ADDENDUM NO. 1

to the

PLANS AND SPECIFICATIONS

for the

WASTEWATER IMPROVEMENTS PROJECT

DIV. II – SANITARY SEWER COLLECTION SYSTEM IMPROVEMENTS

for the

TOWN OF WATERLOO

DEKALB COUNTY, INDIANA

MEI PROJECT #2020073-00

Issue Date: APRIL 23, 2024

This addendum becomes part of the Contract Documents and modifies the original Contract Documents as noted below. Acknowledge receipt of this Addendum by inserting the number and issue date of this addendum in the blank space provided on the Bid Form.

The following items shall amend, clarify, and/or correct plans and/or specifications for the above project and shall take precedence over items in conflict herein:

Item No. 01: **Addition: Supplementary Conditions: Project Geotechnical Report is attached.**

Item No. 02: **Addition: Technical Specification Section 330561 – Monolithic and Precast Concrete Structures is attached. All monolithic and precast concrete structures shall adhere to this specification.**

Item No. 03: **Modification: Bid Schedule. The attached Revised Bid Schedule shall be used for submittal of Bid.**

Item No. 04: **Modification: Special Conditions. A project sign and field office are not required. The following articles shall be removed from the Special Conditions sections.**

Article 4: Commencement and Progress of Work

SPC-4.02 Starting the Work – Add the following new paragraphs immediately after Paragraph 4.02 A:

B. The Contractor shall be required to install the Temporary Sign for Rural Development Projects before the work commences. The sign shall meet the criteria included at the end of the Special Conditions section of the Specification.

SPC-7.02 Supervision and Superintendence – Add the following new paragraph immediately after paragraph 7.02.B

C. Field Offices

A field office is required for the project.

Item No. 05: **Modification: Sheet 14**

Structure SC-4; Inv. (N) shall be modified from 905.63 to 906.50. This will eliminate the internal drops for INV. (SW), INV. (E), and INV. (W).

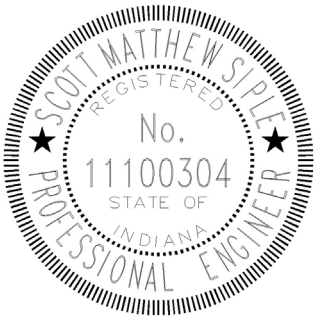
Pipe Segment between structure SC-3 and SC-4 shall be modified as follows:

Proposed 338 L.F. of 12" SDR-35 PVC Sanitary Sewer @ 0.48% Slope.

Item No. 6: **Clarification: Sheet 25, Structure Data Table**

Structure SA-13 structure type shall be 60" Diameter Manhole (Outside Drop)

Structure SC-4 structure type shall be 48" Diameter Manhole; Depth shall be 8.0±



April 23, 2024

Respectfully submitted,

MIDWESTERN ENGINEERS, INC.

Scott M. Siple, P.E.
Senior Project Engineer
(317) 334-0262
ssiple@midwesterneng.com

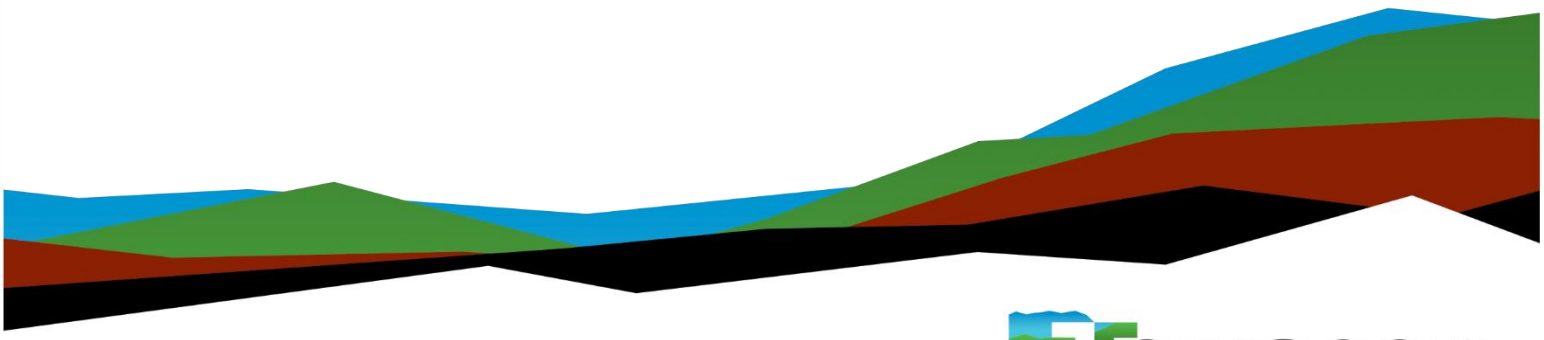
Division II – Sanitary System Improvements

Geotechnical Engineering Report

March 9, 2023 | Terracon Project No. CJ225454

Prepared for:

Midwestern Engineers, Inc.
6809 Corporate Drive
Indianapolis, Indiana 46278



Terracon
Explore with us

Nationwide
Terracon.com

- Facilities
- Environmental
- Geotechnical
- Materials

7770 West New York Street
Indianapolis, IN 46214
P (317) 273-1690
Terracon.com

March 9, 2023

Midwestern Engineers, Inc.
6809 Corporate Drive
Indianapolis, Indiana 46278

Attn: Scott Siple
P: 317-334-0262
E: Ssiple@midwesterneng.com

Re: Geotechnical Engineering Report
Division II – Sanitary System Improvements
6809 Corporate Drive
Waterloo, Indiana
Terracon Project No. CJ225454

Dear Mr. Siple:

We have completed the scope of Geotechnical Engineering services for the referenced project in general accordance with Terracon Proposal No. PCJ225454 dated October 25, 2022 and the proposal for additional services dated January 10, 2023. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of sewers and foundations for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon Consultants, Inc.

Matt JW Mickelson, E.I.
Staff Engineer

Richard D. Olson, P.E.
Principal Engineer

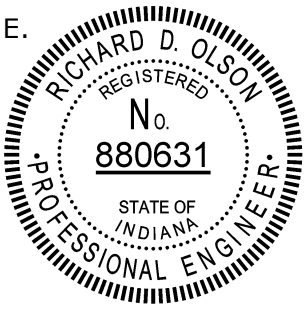


Table of Contents

Figures

Attachments

Note: This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the Terracon logo will bring you back to this page. For more interactive features, please view your project online at **client.terracon.com**.

Refer to each individual Attachment for a listing of contents.

Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the proposed Sanitary System Improvements to be located in Waterloo, Indiana. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions,
- Groundwater conditions,
- Excavation and dewatering considerations.
- Cut-and cover construction considerations,
- Trenchless excavation considerations, and
- Site preparation and earthwork,
- Foundation construction considerations
- Use of stockpile materials for fill considerations, and
- Seismic site classification per IBC

The geotechnical engineering Scope of Services for this project included the advancement of soil borings, test pits, laboratory testing, engineering analysis, and preparation of this report.

Drawings showing the site and boring locations are shown on the **Site Location** and **Exploration Plan**, respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs and as separate graphs in the **Exploration Results** section.

Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located on the east side of Waterloo, Indiana. Latitude/Longitude (approximate) 41.4303, -85.0110 See **Site Location**
Existing Improvements	The project area consists of an existing wastewater treatment plant (including a polishing pond and reinforced concrete

	structures), a railroad, pavements, and adjacent private and residential structures.
Current Ground Cover	Asphalt pavement and grass. Additionally, a stockpile and topsoil stockpile are located near the southwest corner of the existing wastewater treatment plant
Existing Topography	Site grade across the project generally ranged from about El. 884 to 909.

