brought to the site.

3.4 EXCAVATION

A. Explosives: Do not use explosives.

B. Unclassified Excavation: Excavation is unclassified and includes excavation to required subgrade elevations regardless of the character of materials and obstructions encountered.

3.5 STABILITY OF EXCAVATIONS

A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.

B. Slope sides of excavation to comply with local codes, ordinances, and requirements of authorities having jurisdiction. Shore and brace where sloping is not possible because of space

restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

C. Shoring and bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Extend shoring and bracing as excavation progresses.

3.6 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within tolerance of plus or minus ½ inches. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, installing services and other construction, and for inspection.
   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
   2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Appurtenances: Excavate to elevations and dimensions indicated within a tolerance of plus or minus ½ inches. Do not disturb bottom of excavations intended for bearing surface.

3.7 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross sections, elevation and grades.

3.8 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated slopes, lines, depths, and invert elevations.
   1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe conduit, unless otherwise indicated.
   1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels, of pipes and for joints, fittings, and bodies of conduits. Remove stones and sharp objects to avoid point loading.
   1. For pipes or conduit less than 6 inches in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
   2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill. At each pipe joint, dig bell holes to relieve pipe bells of loads and ensure continuous bearing of pipe barrel on bearing surface.

3.9 UNAUTHORIZED EXCAVATION

A. Under footings, foundation bases, or retaining walls, fill unauthorized excavation by extending indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position, when acceptable to Engineer.

B. In locations other than those above, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by the Engineer.

3.10 APPROVAL OF SUBGRADE

A. Notify Engineer when excavations have reached required subgrade.

B. When Engineer determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
   1. Unforeseen additional excavation and replacement material will be paid according to the Contract provisions for changes in Work.

C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Engineer.

3.11 STORAGE OF SOIL MATERIALS

A. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind-blown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.12 BACKFILL

A. Backfill excavations promptly, but not before completing the following:
   1. Acceptance of construction below finish grade including, where applicable, damp-proofing, waterproofing, and perimeter insulation.
   2. Surveying locations of underground utilities for record documents.
   3. Testing, inspecting, and approval of underground utilities.
   4. Concrete formwork removal.
   5. Removal of trash and debris from excavation.
   6. Removal of temporary shoring and bracing, and sheeting.
   7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.13 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on unyielding bearing surface and to fill unauthorized excavations. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Concrete backfill trenches that carry below or pass under footings and that are excavated within 18 inches of footings. Place concrete to level of 4 inches above bottom of footings.

C. Provide 4 inch thick concrete base slab support for piping or conduit less than 30 inches below surface of roadways. After installation and testing, completely encase piping or conduit in a minimum 4 inches of concrete before backfilling or placing roadway subbase.

D. Place and compact initial backfill of satisfactory soil material or subbase material, free of particles large than 1 inch, to a height of 12 inches over the utility pipe or conduit.
   1. Carefully compact material under pipe haunches and bring backfill evenly up to both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

E. Coordinate backfilling with utilities testing.

F. Fill voids with approved backfill materials as shoring and bracing, and sheeting is removed.

G. Place and compact final backfill of satisfactory soil material to final subgrade.

H. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.14 BUILDING SLAB DRAINAGE COURSE

A. General: Drainage course consists of placement of drainage fill material, in layers of indicated thickness, over subgrade surface to support concrete building slabs.

B. Placing: Place drainage fill material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting material during placement operations.

1. Provide minimum 4 inches of drainage fill below all slabs. Drainage fill shall be an evenly graded mixture of natural or crushed gravel or crushed stone and natural sand with 95-100 percent passing a 1 inch sieve and less than 12 percent passing a No. 200 sieve. Place in a single layer and compact to a minimum of 98 percent of the maximum dry density, as determined by the Modified Proctor compaction test method ASTM D 1557. Overlay fill with vapor barrier below all slabs.

3.15 SUBSURFACE DRAINAGE BACKFILL

A. Subsurface Drain: Place a layer of filter fabric around perimeter of drainage trench or at footing, as indicated. Place a 6 inch compacted course of filtering material on filter fabric to support drainage pipe. After installing and testing, encase drainage pipe in a minimum of 6 inches of compacted filtering material and wrap in filter fabric, overlapping edges at least 6 inches.

B. Impervious Fill: Place and compact impervious fill material for top 12" to final subgrade.

3.16 FILL

A. Preparation: Remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstruction, and deleterious materials from ground surface prior to placing fills.
   1. Plow strip, or break up sloped surface steeper than 1 vertical 4 horizontal so fill material will bond with existing surface. Compact all surfaces with a minimum 10-ton smooth drum or sheepfoot roller.

B. When subgrade or existing ground surface to receive fill has density less than required for fill, break up ground surface to depth required, pulverize, moisture-condition or aerate soil and re-compact to required density.

C. Place fill material in layers to required elevations for each location listed below.
   1. Under grass, use satisfactory excavated or borrow soil material.
   2. Under walks, pavements, and footings use subbase or base material, or satisfactory excavated or borrow soil material.
   3. Under steps and ramps, use subbase material.
   4. Under piping and conduit and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation. Shape excavation bottom to fit bottom 90 degrees of cylinder.

3.17 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
   1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
   2. Remove and replace, or scarify and air-dry satisfactory soil material that is too wet to compact to specified density.
   a. Stockpile or spread and dry removed wet satisfactory soil material.

3.18 COMPACTION

A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations to prevent wedging action. Place backfill and fill uniformly along the full length of each structure.

C. Control soil and fill compaction, providing minimum percentage of density specified for each area classification indicated below. Correct improperly compacted areas or lifts as directed by Engineer if soil density tests indicate inadequate compaction.

D. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D-1557 (Modified Proctor):

1. **ADDENDUM 1** Under structures, building slabs, steps, compact the top 12 inches of fill materials below subgrade to 98 ~~95~~ percent maximum density. Each layer of backfill or fill material below the top 12 inches should be compacted to 92 percent maximum dry density.
2. **ADDENDUM 1** Under pavement, compact the top 12 inches of fill materials below subgrade to 98 ~~p~~ercent maximum density. Each layer of backfill or fill material below the top 12 inches should be compacted to 92 percent maximum dry density.
3. **ADDENDUM 1** Under walkways, compact the top 6 inches below subgrade and each layer of backfill or fill material at 92 ~~90~~ percent maximum density.
4. Under lawn or unpaved areas, compact the top 6 inches below subgrade and each layer of backfill or fill material at 85 percent maximum density.

E. **ADDENDUM 1** Proof roll all areas which are to receive pavements and slab-on-grade for the proposed ~~school~~ building with vehicle having a minimum axle load of 35 tons. Unsuitable materials shall be removed and replaced with new compacted fill.

F. When existing ground surface has a density less than that specified under “Compaction” for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.

3.19 GRADING

A. General: Uniformly grade areas to a smooth surface free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
1. Provide a smooth transition between existing adjacent grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
1. Lawn or Unpaved Areas: Plus or minus 1 inch.
2. Walks: Plus or minus 1 inch.
3. Pavements: Plus or minus 1/2 inch.

C. Grading Inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.20 SUBBASE AND BASE COURSES

A. Under pavements and walks, place subbase course material on prepared subgrades. Place base course material over subbases to pavements.
1. Compact subbase course within 2% of optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of ASTM 1557 maximum dry density.
2. Shape subbase and base to required crown elevations and cross-slope grades.
3. When thickness of compacted subbase or base course is 6 inches or less, place materials in a single layer.
4. When thickness of compacted subbase or base course exceed 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

B. Pavement Shoulders: Place shoulder along edges of subbase and base course to prevent lateral movement. Construct shoulders at least 12 inches wide of acceptable soil materials and compact simultaneously with each subbase and base layer.

3.21 DRAINAGE FILL

A. Under slabs-on-grade, place drainage fill course on prepared subgrade.
1. Compact drainage fill to required cross sections and thickness,
2. When compacted thickness of drainage fill is 6 inches or less, place materials in a single layer.

3. When compacted thickness of drainage exceeds 6 inches thick place materials in equal layers, with no layer more than 6 inches thick nor less than 3 inches thick when compacted.

3.22 FIELD QUALITY CONTROL

A. Testing Agency Service: Engage qualified independent testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements that shall be reviewed and approved by the Engineer.
   1. Perform field-in-place density tests according to ASTM D 1556 (sand cone method).
      a. Field-in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.
      b. When field-in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each difference type of material encountered, and at intervals as directed by the Engineer.
   2. Footing Subgrade: Inspect bearing state at each column footing and at twenty foot intervals in wall footings, at the footing subgrade, to verify required bearing capacity.
   3. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2000 sq. ft. or less of paved areas or building slab, but in no case fewer than three tests.
   4. Foundation Wall Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 50 feet or less of wall length, but no fewer than two tests along a wall face.
   5. Trench Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 50 feet or less of trench, but no fewer than two tests.

B. When qualified independent testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, recompact and retest until required density is obtained. Testing will be paid by the Contractor at no additional cost to the Engineer.

3.23 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.
   1. Scarify or remove and replace material to depth directed by the Engineer; reshape and re-compact at optimum moisture content to the required density.

C. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
   1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.24 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Contractor shall remove and dispose of offsite all excess topsoil and/or borrow remaining after final grading has been completed.
   1. Remove waste material, including unsatisfactory soil trash, debris, and legally dispose of off the Engineer's property.

END OF SECTION

ENVIRONMENTAL MANAGEMENT PLAN

CHERRY HILL PARK IMPROVEMENT PROJECT

Baltimore City, Maryland

June 14, 2019 revised November 26, 2019

Submitted to:

Maryland Department of the Environment
Land Restoration Program
1800 Washington Boulevard
Baltimore, Maryland 21230

Attn: Ms. Anuradha Mohanty

Prepared for:

BALTIMORE CITY RECREATION AND PARKS
Capital Development and Planning
2600 Madison Avenue
Baltimore, Maryland 21217

Attn: Mr. Adam Boarman

Prepared by:

GEO-TECHNOLOGY ASSOCIATES, INC.
Geotechnical and Environmental Consultants
14280 Park Center Drive, Suite A
Laurel, Maryland 20707
(410) 792-9446 or (301) 470-4470
www.gtaeng.com

GTA Project No. 180985x1

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CHERRY HILL PARK IMPROVEMENT PROJECT
BALTIMORE CITY, MARYLAND
JUNE 14, 2019 REVISED NOVEMBER 26, 2019

1.0 INTRODUCTION

1.1 Overview and Purpose

At the request of Baltimore City Recreation and Parks (BCRP), Geo-Technology Associates, Inc. ("GTA") has prepared this Environmental Management Plan ("EMP") for planned improvements at Cherry Hill Park ("subject property"). Previous environmental evaluations of the subject property identified environmental concerns associated with the former Reedbird Landfill located on the subject property. This EMP has been prepared to establish a proposed remedy for the soil, groundwater, and methane impacts in conjunction with the planned site development.

The proposed remedy includes segregating excavated clean cap material from impacted fill materials generated during general site grading and foundation and utility installation, reuse of excavated material, and capping of impacted fill in all areas of the site. Construction observation will be performed to document the EMP implementation, and a Health and Safety Plan (HASP) regarding environmental issues will be in place during construction.

In December 2018, the project team requested that the Maryland Department of the Environment (MDE) Land Restoration Program (LRP) participate in the review of the environmental conditions the subject property and the proposed remedy. This EMP is being submitted to the MDE LRP for approval, so that a closure letter may be obtained following implementation of the proposed remedy.

1.2 Limitations

This EMP was prepared by GTA for BCRP, under the terms and conditions of BCRP's contract with GTA. GTA acknowledges that this document is being submitted to the MDE and will be part of the public record, and that the MDE is expected to use this report as part of its

review process. However, use of this report by any third party is at their sole risk. GTA is not responsible for any claims, damages, or liabilities associated with third-party use.

2.0 BACKGROUND

2.1 Site Description

The subject property comprises approximately 33.9 acres of land located west of Potee Street (Maryland Route 2), south of Reedbird Avenue, and north of the Patapsco River at address 101 Reedbird Avenue in the City of Baltimore, Maryland. The subject property contains a playground, tennis court, basketball courts, recreation building with pool, grass fields, sidewalks, pavilions, and a small parking area. A potential non-tidal wetland area and critical area buffers are located on the central portion of the subject property and along the shoreline, respectively. A *Site Location Map* for the subject property is presented as *Figure 1*, and a *Proposed Development Plan* is included as *Figure 2*.

Topographically, the subject property slopes to the south and east towards the shoreline of the easterly-flowing Patapsco River. Surface drainage generally flows downward to the southeast, towards the Patapsco River. Minimum surface grades occur along the shoreline in the southern and eastern boundaries of the subject property at approximately Mean Sea Level (MSL). Maximum surface grades occur in the northwestern portion of the subject property at approximately 24 feet above MSL.

According to the *Geologic Map of Maryland* (1968) published by the Maryland Geologic Survey, the site vicinity is geologically mapped as the Upland Deposits (Western Shore) of the Atlantic Coastal Plain Physiographic Province. These deposits are characterized as gravel and sand, commonly organic-brown, locally limonite-cemented. The *Soil Survey of Baltimore City* indicates that the soils at the subject property are generally classified as the Udorthents (42E) on the southern portion of the subject property, Galestown-Urban land complex (11UB) on the northwestern portion of the subject property, and Christiana-Urban land complex (7UB) on the northeastern portion of the subject property.

Borings performed as part of a Phase II ESA performed by GTA in November 2018 consisted of asphalt or soil at the surface of the boring locations. Below the surface, visual observation of the borings indicated that the soil consisted of three major materials: clays and silts overlying historical shoreline sediments; black fine-grained and sometimes granular fill; and a mostly-clay cap overlying the black fill material. The depth to groundwater ranged from approximately 6.6 to 16.6 feet below existing grades. Based on these groundwater level measurements, the groundwater flow direction is generally to the southeast under a hydraulic gradient of 0.015 feet per foot on the northern portion and 0.0008 feet per foot in the southern portion of the subject property.