Project Description

Our initial understanding of the project was provided in our proposal, and our current understanding of the project conditions is as follows:

Planned Construction

Item	Description
Information Provided	Information for the project was provided by Midwestern Engineers via email and telephone correspondence. The documents provided included preliminary plan and profile for the proposed sewer and site plan documents at the wastewater treatment plant. However, changes have been made to both the alignment and site layout that are not included on these documents. Changes were communicated to Terracon via email and telephone correspondence.
Project Description	▪ Open sewer construction is planned starting at the intersection of E Walnut Street and S Washington Street and extending north to E Douglas Street, then east to Best Street and north again to the existing wastewater treatment plant. The depth of the sewer is anticipated to be about 8 to 20 ft. ▪ A new force main is planned to be installed from Union Street (Hwy 6) to the wastewater treatment plant. We understand that the only area of concern from a geotechnical perspective along the force main will be a trenchless excavation extending beneath Van Vleek Street and the Norfolk Southern railroad line. This will include the construction of sending and receiving pits at the crossing. The force main at this location is anticipated to be about 10 ft deep. Exploration services and

Item	Description
	recommendations to the north of the crossing were outside of the scope of this report. ■ Improvements at the wastewater treatment plant are anticipated to include: ○ A new headworks structure about 15 to 20 ft deep located within the limits of the existing polishing pond ○ A dry sludge storage bay addition about 5 ft deep ○ A new UV disinfection structure about 15 ft deep ○ These structures are planned to consist of reinforced concrete construction with concrete base slabs. Structure loads were not available at the time of this report.
Below-Grade Structures	We understand that the planned structures at the WWTP will include below grade vertical walls.

Terracon should be notified if any of the above information is inconsistent with the planned construction, especially the proposed pipe inverts and structure depths, as modifications to our recommendations may be necessary.

Geotechnical Characterization

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization forms the basis of our geotechnical calculations and evaluation of the site and is summarized in the GeoModel. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** and the GeoModel can be found in the **Figures** attachment of this report.

As part of our evaluation, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
	Surficial Conditions	The asphalt thickness was noted to be approximately 6 in. at Borings B-01 through B-07. Topsoil was noted to be approximately 6 in. in thickness at borings PS-01 and PS-03.
1	**Cohesive Soils**[1,2]	Lean clays and silty clays; varying amounts of sand; stiff to hard; brown / gray
2	**Sand**	Varying amounts of fines; very loose to medium dense; brown / gray

[1] Some soils noted as fill or possible fill, generally in near surface soils underlying the pavements along the proposed alignment.

[2] Medium stiff soils noted at Boring SP-02 near a depth of about 19 ft.

The borings were advanced using hollow stem augers that allow short-term groundwater observations to be made while drilling. Groundwater level observations were made during, at the completion of, and up to 24 hrs after the sampling process. The observed groundwater depths are noted on the boring logs and are summarized below.

Boring Number	Approximate Groundwater Depth		
	During Drilling	**At Completion**	**Up to 24 Hrs after Drilling**
B-01 to B-03	None Observed		--
B-4	4	None Observed	--
B-5	5	None Observed	--
B-6	None Observed		--
B-7	6	None Observed	--
SP-1	16½	13½	13
SP-2	14	17½	12½
SP-3	None Observed		--

Mapping by the Natural Resources Conservation Service (NRCS) indicates a seasonal high groundwater level within ½-ft. of the ground surface. Groundwater conditions may be different at the time of construction because of seasonal variations in rainfall, runoff, and other conditions not apparent at the time of drilling. Also, trapped or "perched" water could be present within the sand or silt seams within native clay soils and/or in

cohesionless soils (fill and native) above lower permeability clay soil layers. Observation of long-term groundwater levels was outside the scope of services for this project.

Additionally, four test pits were performed at the stockpile located to on the southeast corner of the wastewater treatment plant property. Lean clays and silty clay soils were predominately observed at the test pits. However, TP-04 encountered granular soils (sand overlying silty sand). Cobbles, construction debris, and organic matter such as wood, roots, and plant fibers were observed throughout the stockpile and test pits in varying quantities.

Geotechnical Overview

The site appears to be generally suitable for the proposed construction based upon geotechnical conditions encountered at the test boring locations, provided that the recommendations provided in this report are implemented in the design and construction phases of this project.

The subsurface conditions near the invert elevations along the proposed sewer and force main alignments generally consisted of stiff to hard lean and silty clays. Additionally, the subsurface conditions observed near the planned wastewater treatment plant varied and consisted of medium stiff to hard lean clay soils and very loose to medium dense sand soils with varying amounts of fines. The observed cohesive soils are moisture sensitive and will deteriorate in the presence of water. The condition of the subgrade and the performance of the improvements will be, in part, a function of the care and workmanship of the contractor in protecting the subgrade from water. Where softer soils are encountered or if stiff conditions deteriorate, undercutting may be required. Additionally, where interbedded granular seams are encountered perched groundwater may enter the excavations. It should be noted that saturated granular soils were observed above or near the proposed subgrade elevations at Borings PS-01 and PS-03. Where granular soils are encountered at the bearing elevation, they should be recompacted prior to the placement of fill or structural elements.

In regard to the stockpile present near the southwest portion of the wastewater treatment plant, the soils described as fill were observed to contain construction debris and are not anticipated to be suitable for use as structural fill unless the debris and other deleterious material can be removed. In regard to general fill, it is our opinion that the soils described as fill are suitable for use as general fill if some settlement is tolerable, adequate compaction can be achieved, and rubble fragments larger that 6 in. are removed. Additionally, the soils contained within the topsoil stockpile are not applicable for structural or general fill use.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration Results**), engineering analyses, and

our current understanding of the proposed project. The **General Comments** section provides an understanding of the report limitations.

Dewatering and Excavations

Dewatering

Considering the observed groundwater levels and the possibility of seasonal groundwater fluctuations discussed in the **Geotechnical Characterization**, dewatering will be necessary to facilitate construction and prepare the subgrade for the proposed sewer elements and wastewater treatment plant improvements. It should be noted that the soil conditions and anticipated subgrade depths varied along the alignments and improvement locations. As such the dewatering requirements will vary. For excavations in the cohesive soils predominantly encountered on this site, a temporary dewatering system consisting of sumps with pumps may be adequate to achieve the excavation depths. The success of these methods will be dependent on the groundwater conditions at the time of construction and the thickness and fines content of sand seams and layers. If these methods are not suitable or saturated sands (such as those noted at SP-01 and potentially at deeper excavations performed in the granular soils noted at the existing wastewater treatment plant) are observed above or near the subgrade, the use of high volume and/or multiple sump pits or well points outside the limits of the excavation may be required. We recommend that the groundwater level be lowered to a depth of at least 2 ft below the planned invert elevations prior to the excavation activities.

The intent of our evaluation was to provide geotechnical design-related recommendations for the proposed elements. The scope of this evaluation was not to provide dewatering recommendations for contractors. Dewatering is the responsibility of the contractor based on their means and methods and considers the requirements of subgrade preparation discussed herein. It may be necessary for the dewatering contractor to obtain additional subsurface information to assist with the design of their dewatering plan. The effectiveness of the subgrade preparation activities discussed below will be directly dependent on the adequacy of the contactor’s dewatering efforts.

Excavations

We anticipate that excavations for the proposed construction can be accomplished with conventional earthmoving equipment. Considering the anticipated pipe inverts and structure depths, the presence of sand, and the proximity of existing infrastructure in some areas, we anticipate that the use of excavation support will be required. Trench excavation should not be conducted below a downward 1:1 projection from existing infrastructure or foundations without engineering review of shoring requirements and

appropriate geotechnical observation during construction. The type of excavation support utilized will be based on the contractor's means and methods. Excavation support is anticipated to include trench boxes or temporary braced sheeting. In our opinion, boxes and sheeting should be placed in a manner not to disturb the embedment material. It should be noted that the ability to drive sheeting may be difficult in some areas due to the stiff to hard cohesive soils encountered along the majority of the alignments and the presence of cobbles. Possible cobbles were noted near a depth of about 14 ft from the existing ground surface at Borings B-02 and B-03.