2.2 Proposed Development

The subject property is planned to be developed with the existing pool and proposed improvements including an artificial turf field, grass fields, a dog park, new basketball courts, a parking lot, and a fitness and wellness (recreation) building. These areas are depicted on *Figure 2 (Proposed Development Plan)*. The development will be served by publicly available water and sewer utilities. The future site development will not use the onsite groundwater for any purpose.

2.3 Site History

Historically, the southern portion of the subject property consisted of shoreline, wetlands, and part of the Patapsco River. According to an *MDE Regulatory Fact Sheet* concerning the Reedbird Landfill Site, the subject property is a portion of a 118-acre property that was a waterway and marsh prior to 1900. The northern portion of the property was used since the 1930s through the 1970s as a municipal, industrial, and construction waste incinerator. The resulting incinerator ash and waste was reportedly deposited in the southern portion of the subject property along the historical shoreline of the Patapsco River, which resulted in migration of the shoreline to south. Park amenities were added to the northeastern portion of the subject property by 1952. Incinerator operations and landfilling activities on the subject property ceased in 1977. Additional recreational features including the pool, basketball courts, and tennis courts were constructed in their current locations by 1981.

Several documents on file with the MDE and a prior Phase I ESA reviewed by GTA provide additional detail regarding operations at the subject property. In summary, the subject property and property adjacently southwest are described as part of the Patapsco River prior to the 1890s, after which they were marsh or wetland until approximately 1932 when the incinerator facility began operations at the subject property. The majority of the overall landfill was used as a municipal waste dump that included waste from the Koppers Company such as paint waste, metallic residue, and solvent; incinerator ash; municipal waste; and construction debris. The landfill was capped in 1980 and 1981 with a soil and sludge (potentially sewage) mixture. The USEPA identified the site as potentially contaminated, and a preliminary plan to install groundwater wells in 1981 was delayed in order to defer action to the MDE. Six groundwater monitoring wells were installed in 1982 throughout the landfilled area, two of which appear to have been located on the subject property. However, it was noted that the monitoring wells appeared to be screened in a deeper aquifer and not the zone of concern that was likely to be in contact with the waste material. In 1983, groundwater and sediment samples were collected, and laboratory analysis identified elevated lead concentrations. A follow-up investigation in 1992 identified low levels of polychlorinated biphenyls (PCBs) in the soil, and detectable levels of diethyl phthalate in the surface water and groundwater. In 1999, the MDE determined that it had no further requirements for the site and recommended that the USEPA take no action regarding the site.

GTA performed a Phase II ESA in 2018 consisting of soil, groundwater, and soil vapor sampling. The area of the park proposed for improvement was divided into three decision units:

- Recreation building area ("Rec" area) in the northern portion of the park along Reedbird Avenue; the former incinerator was located in this area.
- Artificial turf field area ("Turf" area) in the eastern portion of the park adjacent to Potee Street.
- Grass field area ("Field" area) in the southern portion of the park between the shoreline and the aforementioned decision units (*Figure 3*). Much of this area was historically shoreline that was landfilled with incinerator waste to current grade.

GTA advanced 180 soil borings, nine soil vapor points, and six temporary groundwater monitoring points to further evaluate known environmental impacts due to historical landfilling on

the subject property. Eighteen composite soil samples from three decision units – turf area, field area, and recreation building area - were analyzed. The soil sampling consisted of a total of 36 soil samples – 18 soil samples from each depth (0-2 feet bgs and 4-5 feet bgs) – analyzed for Priority Pollutant metals (PP metals), semi-volatile organic compounds (SVOCs), and PCBs. Six soil samples, one from each depth from each of the three decision units, were also analyzed for dioxins and furans. SVOCs were detected above the laboratory reporting limits but below the MDE residential cleanup standard (RCS) in 16 of the 36 soil samples. PCBs were detected above the laboratory reporting limits but below the RCS in 5 of the 36 soil samples. Metals were detected above the laboratory reporting limits in all of the soil samples, with arsenic and lead exceeding the recreational risk-based comparison value (RCV) and RCS, respectively, in nine samples. Most of the elevated metals concentrations were detected in samples from the 4- to 5-foot depth within the black fill material in the recreation building and field areas.

Six groundwater monitoring points were installed across the subject property. One sample from the recreation building area and one from the field area reported total petroleum hydrocarbons (TPH) diesel-range organics (DRO) above the MDE groundwater cleanup standard (GCS), and two samples from the field area reported antimony above its GCS. No SVOCs were reported above the laboratory reporting limit.

Soil vapor samples collected from the recreation building and field areas reported several VOCs above the laboratory reporting limits, but all were below the commercial Tier 1 target soil vapor values. Methane was detected in five soil vapor points, with one point in the field area within the range of the methane lower explosive limit (LEL).

3.0 EXPOSURE ASSESSMENT

Based on prior evaluations, potential environmental exposure risks to future visitors, construction workers, and on-site workers may exist at the subject property. The identified exposure pathways, potentially exposed populations, and chemicals of potential concern (COPCs) are summarized in the table below.

POTENTIAL EXPOSURE PATHWAYS			
Media	**Potential Exposed Population**	**Exposure Pathway**	**COPCs**
Soil (subsurface)	Child, Youth, and Adult Visitor/Recreator Adult On-Site Worker Construction Worker	Dermal Exposure Incidental Ingestion Inhalation of Fugitive Dust	Arsenic and lead
Soil Vapor/Indoor Air	Child, Youth, and Adult Visitor/Recreator Adult On-Site Worker	Inhalation Explosion	Methane
Groundwater	Construction Worker	Dermal Exposure Incidental Ingestion	TPH DRO and antimony

Generally, the cleanup criteria that will be applied to any additional COPCs will be the published MDE RCS values, or site-specific values calculated using the appropriate frequency exposure parameters, as the need arises. For arsenic, GTA will use a risk-derived comparison value (RCV) for arsenic developed from standard risk assessment calculations, with United States Environmental Protection Agency (USEPA) and MDE guidance for risk assessments. GTA has utilized this approach on projects with similar types of arsenic impacts, and this approach has been reinforced with MDE involvement and oversight. However, MDE approval of this approach is typically on a case-by-case basis. Using this approach, GTA calculated risk-based concentrations for arsenic based on various exposure pathways for children, youths, adults, and construction workers. The lowest arsenic value, which represents the highest risk, resulted from the child exposure population. Furthermore, based on 2013 guidance from the USEPA, MDE began accepting risk-based remedial goal calculations for arsenic that incorporate a relative bioavailability (RBA) value of 0.6 (60%), rather than the default RBA of 1.0 (100%). Using this approach, the moderate-frequency recreational RCV for arsenic is 19.5 mg/kg. The use of cleanup criteria other than those tabulated above will only occur with prior MDE approval.

3.1 Direct Contact from Soil Contamination

With regard to soil exposure, potential risks to construction workers may exist through dermal exposure, incidental ingestion, or inhalation of fugitive dust during development activities. Management of this potential exposure to construction workers is discussed in *Section 5.1*. Based on the planned uses, potential risks to future site occupants (visitors/recreators and workers) from

impacted soils are not anticipated. The proposed remedies for the soil contamination (HASP, excavation and disposal, institutional controls, and engineering controls) are protective of human health, because they are designed to prevent exposure to contamination.

Based on future development plans, existing soil will be capped (e.g., asphalt, concrete, buildings, artificial turf fields, or geotextile marker fabric overlain by clean fill, etc. as shown on *Figure 5* and *Figure 6*) in areas of proposed construction across the subject property. Other portions of the site that will not be disturbed have an existing cap. This will act as a limiting alternative, which will eliminate the direct contact exposure risk to future on-site worker and visitor populations. These limitations will be recorded as a deed restriction in the land records for the subject property. In addition, fill material is expected to be imported to the subject property to adjust the grade or for capping as part of construction. Excavation for installation of subsurface utilities and fencing may encounter impacted soil, which will be re-used onsite beneath the cap or disposed offsite. Once this EMP is complete, the above-referenced populations will be protected and the risk to construction workers will be temporary, limited, and controlled via a site-specific HASP. These proposed remedial strategies are further outlined in *Section 5.0* of this report.

An approved erosion and sediment control plan will be in place for the subject property prior to the beginning of construction. Standard construction erosion and sediment controls will address the potential for COPCs in run-off generated during a storm event from leaving the subject property. A qualified party that has completed their MDE Erosion and Sediment Control Certification will observe sediment controls at the site on a weekly basis and/or 24 hours after a storm event to observe construction entrances, super silt fences, wash racks, swales, check dams, dikes, and any other sediment control measures. Weekly inspection forms will be completed and kept on file by GTA during construction. In the event of a breach or other defect requiring repair to the erosion and sediment controls, the onsite contractor will be notified and the features will be repaired as quickly as possible.

3.2 Inhalation of Fugitive Dust

During future construction activities, it is possible for COPC-impacted soil to become airborne, with the potential that site construction workers may breathe this fugitive dust. The inhalation of fugitive dust is planned to be limited due to implementation of a site-specific HASP and dust control methodologies that will prevent dust generation. Capping (e.g., soil, asphalt, or concrete) across the subject property will eliminate future exposure to inhalation of fugitive dust to future onsite worker and visitor populations. The proposed remedy for inhalation of fugitive dust (HASP and dust control methodologies) is protective of human health since exposure to contamination above regulatory limits will be prevented.

The placement of asphalt and/or concrete, building improvements, artificial turf fields, or clean soil cap material (reused from onsite or MDE-approved clean fill from offsite) will act as a limiting alternative and will eliminate future exposure to inhalation of fugitive dust to future on-site worker and visitor populations. Any exposure to fugitive dust generated during future excavation and/or site development activity that penetrates the recreational cap will be managed through use of site-specific HASP and dust control methodologies, as required by site institutional control to be recorded in the land records. Specific details associated with dust control during construction are further described in *Section 5.1* of this EMP.

3.3 Exposure to Groundwater Contamination

Based on the planned use of public utilities, no groundwater use is planned, and the nature of the proposed development will eliminate the potential exposure pathways to groundwater COPCs after construction. Potential risks to construction workers may exist through dermal exposure or incidental ingestion. This exposure pathway can potentially exist for the construction workers during subsurface excavation activities. Management of this potential exposure to construction workers is discussed in *Section 5.1*. Based on the planned site developments, potential risks to future site occupants from impacted groundwater will not exist. As discussed in *Section 5.3.2*, a groundwater use restriction for the subject property will be recorded in the land records.

Based on the observed depth to groundwater, dewatering for various construction activities (i.e. utility installation) may be necessary. If dewatering is required, site construction workers may come in contact with the groundwater during site development. Specific details associated with the dewatering activities are further described in *Section 5.3.1* of this EMP.

3.4 Soil Vapor Exposure

Analytical results for soil and groundwater samples as described above reported VOCs below the RCS. Therefore, vapor intrusion of VOCs into future improvements is not considered an exposure pathway at this time. The potential for vapor intrusion has been eliminated as an exposure route with the exception of one area of elevated methane. Based on development plans available at the time this EMP was prepared, no buildings are proposed to be constructed in the area where methane was detected within the range of the methane LEL.

4.0 CLEANUP CRITERIA

As a simplified, conservative measure, the cleanup criteria for the subject property's COPCs are the MDE RCS and GCS values, which are the generic risk-based guidance values in MDE's *Cleanup Standards for Soil and Groundwater; October 2018; Interim Final Guidance (Update No. 3.2)*. Arsenic will be compared to the risk-based recreational RCV. The planned use of the site is as a recreational facility/park and residential cleanup criteria will be used for the site.

CLEANUP CRITERIA			
Media	**COPC**	**Cleanup Criteria**	**Basis**
Soil	Arsenic	19.5 mg/kg	RCV (recreational)
	Lead	400 mg/kg	RCS
Groundwater	TPH DRO	47 µg/L	GCS
	Antimony	6.0 µg/L	

Generally, the cleanup criteria that will be applied to any additional COPCs will be the published MDE RCS values, RCV, GCS, or site-specific values calculated using the appropriate frequency exposure parameters, as the need arises. The use of cleanup criteria other than those tabulated above will only occur with prior MDE approval.

5.0 REMEDIES AND INSTITUTIONAL CONROLS

This EMP presents proposed remedial actions to protect against exposure to potentially contaminated soil, fugitive dust, and groundwater in conjunction with future construction and improvement. Potentially-complete exposure pathways have been identified between contaminated soil, fugitive dust, and groundwater and future on-site worker and visitor populations and construction workers at the subject property. These exposure pathways will be eliminated through the preparation and implementation of a site-specific HASP, capping, construction observation for health and safety measures, dust monitoring, proper management of impacted materials encountered during development activities, and engineering and institutional controls (e.g. deed restrictions on use of groundwater and notifications prior to excavation).

5.1 Health and Safety Measures

A site-specific HASP will be prepared to reduce direct contact exposure to the identified soil and groundwater contaminants during the performance of construction activities that could involve impacted media. The HASP will provide recommended procedures to reduce the potential for overexposure. The primary action taken to mitigate potential exposures to construction workers will be the avoidance of direct contact with potentially impacted soil or groundwater, and the appropriate use of personal protective equipment during construction activities.

During soil movement activities, fugitive dust may be produced and air monitoring for particulates will be conducted (twice a day or as needed based on field conditions). When impacted soil removal and transportation activities are being conducted, dust monitoring will be performed using a real time dust monitoring instrumentation, specifically a handheld Dusttrak DRX aerosol monitor. Dust monitoring will be conducted continually, each day of impacted soil removal/relocation activities. Readings will be collected from within the immediate vicinity of the work, from the center of the work area, and from the boundary of the work area downwind of the work. The OSHA permissible exposure limit (PEL) for Particulates Not Otherwise Regulated (PNOR), or nuisance dust, is 15 mg/m^3. For conservancy, a PNOR/nuisance dust action level of 12 mg/m^3 will be used during air monitoring. If the 12 mg/m^3 OSHA PEL is exceeded, operations will be suspended and additional dust suppression BMPs will be applied (e.g. additional wetting

or misting, application of water via water truck, etc.) until dust levels are reduced to below the 12 mg/m^3 action level. If dust levels increase while suppression measures are under way and the dust concentration exceeds 12 mg/m^3, operations must be shut down and suppression activities continued. When dust concentrations are reduced to 12 mg/m^3 or below, operations may resume.

If indications of petroleum or VOC impacts are encountered during construction, such as through soil staining, odors, etc., air monitoring for volatiles will be conducted. The monitoring will be conducted both within the excavation and at the excavation perimeter with a portable photo-ionization detector (PID). If elevated PID readings are encountered, response actions, as defined in the HASP, will be implemented.

The HASP will be submitted to the Client under separate cover and will be provided to all contractors involved in construction activities potentially encountering impacted media, for their information. The contractors should independently assess the available information and implement appropriate measures to protect the health and safety of their employees and subcontractors. Information and recommendations contained in this plan should not in any way be construed as relieving the contractors or their subcontractors of their responsibilities for site health and safety. A copy of the HASP will be provided to MDE prior to the start of construction.

5.2 Remedial Action for Soils

Soil containing COPCs above the cleanup criteria in *Section 4.0* is present throughout the site. A HASP will be implemented to reduce direct contact exposure of construction workers to the impacted soil during construction. Construction practices for dust control will be utilized to limit worker exposure to contaminants borne on dust and windblown particulates. During construction activities, qualified parties will assist with identification and management of impacted soil with COPCs pursuant to the EMP and HASP. Remedial actions for soil that will be performed on the site include the preparation and implementation of a site-specific HASP, capping, construction observation for health and safety measures, dust monitoring, proper management of impacted materials encountered during development activities, and engineering and institutional controls (e.g. deed restrictions on use of groundwater and notifications prior to excavation).

5.2.1 Construction-Related Soil

During construction activities, GTA will assist with identification and management of the COPC-impacted soil. GTA's services will be performed using environmental staff that will periodically visit the site or be contacted directly by the general contractor if there is a concern about the soil being relocated. If excess soil is generated, it will be relocated to a designated soil stockpile on the subject property and staged temporarily prior to being used elsewhere onsite beneath a cap. During construction, active areas will be fenced and secured to prevent exposure to visitors prior to final capping of impacted soils.

5.2.2 Controlled Hazardous Substance-Impacted Soil

Soil impacted by COPCs has been identified at the subject property. Excavated materials generated during site development and utility installation are anticipated to be either utilized elsewhere onsite beneath proposed site improvements and a clean soil cap, or removed from the subject property for disposal. In the event that soil will need to be transported off-site, the offsite disposal facilities proposed for receiving contaminated soil are:

Soil Safe, Inc. (Soil Safe)
16001 Mattawoman Drive
Brandywine, Maryland 20613-3027
(301) 782-3036
www.soilsafe.com/
Point of Contact: Amy Mullens

or

Clean Earth Inc. (Clean Earth)
6250 Dower House Road
Upper Marlboro, Maryland 20772
(215) 734-1400
www.cleanearthinc.com
Point of Contact: Paula Cross

Use of these facilities as an off-site disposal facility is contingent on additional waste characterization soil sampling. If onsite soils are determined to be hazardous in a waste disposal scenario or have COPC concentrations above the acceptable levels in the

facility's permit listed above, the soil will be transported to another selected licensed waste disposal facility. Additional/alternate disposal facilities may also be utilized. Information regarding these facilities will be provided to MDE prior to the transport of impacted soil offsite and disposal shall occur in accordance with local, state, and federal regulations for waste handling and disposal.

5.2.3 Imported Fill Material Sampling and Analysis

Imported fill (soil or aggregate) obtained from an import source will first be sampled and analyzed. Work plans for sampling fill soil source areas will be submitted to the MDE for review and approval prior to sample collection and analysis. No soil will be transported onsite for use as fill without prior written approval by the MDE project manager.

Aggregate that is needed for the construction activities, such as for utility backfill, pavement or building subgrades, etc., can be acquired from standard commercial providers using local quarry sources. A clean fill certification will be obtained for any such materials and provided to MDE for approval prior to being transported to the site. Documentation of the imported fill sampling activities will also be summarized within monthly EMP progress reports and the *EMP Completion Report*.

5.2.4 Temporary Soil Stockpile Management

Based on the proposed construction and development, excess soil may be generated during construction activities (e.g. utility installation, etc.) or may need to be staged temporarily prior to being reused onsite. Any excess soil will be segregated onsite as either impacted soil or clean capping soil. Two stockpile areas will be designated onsite and separated by super silt fencing with separate entrances, and comply with the *2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control* and permit requirements of Baltimore City. These temporary stockpile locations may need to be relocated based on ongoing construction activities (*Figure 4*). If relocation becomes necessary and new temporary stockpile locations are identified, the MDE will be notified.

If previous data collected for the soil being relocated indicates that COPC concentrations are above the RCS and RCV (*Section 4.0*), the soil may be relocated to the impacted soil stockpile staging area. This impacted soil will be used as fill material and must be placed beneath an MDE approved cap. Specific capping details are described on *Figure 5*. Excess of this type of soil will be disposed of properly off-site. Soils that are field-identified as potentially contaminated will be temporarily staged and secured on the property until analytical results indicate whether to reuse as clean capping material or used below the cap. This soil will be covered by plastic at the source location until its use is determined, or will be assumed to be impacted and used beneath the cap.

If previous data collected for the soil being relocated indicates that COPC concentrations are below the RCS and RCV (*Section 4.0*), that soil may be relocated to the clean capping material soil stockpile staging area (*Figure 4*).

5.3 Remedial Action for Groundwater

5.3.1 Construction-Related Groundwater

During construction, temporary dewatering may be necessary for utility installation. If necessary, GTA will develop a dewatering contingency plan for when potentially contaminated groundwater is expected to be encountered during excavation and also for when contaminated groundwater is unexpectedly encountered. When potentially contaminated groundwater is unexpectedly encountered, excavation must be stopped and the dewatering contingency plan must be implemented.

Groundwater dewatering, if required, must be performed in compliance with local, state, and federal laws and regulations and will be accomplished by the general contractor obtaining necessary discharge permits should the need arise. If temporary dewatering is necessary, fluids entering trenches or excavations in use will be removed and will be relocated to another trench or excavation using a hose and pump. Due to the temporary dewatering anticipated, groundwater will not be discharged to the ground surface, or surface water, and will not be treated on site. The contaminated groundwater dewatering

contingency plan should include the following options for handling and disposal of the groundwater offsite if necessary:

- Utilizing a vacuum truck to remove the water and dispose of it off-site at an appropriate facility.
- Pumping the water to on-site frac tanks and analyzing the water for potential on-site treatment or appropriate off-site disposal.
- If acceptable to City of Baltimore Department of Public Works, discharge to the municipal sanitary sewer under a Wastewater Discharge Permit.
- Discharge to the local stormwater system via a general National Pollution Discharge Elimination System (NPDES) permit.

If discharging the water off site is selected then discharge effluent monitoring must be performed for compliance with the local, state, and federal requirements, and must include flow monitoring as well as periodic fixed laboratory analysis of the effluent stream.

If dewatering is required, site construction workers may come in contact with the groundwater during site development and appropriate health and safety precautions presented in the HASP should be followed.

5.3.2 Groundwater Use Restriction

Based on the planned use of public utilities, no groundwater use is planned and the nature of the proposed development will eliminate the potential exposure pathways to groundwater COPCs after construction. A groundwater use prohibition will be established for the site and recorded in the local land records. The proposed remedy for the groundwater contamination (groundwater use prohibition) is protective of human health since contact with the contaminated groundwater will be prevented.

5.4 Remedial Action for Soil Vapor

5.4.1 Methane Monitoring Point

Methane was reported above laboratory reporting limits in five temporary soil vapor probes at the site to a maximum concentration of 4.49% by volume in the central

portion of the property. The lower explosive limit (LEL) of methane is approximately 4-5% by volume. Based on development plans available at the time this EMP was prepared, no buildings are proposed to be constructed in the area where methane was detected within the range of the methane LEL. As a conservative measure, one methane monitoring point will be installed between the sampling location that reported elevated methane and the planned recreation center building for periodic monitoring (*Figure 2*).

At the request of MDE, GTA proposes to install one methane monitoring point between the proposed recreation center building and the area of the site where elevated methane was reported. The methane probes will be installed using the following methodology.

- Drill an 8-foot deep soil boring, or to the depth at which groundwater is encountered, using a direct-push rig.
- Install approximately 1 foot of coarse sand into the bottom of the boring.
- Insert a 1-inch diameter PVC pipe comprised of a 1-foot section of PVC well screen fitted with a threaded end point at the terminal depth of the boring or just above first encountered groundwater. The screened section of PVC will be fitted with enough riser to create a 1½-foot stick-up.
- Backfill the annular space around the screen with clean, coarse sand to 1 foot above the top of screen, resulting in 3 feet of sand pack.
- Place granular bentonite in the annular space around the riser atop the sand to a depth of 1 foot bgs, followed by hydrated bentonite chips to the surface.
- Once the borehole is sealed to the surface, install 1-inch PVC slip cap fitted with quick-disconnect couplings over the stick-up riser.
- Allow the methane probe to equilibrate for at least 2 hours.

GTA will collect real-time methane data monthly from the methane sampling probes using a Landtec GEM 2000 Landfill Gas meter or similar. Monitoring events will occur monthly for the first three months, and then again six months after installation. Methane data will also be collected immediately following two rain events. Additionally, a Tedlar sampling bag will be filled using the GEM 2000 during one monitoring event and submitted for laboratory analysis of methane by USEPA Method 3C to verify field readings. Upon the completion of the field screening events, MDE and GTA will evaluate whether continued methane monitoring is warranted (approximately six months following initiation of the methane monitoring program).

5.5 Remedial Actions for Specific Development Features

The subject property is proposed to be developed with one structure using a slab-on-grade construction with footers, piles, or caissons. The building will include a concrete slab that will act as a cap, which will eliminate the direct contact exposure risk to future on-site workers and visitors. Details regarding the proposed development for the subject property and general capping schematics are presented as *Figure 2* and *4.* Final cap thicknesses will be detailed in final construction plans following the City of Baltimore (to be provided by a third party prior to construction).

5.5.1 Hardscaped Areas

Hardscaped areas will include an entry roadway, parking lots, and sidewalks. The impervious cover is currently planned to generally consist of a minimum of three to six inches of granular sub-base and four to eight inches of pavers, asphalt, or concrete over native material or clean fill, to be illustrated on the final approved grading plan. Based on preliminary grading estimates, the reuse of onsite materials is anticipated. In areas where clean fill is required, the fill will be approved by the MDE and will meet recreational standards. Details of the capping are illustrated in *Figure 5.* A *Clean Fill Sampling Plan* will be submitted for MDE approval, implemented, and the material accepted by MDE prior to bringing any off-site fill to the property.

5.5.2 Landscaped Areas

Pervious capping will include the landscaped areas, a playground, and areas to be covered by stone. A total of at least two feet of MDE-approved clean fill material above a geotextile marker fabric will be placed in areas of pervious capping. The thickness of the cap can be increased during grading or during landscaping following grading as an option to accommodate the planting of different species in order to ensure the minimum clean fill requirements and accommodate the plant's root ball. The pervious capping will eliminate the direct contact exposure risk to future occupants or users of the site. Based on preliminary grading estimates, the re-use of on-site materials is anticipated, with MDE-approved clean fill that meets recreational standards used where necessary to reach final

grade. A *Clean Fill Sampling Plan* will be submitted for MDE approval, implemented, and the material accepted by MDE prior to bringing any off-site fill to the property.

Pervious and landscaping capping will be underlain by a geotextile marker fabric, as shown on *Figure 5*. The geotextile marker fabric will not be placed beneath building improvements, impervious surfaces, or roadways. The geotextile marker fabric will be placed between the native site soil and MDE-approved clean fill. Specifications for geotextile marker fabric are presented, along with general details for the impervious and pervious capping, on *Figure 5.* It should be noted that utilities may be installed in these areas prior to capping. Excavated materials generated during utility installation that are not used as backfill will either be placed elsewhere onsite beneath a capped area or deposited in the impacted soil stockpile. The property owner is responsible for ensuring the proper implementation of all recorded deed restrictions and land use controls, and maintenance requirements for site caps to reduce the risk to public health and the environment.

5.5.3 Artificial Turf Field

A multi-use athletic field is proposed on the eastern portion of the site. Grading and removal of surficial soil will be performed prior to the construction of the field. The field is proposed to consist of compacted subgrade overlain by subsurface separation geotextile fabric followed by approximately 6 inches of base and subbase aggregate. A shock pad may then be installed followed by a synthetic turf. A cross-section of the field is presented on *Figure 5*.

5.6 Concrete Reuse

If concrete structures are identified during demolition, they will be properly crushed and re-purposed for use onsite or disposed offsite. Prior to movement and crushing of the onsite concrete, the concrete will be sampled and characterized in accordance with a Pre-Demolition Masonry Materials Risk Assessment (PDMMRA), which will be submitted to the MDE for approval. Pending laboratory results, the concrete will be crushed and either re-used on site or

disposed off-site. Generation of the PDMMRA, MDE approval, and associated sampling presented in the PDMMRA is estimated to take approximately 30 days.

If the COPCs associated with the sampled concrete meet MDE RCS and/or cleanup criteria in *Section 4.0,* then the concrete can be reused onsite. If the COPCs associated with the sampled concrete do not meet the MDE RCS and/or cleanup criteria in *Section 4.0* then the concrete can only be reused on-site below a cap or disposed off-site at an MDE-approved facility. The location of the re-purposed concrete will be documented in monthly EMP update reports and the EMP completion report.

6.0 RISK MANAGEMENT

The proposed remedies include the use of asphalt and/or concrete, capping, and MDE-approved clean fill, all which will require periodic maintenance activities.