Our scope of work did not include excavation support design, however, we would be pleased to assist with designing a temporary excavation support system, if requested. All excavations should comply with OSHA standards. Stockpiled soil should not be placed adjacent to the excavation. In addition, proper site drainage is recommended to help minimize unwanted surface water runoff into excavations during the construction process. As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

Excavations or other activities resulting in ground disturbance have the potential to affect adjoining infrastructure or structures. Our scope of services does not include review of available final grading information or consider potential temporary grading performed by the contractor for potential effects such as ground movement beyond the project limits. A preconstruction/ precondition survey should be conducted to document nearby property/infrastructure prior to any site development activity. As part of this survey, excavation or ground disturbance activities adjacent or near property lines should be observed or instrumented for potential ground movements that could negatively affect adjoining property and/or structures.

Conventional Cut-and-Cover Considerations

Subgrade Considerations

We understand that the sewer and force main elements are planned to be installed using an open cut-and-cover technique along the majority of the project alignment. Based on information obtained at the boring locations, the subgrade at the inverts is generally

anticipated to consist of stiff to hard cohesive soils. However, while not observed near the invert elevations, softer soils that may require undercutting may be present as well.

As previously mentioned, the condition of the subgrade will be affected by the care and workmanship of the contractor in protecting the subgrade from water. The cohesive soils observed near the planned invert at the test boring locations are moisture-sensitive and will soften when exposed to water. As such, subgrade improvement should be anticipated.

Where soft/unsuitable soil is present at the pipe inverts (such as those noted near about 5 ft below the existing ground surface at Boring B-07) or if stiff conditions degrade due to exposure to moisture, we recommend the pipe subgrades generally be undercut up to a depth of up to 2 ft and grade be reestablished by placing compacted granular fill, such as INDOT No. 8 stone, possibly in conjunction with a geotextile. Due the variability in subsurface conditions, it is impossible to predict with a high degree of accuracy how much undercutting will be required. However, we recommend that a unit rate be included in the bid documents to account for potential undercutting. We recommend that fill placed for this purpose be compacted via several passes with a vibratory plate compactor. Undercutting in areas of poor subgrade conditions, such as those noted above, will require judgement in the field during construction. To reduce the potential for softening of the subgrade soils and additional undercutting, it is recommended that the construction activities be scheduled such that the sewer/force main subgrade is undercut, then reestablished as soon as practical. This will require having all backfill materials present during excavation activities. We recommend that the Geotechnical Engineer observe the subgrade prior to the placement of the bedding layer to confirm the presence of a suitable bearing stratum. Additionally, if granular soils are encountered, we recommend that they be compacted via several passes with a vibratory plate compactor.

Bedding and Backfill

If in any of the areas where cut-and-cover techniques are utilized may be developed in the future (settlement sensitive areas), granular fill is recommended for backfill. This is because of the ease of compaction as compared to cohesive soils which reduces the risk of settlement. In addition, field density tests and observations by the Geotechnical Engineer are recommended during backfill placement to verify the adequacy of compaction effort. We recommend that the pipe manufacturer be contacted to discuss special bedding and backfill requirements. We recommend the following material properties and compaction requirements for the bedding material and soils used for structural backfill surrounding the pipe elements:

Item	Recommendation
Soil Type[1]	Granular soil satisfying a USCS symbol of SP, SW, SW-SM, SP-SM, GP, GW

Item	Recommendation
Maximum Lift Thickness	8 in. or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6 in. in loose thickness when hand-guided equipment (i.e., jumping jack or plate compactor) is used
Minimum Compaction Requirements	95 percent of the modified Proctor density (ASMT D 1557) at the base of the excavation, for bedding material, and soils used for structural backfill surrounding the pipe elements, below structures or infrastructure.
	90 percent of the modified Proctor density (ASMT D 1557) in non-structural areas and areas where settlement is tolerable.

[1] The use of cohesive soils for backfill above the pipe, if considered, should be limited to areas outside of the pavement, other utilities, and non-settlement sensitive areas.

Trenchless Method Considerations

Trenchless Excavation Considerations

We understand that trenchless excavation methods are planned at one location for the crossing of Van Vleek Street and the Norfolk Southern Railroad Line for the installation of the force main. We understand that the invert elevation of the force main is anticipated to be about 10 ft deep. Considering this, the installation activities will typically encounter very stiff to hard cohesive soils possibly with sand seams and layers. It should be noted that the cohesive soils observed in the borings can easily be disturbed and are moisture sensitive, especially in the presence of saturated sand seams and layers. Hence, appropriate techniques and equipment should be implemented for the proposed underground excavation and installation.

Trenchless methods require a specialty contractor, and we recommend details of the methods and techniques be selected by the contractor based on the subsurface conditions and project requirements (i.e., performance-based contract language that includes settlement monitoring). These methods and techniques may also be influenced by the requirements of 3rd parties (e.g., Norfolk-Southern Railroad, Town of Waterloo, and DeKalb County). As such, we recommend that our exploratory information be provided to the prospective contractors for their interpretation and use in preparing an installation plan and developing their means and methods. The previous discussion about soil conditions is from a geotechnical perspective for the benefit of you and the owner. Additional test borings by the contractor may be warranted. We recommend the trenchless excavation pits be backfilled as described below.

Trenchless Pit Subgrade Considerations

Based on the observed subsurface conditions at the borings near the road and railroad crossing (B-01 and B-02), it is anticipated that cohesive soils will be exposed at the sending and receiving pit subgrades (if required for construction). These, and other cohesive soils observed at the test borings are moisture sensitive and will quickly lose strength and yield in the presence of moisture during construction activities. Based on a review of the *Soil Survey of DeKalb County, Indiana* dewatering as a result of perched groundwater, as noted above may be required. To protect the pit subgrades from these conditions and to provide a suitable working platform, we recommend that the pits be undercut at least 4 in. to accommodate a mud mat consisting of crushed stone or lean concrete.

While not observed near the invert elevation at these borings, where soft soils or soils that will not support the equipment necessary to facilitate the trenchless excavations are encountered at the pit subgrades, we recommend they generally be undercut 2 ft. The undercut areas should be backfilled with granular fill and compacted per the recommendations provided in **Earthwork**, prior to the placement of the mud mat. Upon completion, we recommend the trenchless excavation pits be backfilled with cohesive or granular fill in non-structural areas and granular fill in areas where the backfill will be required to support structures or infrastructure. These soils should be compacted per the recommendations provided in **Earthwork.**

Proposed Structure Considerations

Earthwork

We anticipate that earthwork will include demolition, excavations, and structural fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include quality criteria necessary to render the site in the state considered in our geotechnical engineering evaluation for foundations and base slabs.

We understand that the new headworks structure is planned to be constructed within the limits of the existing polishing pond at a depth of about 15 to 20 ft. The area surrounding the structure is expected to receive approximately 6 to 7 ft of fill to establish grade. The Geotechnical Engineer should be present during removal of any existing sediment, pond liner, underlying fill soils, and subsurface components/utilities to confirm that they are completely removed and resulting excavation backfilled properly.

Due to the presence of the existing polishing pond and contents (if present), a boring was unable to be performed at the location of the proposed headworks structure. Based on borings performed nearby, the soil conditions underlying the pond liner are

anticipated to consist of medium stiff to hard cohesive soils or loose to medium dense granular soils.

Where feasible, the subgrade should be proofrolled (or evaluated by other methods where proof rolling is not feasible) with an adequately loaded vehicle such as a fully-loaded tandem-axle dump truck or compacted via a smooth drum vibratory roller where granular soils are observed. The proofrolling should be performed under the observation of the Geotechnical Engineer. Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer. Such areas could be removed or modified by treating/applying/mixing with Portland cement or kiln dust depending on the observations and depth of the unsuitable conditions. Excessively wet or dry material should either be removed, or moisture conditioned and recompacted.

Any unstable soils which will receive fill or structural elements, after being properly cleared and benched, where necessary, should be removed and replaced with fill, as necessary, and compacted per the compaction requirements in this report. Compacted structural fill soils should then be placed to the proposed design grade and the water content and compaction of subgrade soils should be maintained until foundation construction.

Fill required to achieve design grade should be classified as structural fill and general fill. Structural fill is material used below, or within 10 ft of structures, or constructed slopes. General fill is material used to achieve grade outside of these areas.

Earthen materials used for structural and general fill should meet the following material property requirements.

Soil Type [1]	USCS Classification	Acceptable Fill Designation
Low Plasticity Cohesive	CL, CL-ML ML, SM, SC	Structural or General
Granular	GW, GP, GM, GC, SW, SP, SM, SC	Structural or General
On-Site Soils[2]	CL, CL-ML, SP, SM, SC-SM	Structural or General

Soil Type [1]	USCS Classification	Acceptable Fill Designation

1. Structural and general fill should consist of approved materials free of organic matter and debris with a maximum particle size of 6 in. for general fill and 3 in. for structural fill. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site. Additional geotechnical consultation should be provided prior to use of uniformly graded gravel on the site.
2. See **Use of Stockpile Materials as Fill** regarding use of the stockpile materials as fill.

In addition, structural and general fill should meet the following compaction requirements.

Item	Structural Fill	General Fill
Maximum Lift Thickness	8 in. or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6 in. in loose thickness when hand-guided equipment (i.e., jumping jack or plate compactor) is used	Same as structural fill
Minimum Compaction Requirements [1,2,3]	95 percent of max. below foundations, slabs and pavements	90 percent of max if some settlement is tolerable
Water Content Range [1]	Low plasticity cohesive: -2 percent to +3 percent of optimum High plasticity cohesive: 0 to +4 percent of optimum Granular: -3 percent to +3 percent of optimum	As required to achieve min. compaction requirements

1. Maximum density and optimum water content as determined by the modified Proctor test (ASTM D 1557).

Structure Subgrade Considerations

As previously mentioned, the condition of the subgrade will be a function of the care and workmanship of the contractor in protecting the subgrade from water. It should be noted that even stiff cohesive soils may quickly become disturbed due to foot traffic and soften in areas where wet granular layers are encountered near the subgrade. The following subgrade preparation recommendations are provided assuming the subgrade has been

dewatered prior to excavation, where necessary. Where granular soils are encountered at the subgrade, we recommend that the soils be compacted via several passes of a vibratory plate compactor. As stated previously, moisture sensitive cohesive soils are anticipated above or near the subgrade elevation at some of the structures. In the event that these soils are exposed to water, they will be difficult to compact in-situ. If unsuitable soils (similar to those observed at PS-2 near a depth of 20 ft) are encountered at the subgrade or if stiff conditions degrade due to exposure to moisture, we recommend the subgrades generally be undercut to a maximum depth of 2 ft and grade be reestablished by placing compacted granular fill, such as INDOT No. 8 stone in conjunction with a geotextile for separation. We recommend that fill placed for this purpose be compacted via several passes with a vibratory plate compactor. Undercutting in areas of poor subgrade conditions will require judgement in the field during construction. We recommend that a representative of Terracon observe the subgrade prior to the placement of the bedding layer to confirm the presence of a suitable bearing stratum.

Below Grade Foundation Considerations

It is our understanding that the planned structures are planned to be established on base slabs. The soil conditions at the proposed bearing elevations are expected to be variable. Based on the information obtained from the boring locations, the subgrade at the bearing elevations is anticipated to consist of loose to medium dense sands and medium stiff to hard cohesive soils. As mentioned above, dewatering may be required during construction, and we recommend the contractor be prepared to dewater these excavations.

Foundation Considerations

Provided the subgrade is prepared as discussed in the **Structure Subgrade Considerations**, the soils observed at the planned base of these new elements are anticipated to be suitable for support of the foundations. The below table includes the structures, anticipated bearing soils, bearing capacities.

Associated Borings	Structure and Bearing Depth	Anticipated Bearing Soils	Net Allowable Bearing Capacity (psf)[1]
SP-01	UV Disinfection Structure 15 ft deep	Medium dense sand	4,000

Associated Borings	Structure and Bearing Depth	Anticipated Bearing Soils	Net Allowable Bearing Capacity (psf)[1]
SP-03	Dry Sludge Storage Bay Addition 5 ft deep	Loose silty sand	3,000
SP-01 through SP-03	Headworks Structure 15 to 20 ft deep	Medium dense sand, loose silty sand, and/or medium stiff to stiff lean clay	2,500

1. For foundations established in corresponding anticipated bearing soils.

In addition to downward forces, the effects of buoyancy should also be considered for design. Due to the possibility of perched groundwater conditions, we recommend using a groundwater level at or near the exterior grade for buoyancy design. For resistance of uplift pressures, particularly when the below-grade structures are fully drained/empty, we recommend the structures be designed to resist uplift pressures equivalent to the unit weight of water times the depth of the base slab below the water surface. The weight of the structure in addition to the weight of the soils above the exterior portion of the base slab (i.e., lip) should be considered to provide the necessary resistance to the uplift forces. We recommend that a buoyant unit weight of the soil of 60 pcf be utilized for this purpose.

Base Slab Design Parameters

Provided the subgrade areas are prepared and fill placed in accordance with the recommendations noted in **Structure Subgrade Considerations**, the following design parameters are applicable for floor slab design.

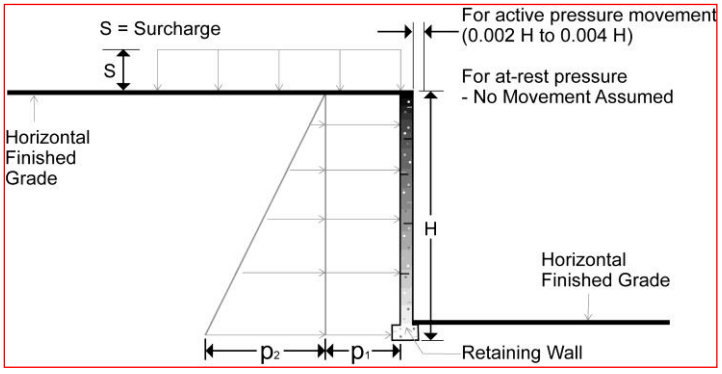
Associated Borings	Structure and Bearing Elevation	Modulus of Subgrade Reaction (pci) [1, 2, 3]
SP-01	UV Disinfection Structure 15 ft deep	250
SP-3	Dry Sludge Storage Bay Addition 5 ft deep	250

Associated Borings	Structure and Bearing Elevation	Modulus of Subgrade Reaction (pci) [1, 2, 3]
SP-01 through SP-03	Headworks Structure 15 to 20 ft deep	Cohesive: 85 Granular: 250

1. Minimum of 8 in. of fine to coarse sand or a uniformly graded stone (e.g. No. 8) to provide uniform contact pressure at the base slab. Where granular soils are present at the base grade imported granular fill is not necessary.
2. Note that the modulus of subgrade reaction is based on a 30-in. diameter loaded area. The modulus of subgrade reaction value should be used for a first-order approximation of the shear and moment requirements of the floor slab. The design of the slab is anticipated to be based on an iterative process involving the stiffness of the floor slab and the location and magnitude of the applied loads in relation to the soil's characteristics. Depending on the actual shear and moment considerations for the slab, it may be necessary to modify this value as a function of the location and magnitude of the applied loads.
3. Provided the structure is established on the corresponding anticipated bearing soils noted in the table above

Lateral Earth Pressures

The walls for the below-grade structures should be designed to resist both hydrostatic and lateral earth pressures. Two wall restraint conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever retaining walls and assumes wall movement. The "at-rest" condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. Based on the nature of the structures, relatively rigid conditions are anticipated such that an at-rest condition will develop. For these conditions, we recommend the parameters provided in the table below. The recommended design lateral earth pressures do not include a factor of safety.