6.1 Hardscaped and Landscaped Maintenance

Once the EMP is implemented physical inspections of the hardscaped and landscaped areas will be conducted annually to inspect for degradation and unacceptable exposure to the underlying soil. A cap inspection form is included as an appendix of this report. Degraded areas identified will be maintained and repaired as required. The property owner will be responsible for the onsite maintenance inspections, performing maintenance, and maintaining all inspection records. Maintenance records will include, at a minimum, the date of the inspection, name of the inspector, any noted issues, and subsequent resolution of the issues. If this action level is reached, preventative maintenance is required. If preventative maintenance is required, the property owner will have 60 days to complete the appropriate preventative maintenance required.

6.2 Emergency Excavation

MDE must be verbally or electronically notified within 24 hours following the discovery of unplanned emergency conditions at the subject property and must be provided with written documentation within 10 days of the repair. In addition, MDE must be provided written notice a minimum of five business days prior to planned activities at the site that could encounter the

dark/black impacted soil, with the repairs completed within 15 days, and written documentation submitted to MDE within 10 days of the repair. Written notice of planned excavation activities must include the proposed date(s) for the excavation, location of the excavation(s), health and safety protocols (as required), clean fill source and documentation (as required), and proposed characterization and disposal requirements (as required). The property owner will maintain on-site records of the yearly inspections and will include information on any repairs to the subject property. The property owner or occupants will be required to notify MDE in writing of any proposed construction or excavation activities that could encounter the dark/black impacted soil. These notification requirements and appropriate contact information must be included in the EMP for each future development area.

6.3 Planned Excavations

MDE will be provided written notice, either by the property owner or a party designated and notified by the property owner, a minimum of five business days prior to planned activities at the site that will penetrate any capped areas, with the repairs completed within 15 days, and written documentation submitted to MDE within 10 days of the repair. The property owner will provide written notice of planned excavation activities, including the proposed date(s) for the excavation, location of the excavation(s), health and safety protocols (as required), clean fill source and documentation (as required), and proposed characterization and disposal requirements (as required).

7.0 PERMITS AND CONTINGENCIES

7.1 Permits

The property owner must comply with federal, State and local laws and regulations by obtaining necessary approvals and permits to conduct activities and implement this EMP or activities specified in the EMP.

7.2 Site Contingency Plan

In the event that the future soil and/or groundwater COPCs exceed their designated cleanup criteria, or safe concentrations cannot be controlled during the EMP implementation process, or

contamination and/or exposure risks/pathways not previously identified are identified, the following contingency measures will be taken:

- Notify MDE within 24 hours;
- Postpone implementation of the EMP;
- Evaluate new site conditions identified; and
- Amend EMP to address new site conditions identified.

Notified departments will include:

MDE Land Restoration Program
Land Management Administration
1800 Washington Boulevard
Baltimore, Maryland 21230
(410) 537-3493
Attention: Anuradha Mohanty

In addition to the above, if there is evidence of an oil discharge at the subject property in violations of applicable regulations, it must be reported within two hours as specified in COMAR 26.10.08.01, to the Oil Control Program (OCP) (410-537-3442) or, if after normal business hours, to the 24-hour Spill Reporting Hotline (1-866-633-4646). The MDE will be verbally notified within 48 hours (72 hours in writing) of changes (planned or emergency) to the EMP implementation schedule, previously undiscovered contamination, and citations from regulatory entities related to health and safety practices. Notifications shall be made to the MDE project manager at 410-537-3493.

Emergency conditions that cause imminent and substantial endangerment to human health and the environment will require abeyance of the EMP process until the emergency condition has been addressed.

The MDE must be provided with documentation and analytical reports generated as a result of any unidentified contamination. Previously undiscovered contamination may require an amendment to the EMP.

8.0 ADMINISTRATIVE

8.1 Schedule

The following schedule is provided for the proposed development set to begin preliminary earth moving in or about first quarter 2020, provided all necessary permits are acquired. During implementation of the EMP, MDE will be notified of any project schedule changes.

Description of Work	TENTATIVE SCHEDULE
EMP Review/Approval	December 2019
Submission of Monthly EMP Progress Reports	Monthly following initiation of work (due the 15th of each subsequent month)
Rough Grading and Asphalt Removal	February 2020
Begin Construction and Utility Installation	May 2020

The Land Management Administration project manager will be notified in writing within five calendar days of the beginning of EMP implementation activities. Schedule updates will be provided as-needed, as part of the progress reports discussed in *Section 8.2*.

8.2 Documentation

During implementation of this EMP, GTA will prepare monthly EMP progress reports summarizing the remedial activities occurring during that month. These monthly progress reports will be submitted to the Client and to MDE to demonstrate implementation of this EMP. The monthly reports will be due to MDE by the 15th day of the month following the month covered by the report.

At the conclusion of the EMP implementation, GTA will prepare an *EMP Completion Report*, and a no further action letter or other appropriate regulatory action will be requested.

******* END OF REPORT *******

Important Information about This Geoenvironmental Report

Geoenvironmental studies are commissioned to gain information about environmental conditions on and beneath the surface of a site. The more comprehensive the study, the more reliable the assessment is likely to be. But remember: Any such assessment is to a greater or lesser extent based on professional opinions about conditions that cannot be seen or tested. Accordingly, no matter how many data are developed, risks created by unanticipated conditions will always remain. *Have realistic expectations.* Work with your geoenvironmental consultant to manage known and unknown risks. Part of that process should already have been accomplished, through the risk allocation provisions you and your geoenvironmental professional discussed and included in your contract's general terms and conditions. This document is intended to explain some of the concepts that may be included in your agreement, and to pass along information and suggestions to help you manage your risk.

Beware of Change; Keep Your Geoenvironmental Professional Advised

The design of a geoenvironmental study considers a variety of factors that are subject to change. Changes can undermine the applicability of a report's findings, conclusions, and recommendations. *Advise your geoenvironmental professional about any changes you become aware of.* Geoenvironmental professionals cannot accept responsibility or liability for problems that occur because a report fails to consider conditions that did not exist when the study was designed. Ask your geoenvironmental professional about the types of changes you should be particularly alert to. Some of the most common include:

- modification of the proposed development or ownership group,
- sale or other property transfer,
- replacement of or additions to the financing entity,
- amendment of existing regulations or introduction of new ones, or
- changes in the use or condition of adjacent property.

Should you become aware of any change, *do not rely on a geoenvironmental report.* Advise your geoenvironmental professional immediately; follow the professional's advice.

Recognize the Impact of Time

A geoenvironmental professional's findings, recommendations, and conclusions cannot remain valid indefinitely. The more time that passes, the more likely it is that important latent changes will occur. *Do not rely on a geoenvironmental report if too much time has elapsed since it was completed.* Ask your environmental professional to define "too much time." In the case of Phase I Environmental Site Assessments (ESAs), for example, more than 180 days after submission is generally considered "too much."

Prepare To Deal with Unanticipated Conditions

The findings, recommendations, and conclusions of a Phase I ESA report typically are based on a review of historical information, interviews, a site "walkover," and other forms of noninvasive research. When site subsurface conditions are not sampled in any way, the risk of unanticipated conditions is higher than it would otherwise be.

While borings, installation of monitoring wells, and similar invasive test methods can help reduce the risk of unanticipated conditions, *do not overvalue the effectiveness of testing.* Testing provides information about actual conditions only at the precise locations where samples are taken, and only when they are taken. Your geoenvironmental

professional has applied that specific information to develop a general opinion about environmental conditions. *Actual conditions in areas not sampled may differ (sometimes sharply) from those predicted in a report.* For example, a site may contain an unregistered underground storage tank that shows no surface trace of its existence. *Even conditions in areas that were tested can change*, sometimes suddenly, due to any number of events, not the least of which include occurrences at adjacent sites. Recognize, too, that *even some conditions in tested areas may go undiscovered,* because the tests or analytical methods used were designed to detect only those conditions assumed to exist.

Manage your risks by retaining your geoenvironmental professional to work with you as the project proceeds. Establish a contingency fund or other means to enable your geoenvironmental professional to respond rapidly, in order to limit the impact of unforeseen conditions. And to help prevent any misunderstanding, identify those empowered to authorize changes and the administrative procedures that should be followed.

Do Not Permit Any Other Party To Rely on the Report

Geoenvironmental professionals design their studies and prepare their reports to meet the specific needs of the clients who retain them, in light of the risk management methods that the client and geoenvironmental professional agree to, and the statutory, regulatory, or other requirements that apply. The study designed for a developer may differ sharply from one designed for a lender, insurer, public agency...or even another developer. *Unless the report specifically states otherwise, it was developed for you and only you.* Do not unilaterally permit any other party to rely on it. The report and the study underlying it may not be adequate for another party's needs, and you could be held liable for shortcomings your geoenvironmental professional was powerless to prevent or anticipate. Inform your geoenvironmental professional when you know or expect that someone else—a third-party—will want to use or rely on the report. *Do not permit third-party use or reliance until you first confer with the geoenvironmental professional who prepared the report.* Additional testing, analysis, or study may be required and, in any event, appropriate terms and conditions should be agreed to so both you and your geoenvironmental professional are protected from third-party risks. *Any party who relies on a geoenvironmental report without the express written permission of the professional who prepared it and the client for whom it was prepared may be solely liable for any problems that arise.*

Avoid Misinterpretation of the Report

Design professionals and other parties may want to rely on the report in developing plans and specifications. They need to be advised, in writing, that their needs may not have been considered when the study's scope was developed, and, even if their needs were considered, they might misinterpret geoenvironmental findings, conclusions, and recommendations. *Commission your geoenvironmental professional to explain pertinent elements of the report to others who are permitted to rely on it, and to review any plans, specifications or other instruments of professional service that incorporate any of the report's findings, conclusions, or recommendations.* Your geoenvironmental professional has the best understanding of the issues involved, including the fundamental assumptions that underpinned the study's scope.

Give Contractors Access to the Report

Reduce the risk of delays, claims, and disputes by giving contractors access to the full report, *providing that it is accompanied by a letter of transmittal that can protect you* by making it unquestionably clear that: 1) the study was not conducted and the report was not prepared for purposes of bid development, and 2) the findings, conclusions, and recommendations included in the report are based on a variety of opinions, inferences, and assumptions and are subject to interpretation. Use the letter to also advise contractors to consult with your geoenvironmental professional to obtain clarifications, interpretations, and guidance (a fee may be required for this service), and that—in any event—they should conduct additional studies to obtain the specific type and extent of information each prefers for preparing a bid or cost estimate. Providing access to the full report, with the appropriate caveats, helps prevent formation of adversarial attitudes and claims of concealed or differing conditions. If a contractor elects to ignore the warnings and advice in the letter of transmittal, it would do so at its own risk. Your geoenvironmental professional should be able to help you prepare an effective letter.

Do Not Separate Documentation from the Report

Geoenvironmental reports often include supplemental documentation, such as maps and copies of regulatory files, permits, registrations, citations, and correspondence with regulatory agencies. If subsurface explorations were performed, the report may contain final boring logs and copies of laboratory data. If remediation activities occurred on site, the report may include: copies of daily field reports; waste manifests; and information about the disturbance of subsurface materials, the type and thickness of any fill placed on site, and fill placement practices, among other types of documentation. *Do not separate supplemental documentation from the report. Do not, and do not permit any other party to redraw or modify any of the supplemental documentation for incorporation into other professionals' instruments of service.*

Understand the Role of Standards

Unless they are incorporated into statutes or regulations, standard practices and standard guides developed by the American Society for Testing and Materials (ASTM) and other recognized standards-developing organizations (SDOs) are little more than aspirational methods agreed to by a consensus of a committee. The committees that develop standards may not comprise those best-qualified to establish methods and, no matter what, no standard method can possibly consider the infinite client- and project-specific variables that fly in the face of the theoretical "standard conditions" to which standard practices and standard guides apply. In fact, these variables can be so pronounced that geoenvironmental professionals who comply with every directive of an ASTM or other standard procedure could run afoul of local custom and practice, thus violating the standard of care. Accordingly, when geoenvironmental professionals indicate in their reports that they have performed a service "in general compliance" with one standard or another, it means they have applied professional judgement in creating and implementing a scope of service designed for the specific client and project involved, and which follows some of the general precepts laid out in the referenced standard. To the extent that a report indicates "general compliance" with a standard, you may wish to speak with your geoenvironmental professional to learn more about what was and was not done. *Do not assume a given standard was followed to the letter.* Research indicates that that seldom is the case.

Realize That Recommendations May Not Be Final

The technical recommendations included in a geoenvironmental report are based on assumptions about actual conditions, and so are preliminary or tentative. Final recommendations can be prepared only by observing actual conditions as they are exposed. For that reason, you should retain the geoenvironmental professional of record to observe construction and/or remediation activities on site, to permit rapid response to unanticipated conditions. *The geoenvironmental professional who prepared the report cannot assume responsibility or liability for the report's recommendations if that professional is not retained to observe relevant site operations.*

Understand That Geotechnical Issues Have Not Been Addressed

Unless geotechnical engineering was specifically included in the scope of professional service, a report is not likely to relate any findings, conclusions, or recommendations about the suitability of subsurface materials for construction purposes, especially when site remediation has been accomplished through the removal, replacement, encapsulation, or chemical treatment of on-site soils. The equipment, techniques, and testing used by geotechnical engineers differ markedly from those used by geoenvironmental professionals; their education, training, and experience are also significantly different. If you plan to build on the subject site, but have not yet had a geotechnical engineering study conducted, your geoenvironmental professional should be able to provide guidance about the next steps you should take. The same firm may provide the services you need.

Read Responsibility Provisions Closely

Geoenvironmental studies cannot be exact; they are based on professional judgement and opinion. Nonetheless, some clients, contractors, and others assume geoenvironmental reports are or certainly should be unerringly precise. Such assumptions have created unrealistic expectations that have led to wholly unwarranted claims and disputes. To help prevent such problems, geoenvironmental professionals have developed a number of report provisions and contract terms that explain who is responsible for what, and how risks are to be allocated. Some people mistake these for "exculpatory clauses," that is, provisions whose purpose is to transfer one party's rightful responsibilities and liabilities to someone else. Read the responsibility provisions included in a report and in the contract you and your geoenvironmental professional agreed to. *Responsibility provisions are not "boilerplate."* They are important.

Rely on Your Geoenvironmental Professional for Additional Assistance

Membership in the Geoprofessional Business Association exposes geoenvironmental professionals to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a geoenvironmental project. Confer with your GBA-member geoenvironmental professional for more information.

GEOPROFESSIONAL BUSINESS ASSOCIATION

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

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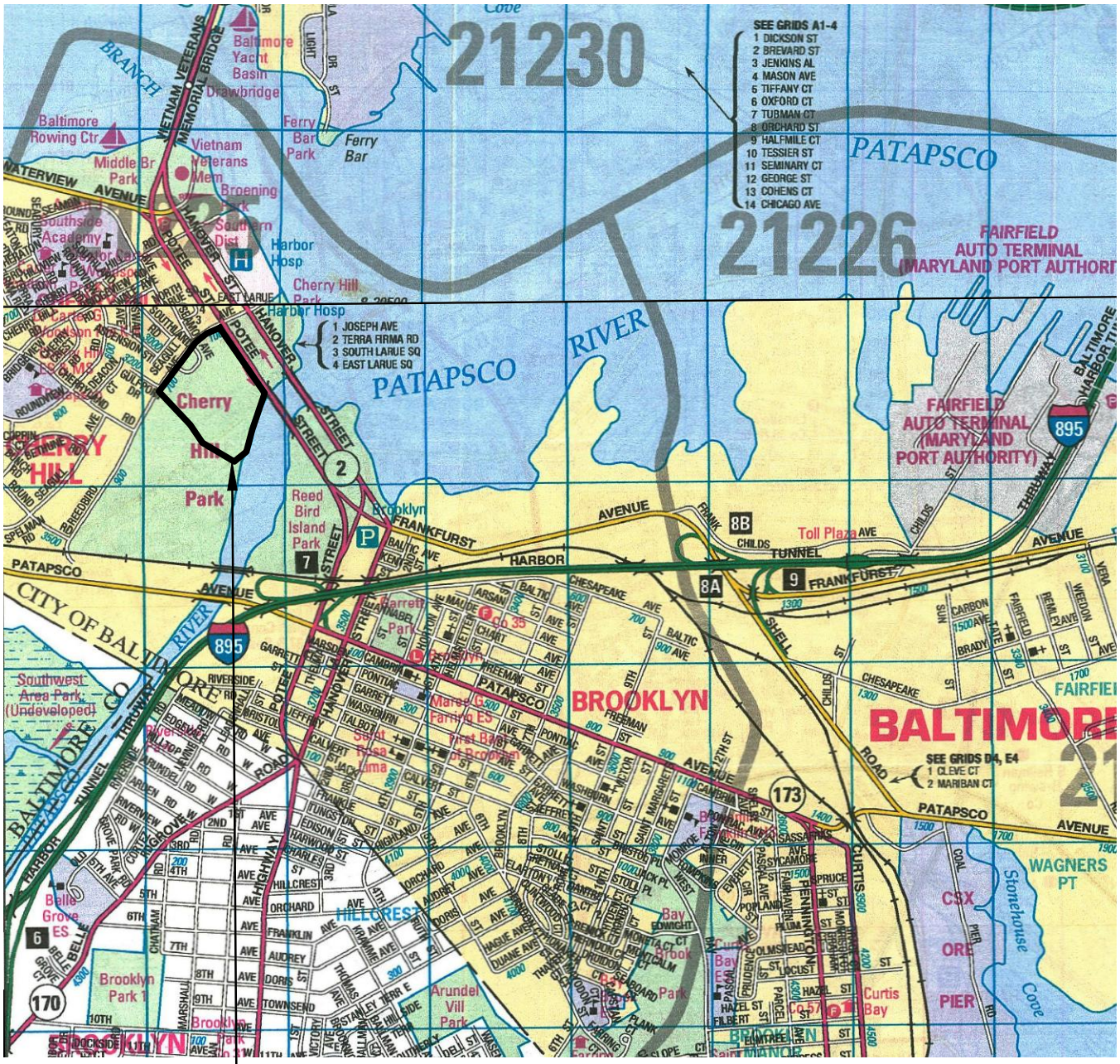
FIGURES



Approximate Subject Property Boundary

0 1,000 2,000

Approximate Scale
1 inch = 2,000 feet

NORTH

Notes

1. Map Copyright © ADC The Map People, (800) 829-6277
2. Permitted Use Number 21006238

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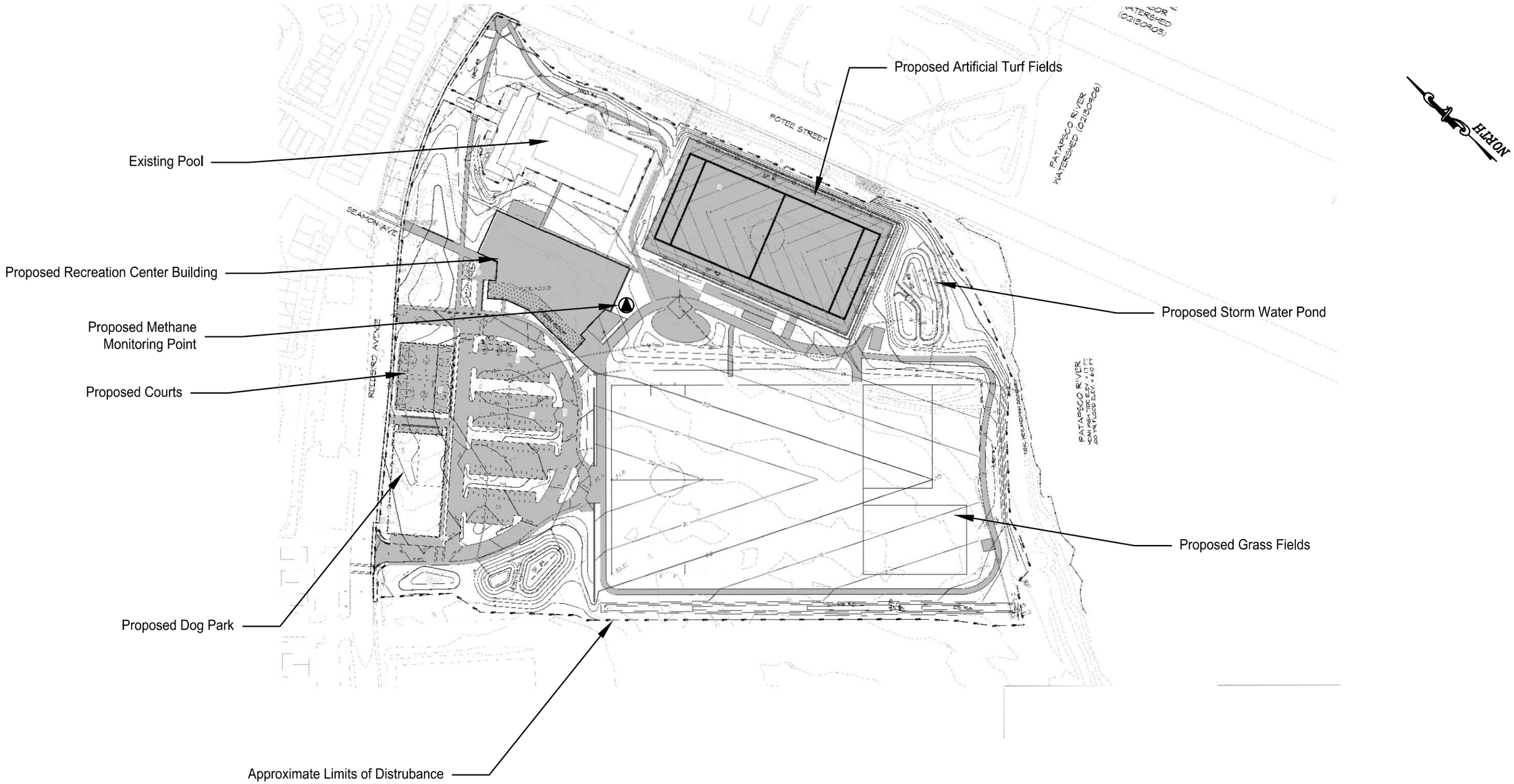
CHERRY HILL PARK

BALTIMORE COUNTY, MARYLAND

SITE LOCATION MAP

PROJECT: 180985 x1	DATE: AUGUST 2018	SCALE: 1" = 2000'	DESIGN BY: BSC	REVIEW BY: KBD	FIGURE: 1

1571r



Notes

1. Base image obtained from MK Consulting Engineers, LLC (April 2019).

0 100 200
Approximate Scale
1 inch = 200 feet

GTA
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CHERRY HILL PARK
BALTIMORE COUNTY, MARYLAND

PROPOSED DEVELOPMENT PLAN

PROJECT: 180985x1	DATE: APRIL 2019	SCALE: 1" = 200'	DESIGN BY: KBD	REVIEW BY: PHH	FIGURE: 2

1572r

Notes

1. Base image obtained from Google Earth (©2017 Google).

0 150 300
Approximate Scale
1 inch = 300 feet

NORTH

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CHERRY HILL PARK
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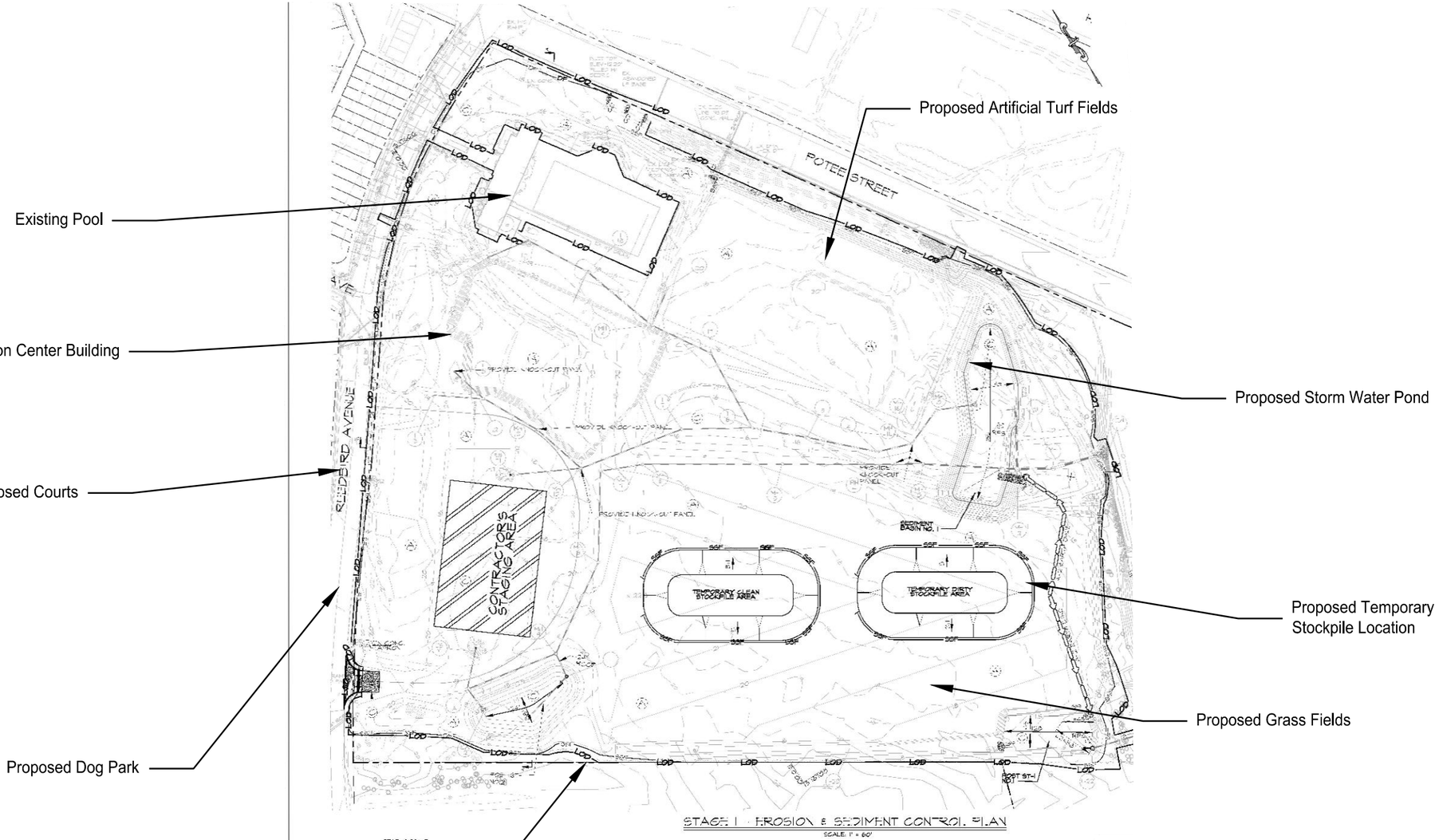
ASSESSMENT AREAS

PROJECT: 180985 x1	DATE: AUGUST 2018	SCALE: 1" = 300'	DESIGN BY: BSC	REVIEW BY: KBD	FIGURE: 3

1573r



Notes

1. Base image obtained from MK Consulting Engineers, LLC (May 2019).

0 100 200
Approximate Scale
1 inch = 200 feet

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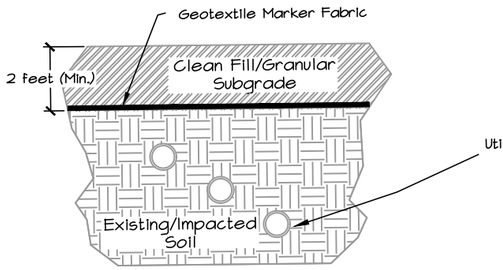
PROPOSED STOCKPILE AREA

PROJECT: 180985x1	DATE: AUGUST 2019	SCALE: 1" = 200'	DESIGN BY: KBD	REVIEW BY: PHH	FIGURE: 4

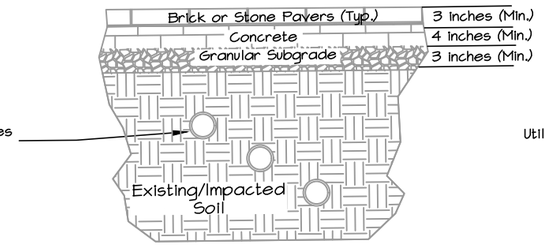
1574r

NOTES

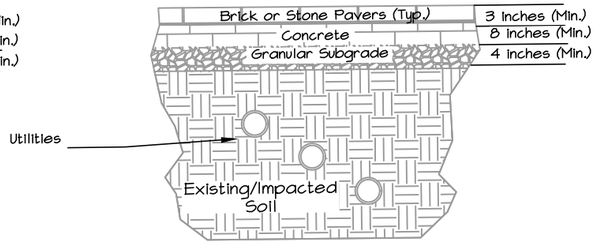
1. DEPTH/WIDTH OF UTILITY TRENCH WILL VARY.
2. DETAILS ARE NOT FOR CONSTRUCTION.
3. DETAILS ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY AND ARE SUBJECT TO FINAL DESIGN.
4. GRANULAR SUBGRADE BENEATH ASPHALT/CONCRETE IS MDE-APPROVED CLEAN STONE/FILL.