Lateral Earth Pressure Design Parameters

Earth Pressure Condition	Coefficient for Backfill Type [1]	Surcharge Pressure [2] p_1 (psf)	Equivalent Fluid Pressures (psf) [1,3]	
			Unsaturated	Submerged
At-Rest (Ko)	Granular - 0.47	(0.47)S	(55)H	(90)H

1. Uniform, horizontal backfill, with a maximum unit weight of 125 pcf for granular soils.
2. Uniform surcharge, where S is surcharge pressure.
3. Loading from heavy compaction equipment is not included.

In addition to the lateral earth pressures, surcharges from temporary loads during construction (if any) or adjacent foundations should be taken into account in the wall design. Additionally, for the equivalent fluid pressure value provided in the table above to be valid, we recommend that clean well-graded granular backfill extend horizontally behind the wall a distance of at least ½ of the depth of the wall below grade. Compaction of backfill within 3 ft of the walls should be performed with a hand guided compactor to avoid over-stressing the walls.

Construction Adjacent to Existing Structure

We understand that the dry sludge storage beds are planned to be expanded. Expansion joints should be provided between the existing structure and the proposed addition to accommodate differential movements between the structures. Underground piping between the structures should be designed with flexible couplings and utility knockouts in foundation walls should be oversized, so minor deflections in alignment do not result in breakage or distress. Care should be taken during excavation adjacent to the existing foundation, to avoid disturbing existing foundation bearing soils.

The new foundations should bear at or near the bearing elevation of the existing foundation. Depending upon the location and current loads on the existing foundation, the foundation for the new addition could cause settlement of adjacent walls.

We understand the existing foundation may support additional load from the walls of the new addition. It is possible additional loads on the existing foundations could cause other building settlements to occur. The structural capacity of existing foundations should be evaluated by a licensed structural engineer, where increases in loading are planned.

Use of Stockpile Materials as Fill

Fill consisting of cohesive and granular soils (USCS symbols "CL" "CL-ML" "SP" and SM") containing construction debris (concrete fragments, asphalt fragments, plastic, wires, and metal) were observed throughout the test pits. In addition, some organic matter including branches, roots and plant fibers was observed throughout the stockpile. Photographs of the subsurface conditions observed at the test pits are included in the attached **Photography Log**

.

Moisture Density Relationship Testing

A summary of the moisture density relationship testing and loss on ignition testing on composite samples retrieved from the soil stockpile can be found in the following table. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the test pit logs and as separate graphs in the **Exploration and Laboratory Results**

.

Summary of Test Pit Laboratory Test Results					
Location/ Samples	**Soil Classification**	**Maximum Dry Density[1] (pcf)**	**Optimum Moisture Content[1] (%)**	**In—Situ Water Content[2] (%)**	**Organic Content[3] (%)**
TP-01: BS-01 TP-02: BS-01 TP-02: BS-02 TP-03: BS-01 (Composite 1)	Lean Clay (CL)	129.4	10.5	16.6 to 18.5	1.5

Summary of Test Pit Laboratory Test Results					
Location/ Samples	**Soil Classification**	**Maximum Dry Density[1] (pcf)**	**Optimum Moisture Content[1] (%)**	**In—Situ Water Content[2] (%)**	**Organic Content[3] (%)**
TP-04: BS-1 TP-04: BS-2 (Composite 2)	Silty Sand with Gravel (SM)	136.8	5.7	--	0.9

1. Based on results from modified Proctor (ASTM D1557) tests performed on representative bulk samples taken at the noted test pits.
2. The range provided is based on results from natural moisture content tests performed on representative bulk samples taken at the noted test pits
3. Organic contents listed do not include large pieces of organic matter such as sticks branches or wood.

Suitability as Fill

As noted above, construction debris was observed at each of the test pits. The fill also contained larger pieces of organic matter, including branches, wood fragments, and plant fibers. These materials pose a risk of excessive settlement as they will create voids as they decompose. The fill soils also contained trace organic matter, based on organic contents of about 1.8 percent. Based on our observations, the trace amounts of organic matter do not present additional risk of settlement, although the larger pieces do, as noted above. Photographs depicting subsurface conditions observed at the test pits are included in the attached **Photography Log**

shown in the Exploration Results section of the Appendix.

Based on our observations it is our opinion that these soils are not suitable for use as structural fill in their present state but could be if the construction debris and large organic matter is screened from the soils. However, it should be noted that the screening process can be costly. Additionally, soils to be screened need to be in a semi-dried state, and as a result, the soils contained in the stockpile would need to be moisture conditioned, which could pose difficulties if this is planned outside of the late-summer or early-fall. Considering that the soils observed in the stockpile were cohesive in nature, utilizing them for on-site soils could also be difficult due to their susceptibility

to soften when exposed to moisture. In regard to general fill, it is our opinion that these soils are suitable for use as general fill if some settlement is tolerable, adequate compaction can be achieved, and rubble fragments larger than 6 in. are removed

Seismic Considerations

The Site Classification is required to determine the Seismic Design Category for a structure. Based on our observations, it is our opinion the subsurface conditions most closely resemble a Site Class D. Note that the Site Class is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the international building code (IBC), and our exploratory activities extended to a maximum depth of about 30 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not

intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development and/or vibration monitoring. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

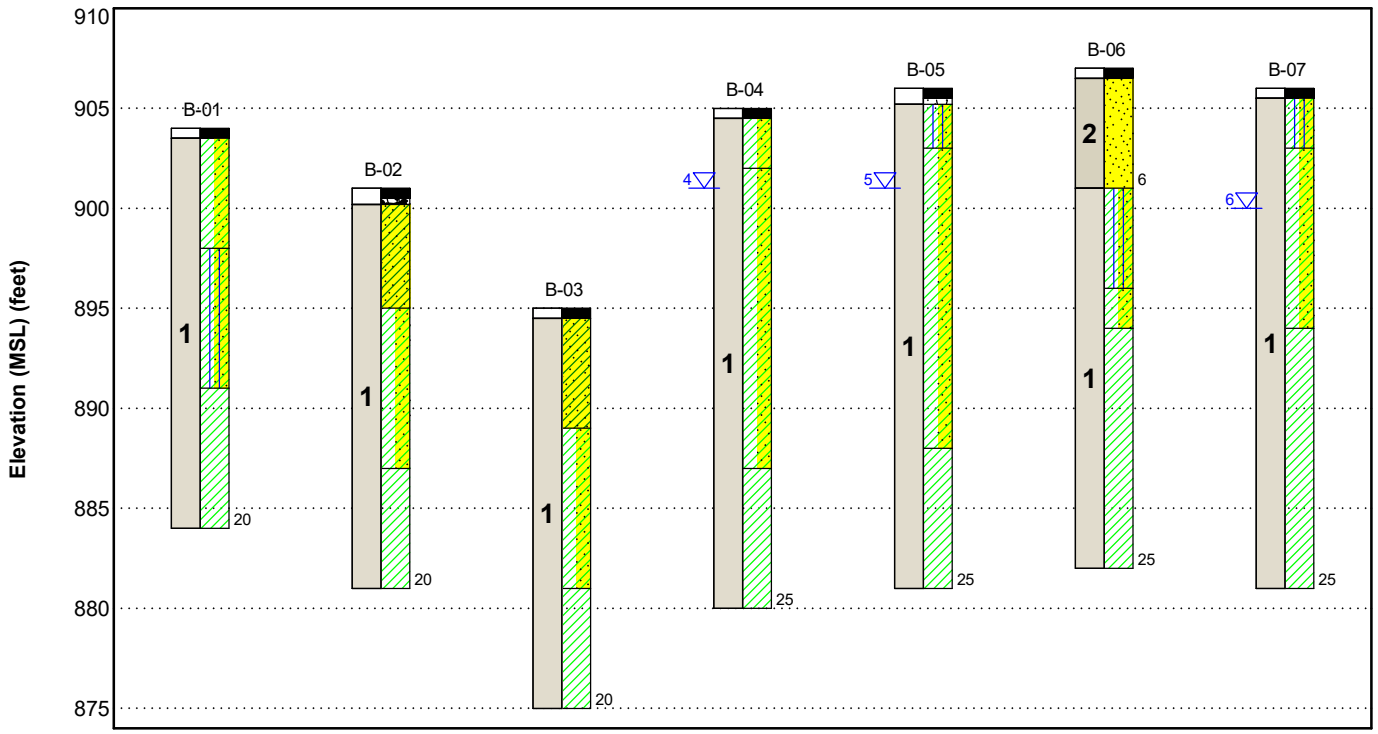
Figures

Contents:

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Cohesive Soils	Lean clays and silty clays; varying amounts of sand; stiff to hard; brown / gray
2	Sand	Varying amounts of fines; very loose to medium dense; brown / gray

LEGEND

- Asphalt
- Lean Clay
- Topsoil
- Lean Clay with Sand
- Fill
- Poorly-graded Sand
- Silty Clay with Sand
- Sandy Lean Clay

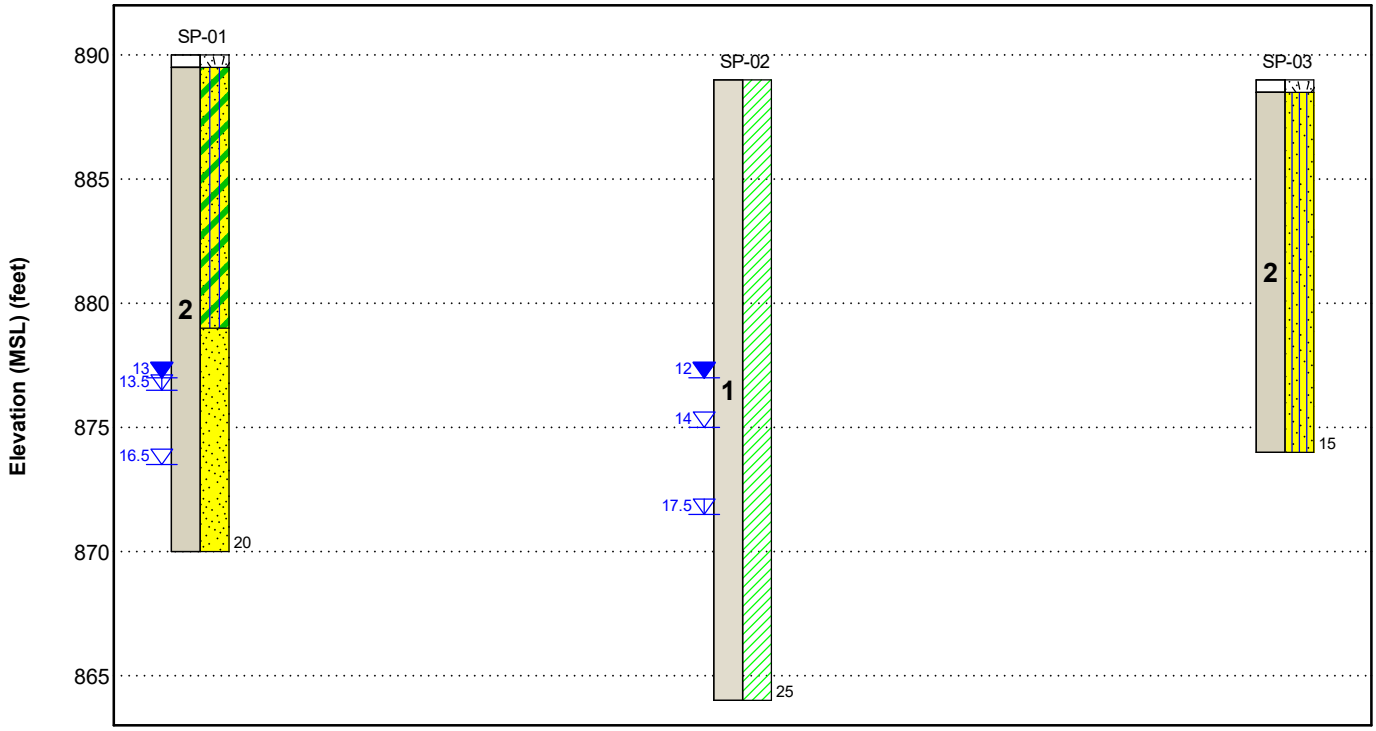
- First Water Observation
- Second Water Observation
- Third Water Observation

The groundwater levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

Terracon
7770 W New York St
Indianapolis, IN

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Cohesive Soils	Lean clays and silty clays; varying amounts of sand; stiff to hard; brown / gray
2	Sand	Varying amounts of fines; very loose to medium dense; brown / gray

LEGEND

- Topsoil
- Lean Clay
- Silty Clayey Sand
- Silty Sand
- Poorly-graded Sand

- First Water Observation
- Second Water Observation
- Third Water Observation

The groundwater levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

Attachments

Exploration and Testing Procedures

Field Exploration

Number of Explorations and Type	Approximate Boring Depth (ft)	Location
5 Borings	20 to 25	Sewer Alignment
2 Borings	20	Force Main
3 Borings	15 to 25	Treatment Plant Improvements
4 Test Pits	8 to 10	Stockpile

Boring Layout and Elevations: Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ±10 ft). Approximate ground surface elevations were estimated using the Indiana Map GIS system. If elevations and a more precise boring layout are desired, we recommend borings be surveyed.

Subsurface Exploration Procedures: We advanced the borings with an ATV-mounted rotary drill rig using continuous hollow stem flight augers. Samples were obtained at 2½-ft intervals throughout the boring depths using split-barrel sampling procedures. In the split-barrel sampling procedure, a standard 2-in. outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 in. The number of blows required to advance the sampling spoon the last 12 in. of a normal 18-in. penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. all borings were backfilled with auger cuttings after their completion. Pavements were patched with pre-mixed concrete, as appropriate.

In addition, the test pits were performed using a Kubota excavator. Bulk samples were retrieved from the excavation spoils.

The sampling depths, penetration distances, and other sampling information were recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials observed during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the geotechnical engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The laboratory testing program included observation of soil samples by an engineer. Based on the results of our field and laboratory programs, we described and classified the soil samples in general accordance with the Unified Soil Classification System.

- The project engineer then reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:
- Hand penetrometer readings (i.e., HP, which provide an indication of the shear strength characteristics of cohesive-type soils),
- Natural water content tests (W%),
- Atterberg limit determinations,
- Unit weight determinations (γ_d),
- Grain size analyses,
- Unconfined compression tests,
- Loss on ignition (organic content),
- Moisture density relationship (Modified Proctor)

Photography Log

Photo 1: Stockpile

Photo 2: Debris and wood on exterior of stockpile

Photo 3: Construction debris and a tire on stockpile exterior

Photo 4: TP-1 Excavation

Photo 5: TP-02 Excavation

Photo 6: Test Pit 3 Excavation

Photo 7: TP-04 Excavation

Photo 8: Topsoil stockpile to the left of stockpile

Site Location and Exploration Plans

Contents:

Site Location
Exploration Plan (2)

Note: All attachments are one page unless noted above.