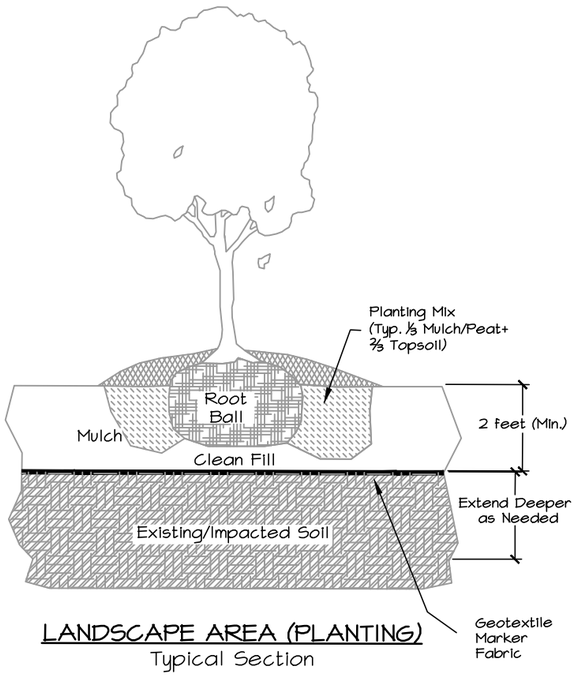
LANDSCAPED AREA (SOIL/STONE)
Typical Section



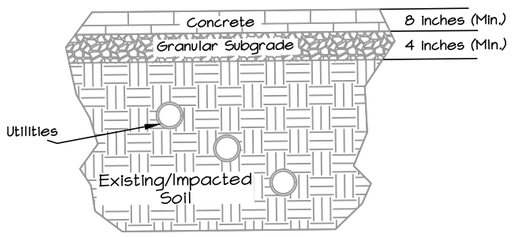
PAVER SIDEWALK (STABLE SOIL)
Typical Section



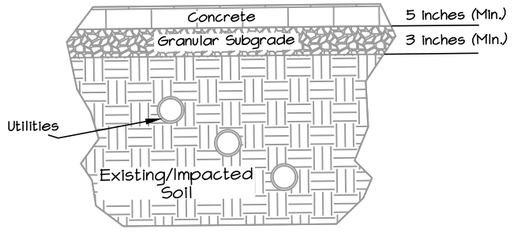
PAVER ROADWAY (STABLE SOIL)
Typical Section



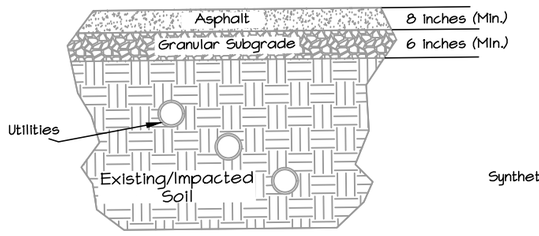
LANDSCAPE AREA (PLANTING)
Typical Section



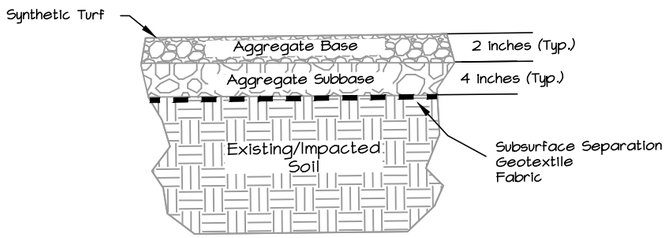
CONCRETE ROADWAY (STABLE SOIL)
Typical Section



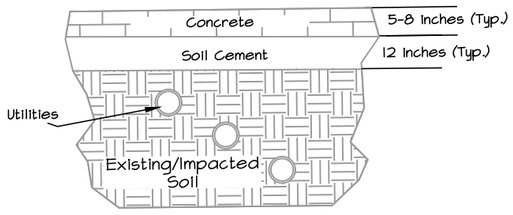
CONCRETE SIDEWALK (STABLE SOIL)
Typical Section



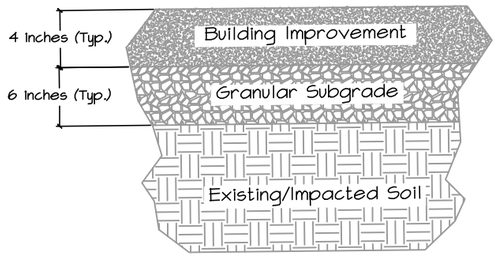
ASPHALT ROADWAY (STABLE SOIL)
Typical Section



ARTIFICIAL TURF FIELD
Typical Section



HARDSCAPED AREA (SOFT SOIL)
Typical Section



BUILDING SLAB
Typical Section

TABLE 1
MINIMUM PHYSICAL REQUIREMENTS FOR GEOTEXTILE MARKER FABRIC

PROPERTY	UNITS	ACCEPTABLE VALUES	TEST METHOD
GRAB STRENGTH	LBS	160X160	ASTM D 4632
MULLEN BURST	PSI	350	ASTM D 3786
CBR PUNCTURE	LBS	75	ASTM D 4833
TRAPEZOID TEAR	LBS	75	ASTM D 4533
APPARENT OPENING SIZE	U.S. SIEVE	30	ASTM D 4751
PERMITTIVITY	SEC -1	0.05	ASTM D 4491
ULTRAVIOLET DEGRADATION	PERCENT	80 AT 500 HRS	ASTM D 4355

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LAUREL, MARYLAND 20707
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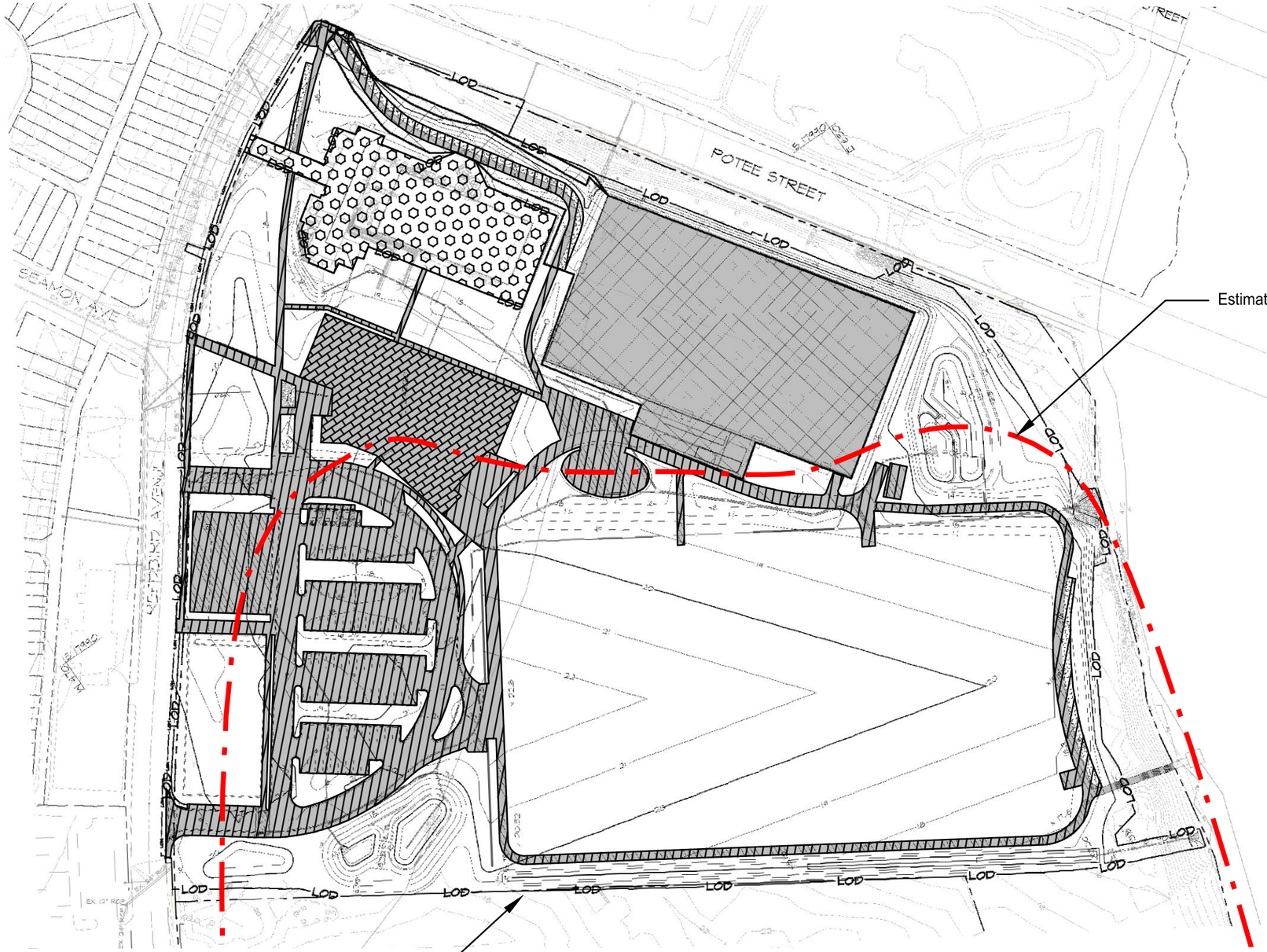
CAPPING DETAILS

PROJECT: 180985x1	DATE: MAY 2019	SCALE: 1" = 50'	DESIGN BY: KBD	REVIEW BY: PHH	FIGURE: 5



Legend

- Proposed pervious - grass or landscape
- Proposed impervious - concrete or asphalt
- Proposed impervious - artificial turf
- Proposed impervious - building
- Existing impervious - pool complex

Approximate Subject Property Boundary

Notes

1. Base image obtained from MK Consulting Engineers, LLC (April 2019).

0 75 150
Approximate Scale
1 inch = 150 feet

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PLAN VIEW CAPPING DETAILS

PROJECT: 180985x1	DATE: OCTOBER 2019	SCALE: 1" = 150'	DESIGN BY: KBD	REVIEW BY: PHH	FIGURE: 6

APPENDIX

CAP INSPECTION FORM

Location:		**Date/Time:**	
Inspector:		**Weather:**	

LAWNS AND LANDSCAPED AREAS

Overall Condition	
Check all that apply	☐ Sound ☐ Erosion ☐ Healthy Plant Condition ☐ Mortality ☐ Animal Burrows
Trees	☐ Healthy ☐ Poor Health ☐ Dead ☐ Fallen ☐ Other_____
Shrubs	☐ Healthy ☐ Poor Health ☐ Dead ☐ Fallen ☐ Other_____

Specific Areas of Note
(use CI, below, and attach sketches/ photographs, as needed)

Area	CI	Comments
Artifical Turf Field		
Grass Fields		
Parking Lots and Roadways		
Dog Park		

Condition Index (CI)

Response?	CI	Characterization	Description
Optional	**1**	Undisturbed landscape	Landscape surfaces undisturbed
	2	Minor disturbance of soil surfaces	Landscape has minor wear.
	3	Landscaping shows signs of significant animal or root activity	Depressions less than 2 inches in landscaping.
Required	**4**	Soil surfaces have significant depressions or excavations.	Soil penetration less than 6 inches.
	5	Soil surfaces have significant depressions or excavations.	Soil penetration greater than 6 inches. Preventive maintenance.
	6	Soil surfaces have significant depressions or excavations.	Soil penetration greater than 6 inches in multiple locations.
	7	Soil surfaces have significant depressions or excavations.	Soil penetration greater than 9 inches.
	8	Soil surfaces have significant depressions or excavations.	Multiple soil penetrations greater than 9 inches.
	9	Soil surfaces have significant depressions or excavations.	Soil penetration of one foot or greater.
	10	General breakup of surface.	Geomembrane fabric visible or breached.

RESPONSE ACTIONS

Responses Required	
Work Completed (Description, Date, Contractor, etc.)	
List Attached Photographs/Sketches	

Attach additional sheets as necessary.

meet the requirements of the S.H.A. Specifications, Section 904, as later specified herein or as indicated on the drawings.

B. Coarse Aggregate: Sound, angular crushed stone; crushed gravel; or properly cured, crushed blast-furnace slag, complying with ASTM D 692-88.

C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone; gravel, properly cured blast-furnace slag; or combination thereof, complying with ASTM D 1073.
   1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Recycled Content: Provide maximum reclaimed asphalt pavement (RAP) as feasible.

E. Regional Materials: Provide aggregate products manufactured and of primary raw materials extracted or recovered within 500 mile radius of Project Site.

2.2 ASPHALT MATERIALS

A. Asphalt Cement: ASTM D 3381 for viscosity-graded material, ASTM D 946 for penetration-graded material.

B. Undersealing Asphalt: ASTM D 3141, pumping consistency.

C. **ADDENDUM 1** ~~Prime Coat: ASTM D 2027; medium-curing cutback asphalt; MC-30, MC-70, or MC-250.~~

D. Tack Coat: ASTM D 977, emulsified asphalt.

E. Water: Portable.

2.3 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA). Provide granular, liquid, or wettable powder form.

B. Sand: ASTM D 1073, Grade Nos. 2 or 3.

C. Paving Geotextile: AASHTO M 288, nonwoven polypropylene, specifically designed for paving applications, resistant to chemical attack, rot, and mildew.

D. Provide Crusher Run (CR-6) subbase and fill material.

2.4 MIXES

A. Hot-Mix Asphalt: Provide dense, hot-laid, hot- mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:
   1. Base Course: Hot mix Asphalt Superpave 19.0 mm – PG 64-22 Level 2.
   2. Surface Course: Hot mix Asphalt Superpave 9.5 mm – PG 64-22 Level 2.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.

B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.

C. Notify Engineer in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.2 COLD MILLING

A. Clean existing paving surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement, including hot-mix asphalt and as necessary, unbound-aggregate base course, by cold milling to grades and cross sections indicated.
   1. Repair or replace curbs, manholes, and other construction damaged during cold milling.

3.3 PATCHING AND REPAIRS

A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Recompact new subgrade. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.
   1. Tack coat faces of excavation and allow to cure before paving.
   2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
   3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
   1. Pump hot undersealing asphalt under rocking slabs until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
   2. Remove disintegrated or badly broken pavement. Prepare and patch with hot-mix asphalt.

C. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
   1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.

D. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of ¼ inch. Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.

E. Tack Coat: Apply uniformly to existing surface of previously constructed asphalt or Portland cement concrete paving to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.01 to 0.05 gal./sq. ft. of surface.
   1. Allow tack coat to cure undisturbed before paving.
   2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 SURFACE PREPARATION

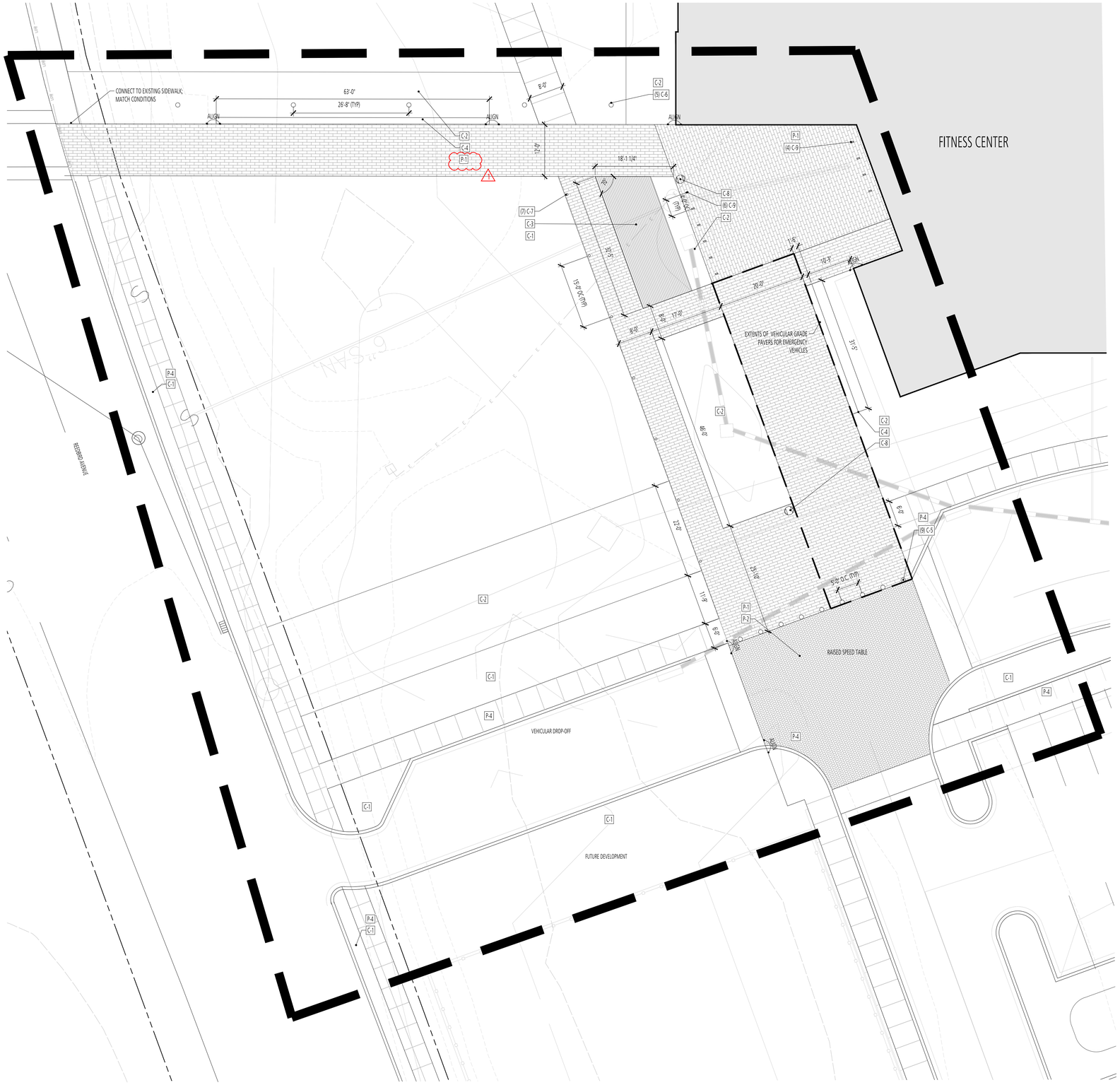
A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
   1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface or compacted-aggregate base before applying paving materials.
   1. **ADDENDUM 1** ~~Mix herbicide with prime coat when formulated by manufacturer for that purpose.~~

C. **ADDENDUM 1** ~~Prime Coat: Apply uniformly over surface of compacted-aggregate base at a rate of 0.15 to 0.50 gal./sq. yd. Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure for 72 hours minimum.~~
   ~~1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use just enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.~~
   ~~2. Protect primed substrate from damage until ready to receive paving.~~
   ~~3. Prime coat shall be applied at a temperature of 75° to 100°.~~

3.5 HOT-MIX ASPHALT PLACING

A. Bituminous concrete shall not be placed when the ambient air and surface temperature is below 40° F. When the surface temperature falls below these limits, material enroute may be placed at the risk of the Contractor.



1 HARDSCAPE ENLARGEMENT PLAN - COMMUNITY PLAZA
PLAN

FTLA_L1.01-Hardscape Enlargment Plan - Community Plaza
SCALE: 1"= 10'-0"

KEY PLAN:

KEYNOTES LISTED ON THIS SHEET ARE FOR CONVENIENCE ONLY. REFER TO SHEET CS.2 FOR COMPLETE LIST

KEYNOTES:

CONSTRUCTION NOTES			
SYMBOL	**ITEM TYPE**	**NOTES**	**REFERENCE**
C-1	LAWN		1/L4.00
C-2	PLANTING BED		1/L4.00
C-3	BENCH A	REFER TO SPECIFICATIONS	
C-4	CONCRETE SEATWALL		5/L3.00
C-5	VEHICULAR GRADE BOLLARDS		
C-6	LIGHT COLUMN	REFER TO ELECTRICAL	
C-7	LIGHT BOLLARDS	REFER TO ELECTRICAL	
C-8	LITTER RECEPTACLE	REFER TO SPECIFICATIONS	
C-9	BICYCLE RACK	REFER TO SPECIFICATIONS	
C-10	HARVEST TABLE	REFER TO SPECIFICATIONS	
PAVEMENT NOTES			
SYMBOL	**PAVER TYPE**	**NOTES**	**REFERENCE**
P-1	PAVER A	REFER TO SPECIFICATIONS	2/L 300
P-2	PAVER B - VEHICULAR USE	REFER TO SPECIFICATIONS	3/L3.00
P-3	EXTERIOR FITNESS TILE	REFER TO SPECIFICATIONS	4/L3.00
P-4	SCORED CONCRETE		1/L3.00
P-5	SUNDECK	REFER TO ARCHITECTURAL DRAWINGS	

GENERAL NOTES:

1. IT IS THE CONTRACTORS RESPONSIBILITY TO FIELD VERIFY SITE CONDITIONS PRIOR TO THE START OF ANY WORK. ANY DISCREPANCY FOUND SHALL BE REPORTED TO THE ARCHITECT IMMEDIATELY.
2. THE CONTRACTOR SHALL CONTACT THE ARCHITECT IMMEDIATELY UPON FINDING ANY UNFORESEEN CONDITIONS.
3. MAINTAIN POSITIVE DRAINAGE FROM BUILDINGS THROUGHOUT CONSTRUCTION, REFER TO CIVIL DRAWINGS FOR PROPOSED GRADING AND SPOT ELEVATIONS.
4. THE CONTRACTOR IS RESPONSIBLE FOR REMOVAL AND PROPER DISPOSAL OF ANY WASTE FROM THE SITE.
5. PROVIDE MOCK UPS OF WALL AND PAVING ASSEMBLIES PRIOR TO STARTING INSTALLATION. APPROVED MOCK UPS MAY BE USED IN COMPLETED PROJECT IF UNDAMAGED THROUGHOUT CONSTRUCTION.

ISSUED FOR BID

Seal:

Seal:

GWWO INC.
800 WYMAN PARK DRIVE, SUITE 300
BALTIMORE, MARYLAND 21211, 410-332-1009

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Revisions:

No.	Date	Description
1	1/13/2020	Addendum 1

MIDDLE BRANCH FITNESS & WELLNESS CENTER AT CHERRY HILL

BALTIMORE CITY RECREATION & PARKS

Job No.	#18010	Author	Drawn
Scale		Checker	Checked
Date	12/13/2019	Approver	Approved
Drawing Title: HARDSCAPE ENLARGEMENT - COMMUNITY PLAZA		Drawing Number: L1.01r	
Sheet			Of

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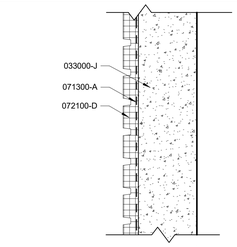
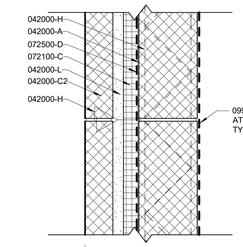
11/8/2019 3:30:51 PM



A.21 PLAN 6"
R-VALUE: 10.52
U-VALUE: 0.095

A.22 PLAN 8"
R-VALUE: 10.64
U-VALUE: 0.094

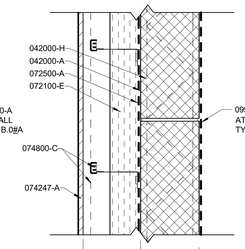
A.23 PLAN 12"
R-VALUE: 10.76
U-VALUE: 0.093



B.01 PLAN 7 5/8"
R-VALUE: 13.29
U-VALUE: 0.075

B.02 PLAN 9 5/8"
R-VALUE: 13.35
U-VALUE: 0.075

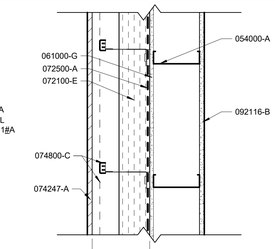
B.03 PLAN 11 5/8"
R-VALUE: 13.38
U-VALUE: 0.075



B.11 PLAN 7 5/8"
R-VALUE: 17.95
U-VALUE: 0.056

B.12 PLAN 9 5/8"
R-VALUE: 18.01
U-VALUE: 0.056

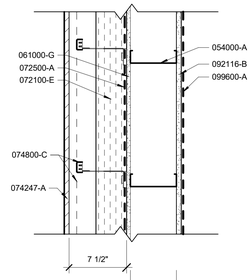
B.13 PLAN 11 5/8"
R-VALUE: 18.04
U-VALUE: 0.055



C.01 PLAN 3 5/8"
R-VALUE: 17.54
U-VALUE: 0.057

C.02 PLAN 6"
R-VALUE: 17.54
U-VALUE: 0.057

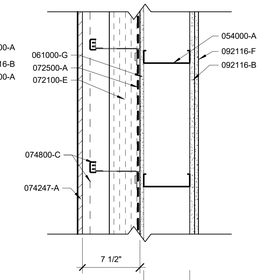
C.03 PLAN 8"
R-VALUE: 17.54
U-VALUE: 0.057



C.11 PLAN 3 5/8"
R-VALUE: 17.54
U-VALUE: 0.057

C.12 PLAN 6"
R-VALUE: 17.54
U-VALUE: 0.057

C.13 PLAN 8"
R-VALUE: 17.54
U-VALUE: 0.057

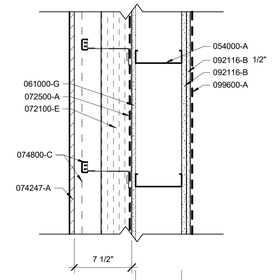


C.21 PLAN 3 5/8"
R-VALUE: 17.99
U-VALUE: 0.056

C.22 PLAN 6"
R-VALUE: 17.99
U-VALUE: 0.056

C.23 PLAN 8"
R-VALUE: 17.99
U-VALUE: 0.056

C.24 PLAN 10"
R-VALUE: 17.99
U-VALUE: 0.056

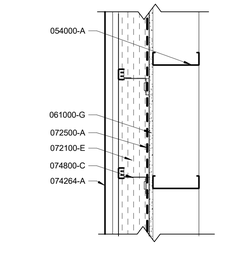


C.31 PLAN 3 5/8"
R-VALUE: 17.99
U-VALUE: 0.056

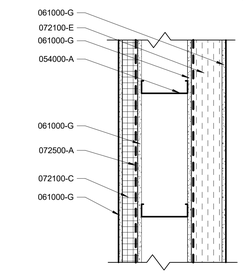
C.32 PLAN 6"
R-VALUE: 17.99
U-VALUE: 0.056