Site Location

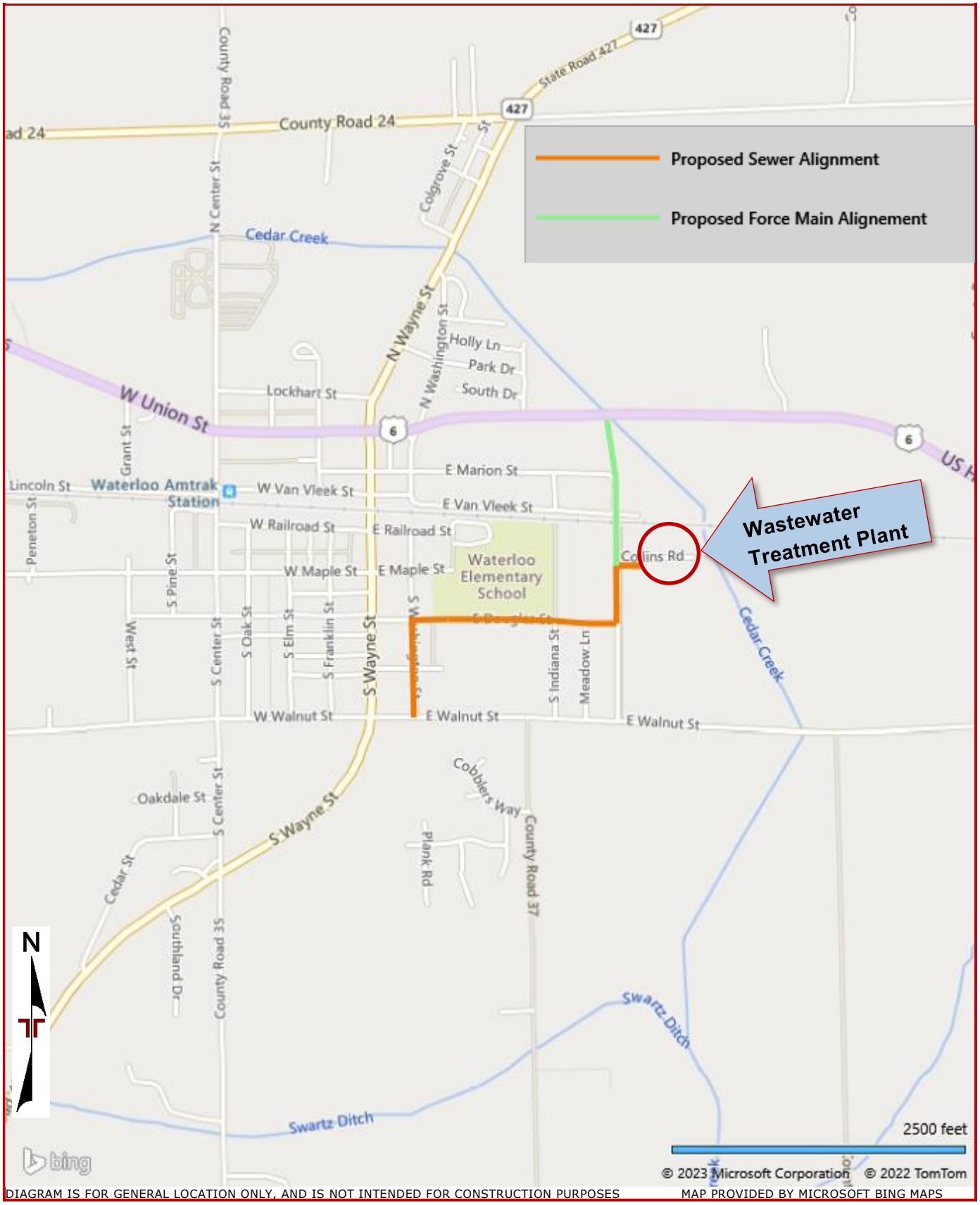


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan – Proposed Sewers

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan – Wastewater Treatment Plant

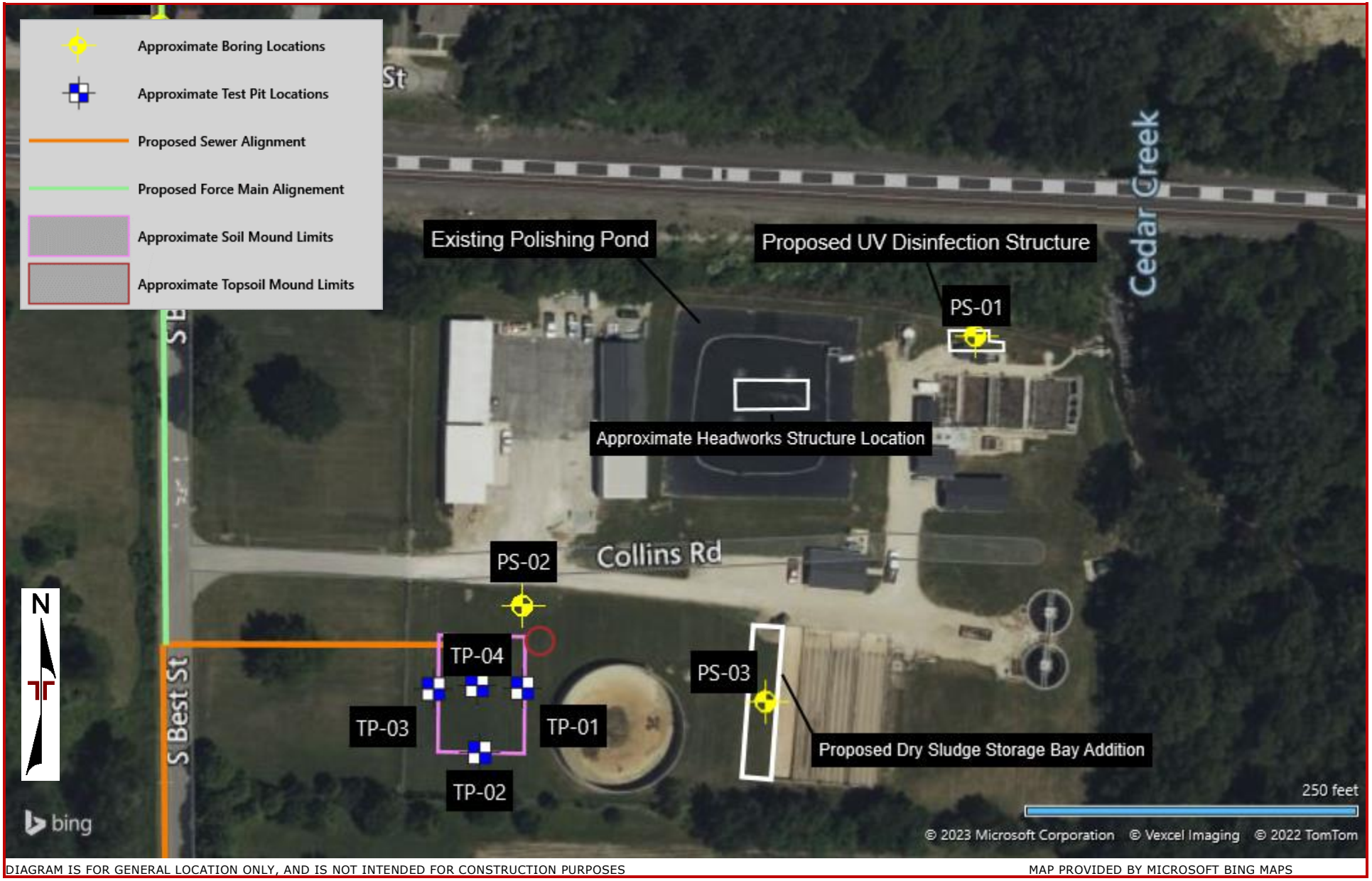


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Note: All attachments are one page unless noted above.