C.33 PLAN 8"
R-VALUE: 17.99
U-VALUE: 0.056

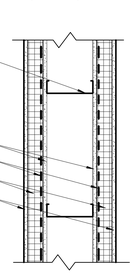
C.34 PLAN 10"
R-VALUE: 17.99
U-VALUE: 0.056



C.41 PLAN 4"
R-VALUE: 17.09
U-VALUE: 0.059



C.51 PLAN 4"
R-VALUE: 30.85
U-VALUE: 0.032



C.61 PLAN 4"
R-VALUE: 23.14
U-VALUE: 0.043

C.62 PLAN 6"
R-VALUE: 23.14
U-VALUE: 0.043

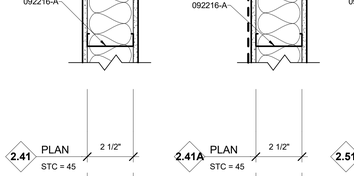
C.63 PLAN 8"
R-VALUE: 23.14
U-VALUE: 0.043

EXTERIOR WALL TYPES
1 1/2" = 1'-0"

D5.1.1 SECTION
SINGLE-PLY MEMBRANE OVER COVERBOARD, TAPERED RIGID INSULATION, VAPOR BARRIER, SHEATHING, AND METAL DECK
R-VALUE = 34.18 , U-VALUE = .029

D5.1.2 SECTION
SINGLE-PLY MEMBRANE OVER COVERBOARD, TAPERED RIGID INSULATION, VAPOR BARRIER, SHEATHING, AND METAL DECK
R-VALUE = 49.18 , U-VALUE = .020

D5.1.3 SECTION
SINGLE-PLY MEMBRANE OVER COVERBOARD, TAPERED RIGID INSULATION, VAPOR BARRIER, SHEATHING, AND ACOUSTIC WIDE-SPAN METAL DECK
R-VALUE = 34.18, U-VALUE = .029

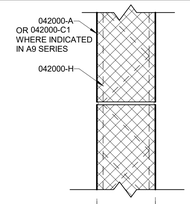


D5.1.4 SECTION
SINGLE-PLY MEMBRANE OVER COVERBOARD, TAPERED RIGID INSULATION, VAPOR BARRIER, SHEATHING, AND METAL DECK
R-VALUE = 34.18 , U-VALUE = .029

GENERAL NOTES:

1. SEE ROOF PLAN FOR LOCATION OF WALK WAY PAD(S).
2. SEE ROOF PLANS FOR SLOPES

ROOF TYPES
1 1/2" = 1'-0"



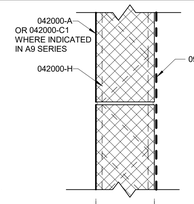
1.01 PLAN 3 5/8"
2 HOUR FIRE RATED (UL U906)
STC = 45*

1.02 PLAN 5 5/8"
2 HOUR FIRE RATED (UL U906)
STC = 51*

1.03 PLAN 7 5/8"
2 HOUR FIRE RATED (UL U906)
STC = 55*

1.05 PLAN 11 5/8"
2 HOUR FIRE RATED (UL U906)
STC = 61*

*FULLY-GROUTED CMU WALL TYPE INDICATED WITH "A" ON PLANS



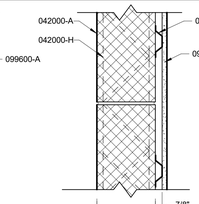
1.41 PLAN 3 5/8"
2 HOUR FIRE RATED (UL U906)
STC = 45*

1.42 PLAN 5 5/8"
2 HOUR FIRE RATED (UL U906)
STC = 51*

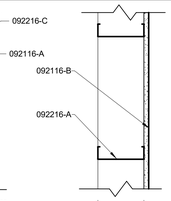
1.43 PLAN 7 5/8"
2 HOUR FIRE RATED (UL U906)
STC = 55*

1.45 PLAN 11 5/8"
2 HOUR FIRE RATED (UL U906)
STC = 63*

*FULLY-GROUTED CMU WALL TYPE INDICATED WITH "A" ON PLANS



1.53 PLAN 7 5/8"
2 HOUR FIRE RATED (UL U906)
STC = 55*

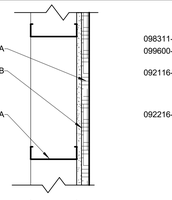


2.11 PLAN 2 1/2"

2.12 PLAN 3 5/8"

2.13 PLAN 6"

2.14 PLAN 8"

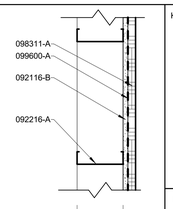


2.11A PLAN 2 1/2"

2.12A PLAN 3 5/8"

2.13A PLAN 6"

2.14A PLAN 8"

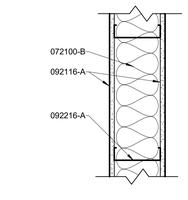


2.11B PLAN 2 1/2"

2.12B PLAN 3 5/8"

2.13B PLAN 6"

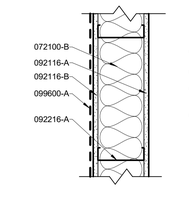
2.14B PLAN 8"



2.41 PLAN 2 1/2"
STC = 45

2.42 PLAN 3 5/8"
STC = 49

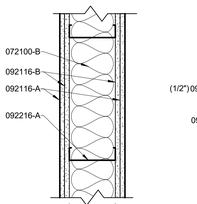
2.43 PLAN 6"
STC = 49



2.41A PLAN 2 1/2"
STC = 45

2.42A PLAN 3 5/8"
STC = 49

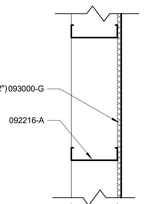
2.43A PLAN 6"
STC = 49



2.51 PLAN 2 1/2"
STC = 55

2.52 PLAN 3 5/8"
STC = 59

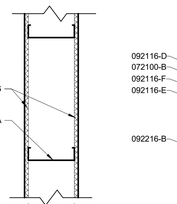
2.53 PLAN 6"
STC = 59



2.61 PLAN 2 1/2"

2.62 PLAN 3 5/8"

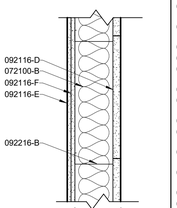
2.63 PLAN 6"



2.71 PLAN 2 1/2"

2.72 PLAN 3 5/8"

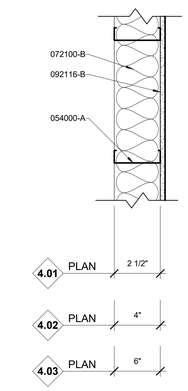
2.73 PLAN 6"



3.01 PLAN 2 1/2"
2 HOUR FIRE RATED (UL U415)
STC = 50

3.02 PLAN 4"
2 HOUR FIRE RATED (UL U415)
STC = 54

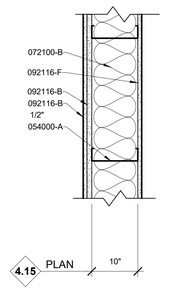
3.03 PLAN 6"
2 HOUR FIRE RATED (UL U415)
STC = 54



4.01 PLAN 2 1/2"

4.02 PLAN 4"

4.03 PLAN 6"

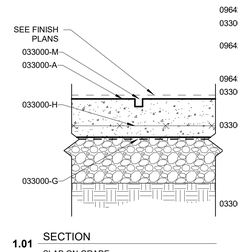


4.15 PLAN 10"

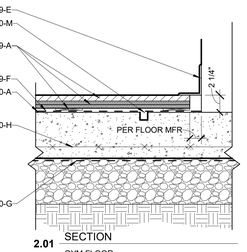
EXTEND ALL WALLS TO BOTTOM OF DECK ABOVE, UNO

GENERAL NOTES:
1. PROVIDE FIRE RATED ASSEMBLIES WHERE FIRE RESISTANT CONSTRUCTION IS INDICATED IN CS SERIES DRAWINGS.

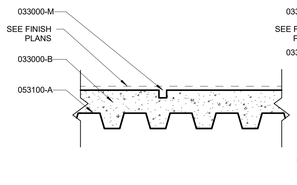
INTERIOR WALL TYPES
1 1/2" = 1'-0"



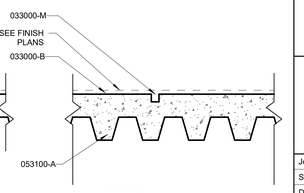
1.01 SECTION
SLAB ON GRADE



2.01 SECTION
GYM FLOOR



3.01 SECTION
ELEVATED FLOOR SLAB



3.02 SECTION
ELEVATED FLOOR SLAB

FLOOR TYPES
1 1/2" = 1'-0"

KEY PLAN:

KEYNOTES LISTED ON THIS SHEET ARE FOR CONVENIENCE ONLY. REFER TO SHEET CS.2 FOR COMPLETE LIST

033000-A	CONCRETE SLAB ON GRADE (REFER TO STRUCTURAL FOR MORE INFORMATION)
033000-B	CONCRETE SLAB ON STEEL DECK (REFER TO STRUCTURAL FOR MORE INFORMATION)
033000-G	UNDER SLAB VAPOR BARRIER
033000-H	WELDED WIRE FABRIC (REFER TO STRUCTURAL FOR MORE INFORMATION)
033000-J	ANCHOR BOLTS
033000-M	CONTROL JOINT
042000-A	CONCRETE MASONRY UNIT, SIZE AS INDICATED
042000-C1	GROUND FACE CMU 1, SIZE AND COLOR AS INDICATED
042000-C2	GROUND FACE CMU 2, SIZE AND COLOR AS INDICATED
042000-H	JOINT REINFORCEMENT/MASONRY TIE
042000-L	CEMENTITIOUS GROUT
053100-A	STEEL DECK (REFER TO STRUCTURAL FOR MORE INFORMATION)
053100-B	ACOUSTIC METAL DECK (REFER TO STRUCTURAL FOR MORE INFORMATION)
054000-A	COLD-FORMED STEEL FRAMING, SIZE AS INDICATED
061000-G	EXTERIOR GYPSUM SHEATHING, 1/2" UNO
071300-A	SELF-ADHERING MEMBRANE WATERPROOFING
072100-B	BATT INSULATION, 5 1/2" UNO (OR MAX THICKNESS FOR LOCATION)
072100-C	RIGID INSULATION BOARD, 2" THICK UNO
072100-D	RIGID INSULATION BOARD WITH DRAINAGE CHANNEL AND FILTER FABRIC, 2" THICK UNO
072100-E	MINERAL WOOL INSULATION BOARD, 4" THICK UNO
072500-A	VAPOR-PERMEABLE, AIR/WATER-RESISTIVE BARRIER
072500-B	VAPOR-IMPERMEABLE, AIR/WATER-RESISTIVE BARRIER
072500-D	BELOW GRADE VAPOR-PERMEABLE, AIR/WATER-RESISTIVE BARRIER
074247-A	CONCRETE PANEL
074264-A	ALUMINUM COMPOSITE PANEL
074800-C	THERMAL BRACKET
075423-A	TPO ROOFING
075423-B	COVER BOARD
075423-E	ROOF INSULATION
075423-Q	EXTERIOR GYPSUM SHEATHING, 1/2" UNO
092116-A	GYPSUM BOARD, ABUSE AND MOISTURE RESISTANT, 5/8" THICKNESS UNO
092116-B	GYPSUM BOARD, MOISTURE RESISTANT TYPE 'XP', 5/8" THICKNESS UNO
092116-D	GYPSUM BOARD, MOISTURE RESISTANT SHAFTLINER PANELS TYPE 'XP', 1" THICKNESS
092116-E	GYPSUM BOARD, ABUSE AND MOISTURE RESISTANT, TYPE 'C', 1/2" THICKNESS
092116-F	GYPSUM BOARD, MOISTURE RESISTANT, TYPE 'C', 1/2" THICKNESS
092216-A	NON-STRUCTURAL METAL STUD, SIZE AS INDICATED
092216-B	NON-STRUCTURAL METAL SHAFTWALL STUD, SIZE AS INDICATED
092216-C	HAT SHAPED METAL FURRING CHANNEL, SIZE AS INDICATED
093000-G	CEMENTITIOUS BACKER BOARD, 1/2" THICKNESS UNO
096429-A	GYMNASIUM WOOD FLOORING SYSTEM
096429-E	BASE TRIM
096429-F	VAPOR RETARDER
098311-A	SHREDDED WOOD ACOUSTIC PANEL; PAINTED PT-1 UNO, 2" THICK UNO
099600-A	MULTI-LAYER IMPERMEABLE SURFACE

8 0 8 16
SCALE OF FEET
1/8" = 1'-0"

ISSUED FOR BID

Seal:

Seal:

GWWO INC.
800 WYMAN PARK DRIVE, SUITE 300
BALTIMORE, MARYLAND 21211, 410-332-0309

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I CERTIFY THAT THESE DOCUMENTS WERE PREPARED OR APPROVED BY ME, AND THAT I AM A DULY LICENSED ARCHITECT UNDER THE LAWS OF THE STATE OF MARYLAND, LICENSE NUMBER: 8400, EXPIRATION DATE 12/21/2020

Revisions:

No.	Date	Description
1	1/13/2020	ADDENDUM 1

MIDDLE BRANCH FITNESS & WELLNESS CENTER AT CHERRY HILL

BALTIMORE CITY RECREATION & PARKS

Job No.	#18010	AWM	Drawn
Scale	1 1/2" = 1'-0"	KMS	Checked
Date	12/13/2019	AER	Approved

Drawing Title: CONSTRUCTION TYPES, TYPICAL DETAILS, AND DIAGRAMS

Drawing Number: AC.1r

Sheet: Of

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1/10/2020 3:46:17 PM