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Boring Log No. B-01

Location: See Exploration Plan

Latitude: 41.4314° Longitude: -85.0124°

Depth (Ft.) Elevation: 904 (Ft.) +/-

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
		0.5 **ASPHALT** 903.5									
1		**FILL - LEAN CLAY WITH SAND (CL)**, trace gravel, brown, stiff to very stiff, with asphalt fragments near 4 ft			16	3-2-2 N=4		2.25 (HP)	16.6		
					8	4-5-3 N=8		1.25 (HP)	12.0		
		6.0 898									
		SILTY CLAY WITH SAND (CL-ML), trace gravel, brown to gray near 12 ft, very stiff to hard			16	4-8-9 N=17		3.25 (HP)	10.0		
					8	7-9-9 N=18		4.5 (HP)	10.1		
					16	6-8-9 N=17		4.5 (HP)	9.5		
		13.0 891									
		LEAN CLAY (CL), trace gravel, trace sand, gray, very stiff			18	5-7-9 N=16		3.25 (HP)	6.6	29-15-14	
					18	2-3-4 N=7		2.5 (HP)	14.9		
					18	3-3-5 N=8		2.5 (HP)	17.1		
		20.0 884									
		Boring Terminated at 20 Feet									

5 10 15 20

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No water observed while drilling

No water observed at completion of drilling

Drill Rig
Geoprobe

Hammer Type
Automatic

Driller
J.W.

Logged by

Boring Started
12-07-2022

Boring Completed
12-07-2022

Notes

Advancement Method
3¼" HSA

Abandonment Method
Backfilled with auger cuttings and a bentonite chip plug near the surface. Pavement restored with a concrete pavement patch.

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Boring Log No. B-02

Location: See Exploration Plan

Latitude: 41.4310° Longitude: -85.0124°

Model Layer	Depth (Ft.)	Elevation: 901 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
	0.5	**ASPHALT** 900.5										
	0.8	**GRANULAR SUBBASE**, (sand) 900.2										
1		**SANDY LEAN CLAY (CL)**, trace gravel, brown, medium stiff to hard, (possible fill)			X	10	3-3-3 N=6		0.5 (HP)	14.4		
					X	14	2-3-6 N=9		4.5 (HP)	11.4		
	6.0	895	5									
		LEAN CLAY WITH SAND (CL), trace gravel, brown, hard, with possible petroleum odor near 9 ft, with possible cobbles near 14 ft, (possible fill)			X	18	8-8-9 N=17		4.5+ (HP)	8.9		
					X	18	6-7-8 N=15	1.1	4.25 (HP)	11.2		
			10		X	16	3-5-7 N=12		4.25 (HP)	10.2		
	14.0	887										
		LEAN CLAY (CL), trace gravel, trace sand, gray, very stiff			X	0	4-5-8 N=13					
			15		X	7	3-4-5 N=9		3.0 (HP)	15.7		
	20.0	881			X	18	3-5-6 N=11		2.25 (HP)	18.1		
		Boring Terminated at 20 Feet	20									

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No water observed while drilling

No water observed at completion of drilling

Drill Rig
Geoprobe

Hammer Type
Automatic

Driller
J.W.

Logged by

Boring Started
12-06-2022

Boring Completed
12-06-2022

Notes

Advancement Method
3¼" HSA

Abandonment Method
Backfilled with auger cuttings and a bentonite chip plug near the surface. Pavement restored with a concrete pavement patch.

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Boring Log No. B-03

Location: See Exploration Plan

Latitude: 41.4292° Longitude: -85.0123°

Depth (Ft.) Elevation: 895 (Ft.) +/-

Model Layer	Depth (Ft.)	Elevation (Ft.)	Material Description	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
	0.5	894.5	**ASPHALT**								
1	6.0	889	**SANDY LEAN CLAY (CL)**, trace gravel, brown, very stiff, (possible fill)		4	2-3-3 N=6		3.75 (HP)	19.2		
					16	5-5-6 N=11		3.25 (HP)	10.9		
					16	5-7-8 N=15		4.5 (HP)	10.7		
					16	6-7-10 N=17		4.0 (HP)	12.2		
					8	6-6-8 N=14		4.5 (HP)	11.0		
	14.0	881	**LEAN CLAY WITH SAND (CL)**, trace gravel, brown to gray near 9 ft, hard, with silty clay seam near 7 ft, with possible cobbles near 14 ft, (possible fill)		6	5-5-7 N=12					
					16	3-5-6 N=11		1.75 (HP)	16.7		
	20.0	875	**LEAN CLAY (CL)**, trace gravel, trace sand, gray, stiff		18	3-6-7 N=13		1.5 (HP)	18.0		
			Boring Terminated at 20 Feet								

Depth (Ft.): 5, 10, 15, 20

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No water observed while drilling

No water observed at completion of drilling

Drill Rig
Geoprobe

Hammer Type
Automatic

Driller
J.W.

Logged by

Boring Started
12-06-2022

Boring Completed
12-06-2022

Notes

Advancement Method
3¼" HSA

Abandonment Method
Backfilled with auger cuttings and a bentonite chip plug near the surface. Pavement restored with a concrete pavement patch.

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Boring Log No. B-04

Location: See Exploration Plan

Latitude: 41.4288° Longitude: -85.0149°

Depth (Ft.) Elevation: 905 (Ft.) +/-

Model Layer	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
	0.5 **ASPHALT** 904.5									
1	**LEAN CLAY WITH SAND (CL)**, trace gravel, black gray, stiff, (possible fill)		X	18	3-1-4 N=5		1.25 (HP)	18.7		
	3.0 902									
	LEAN CLAY WITH SAND (CL), trace gravel, brown to gray near 12 ft, very stiff to hard, with silty clay seam near 11 ft	▽	X	18	3-5-8 N=13		4.0 (HP)	12.3		
	5		X	10	3-4-5 N=9		2.25 (HP)	10.7		
			X	18	3-5-8 N=13		4.5 (HP)	10.5		
	10		X	10	3-4-4 N=8		4.25 (HP)	11.9		
			X	14	3-5-5 N=10		2.5 (HP)	10.7		
	15		X	18	3-3-4 N=7		2.25 (HP)	16.0	29-13-16	
	18.0 887									
	LEAN CLAY (CL), trace gravel, trace sand, gray, very stiff		X	16	3-4-7 N=11		2.5 (HP)	17.1		
	20		X	12	3-5-7 N=12		2.5 (HP)	16.8		
			X	12	3-4-6 N=10		1.0 (HP)	18.3		
	25.0 880 25									
	Boring Terminated at 25 Feet									

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ 4 ft while drilling

No water observed at completion of drilling

Drill Rig
Geoprobe

Hammer Type
Automatic

Driller
J.W.

Logged by

Boring Started
12-06-2022

Boring Completed
12-06-2022

Notes

Advancement Method
3¼" HSA

Abandonment Method
Backfilled with auger cuttings and a bentonite chip plug near the surface. Pavement restored with a concrete pavement patch.

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Boring Log No. B-05

Location: See Exploration Plan

Latitude: 41.4289° Longitude: -85.0186°

Depth (Ft.) Elevation: 906 (Ft.) +/-

Model Layer	Depth (Ft.)	Elevation	Description	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
	0.5	905.5	**ASPHALT**									
	0.8	905.2	**TOPSOIL**									
1	3.0	903	**SILTY CLAY WITH SAND (CL-ML)**, trace gravel, brown, soft									
			LEAN CLAY WITH SAND (CL), trace gravel, brown to gray near 14 ft, stiff to very stiff, with trace sand near 20 ft									
						5	3-2-2 N=4		0.25 (HP)	8.6		
				▽		18	2-2-3 N=5		1.5 (HP)	25.7		
	5					18	3-4-5 N=9		2.25 (HP)	12.9		
	10					18	3-4-5 N=9		2.5 (HP)	11.7		
						16	3-3-5 N=8		2.0 (HP)	11.8		
	15					16	3-6-8 N=14		4.5 (HP)	12.2		
						18	3-5-6 N=11		2.25 (HP)	10.4		
	18.0	888	**LEAN CLAY (CL)**, trace gravel, trace sand, gray, very stiff									
	20					18	4-6-7 N=13		3.25 (HP)	10.8		
						16	5-6-8 N=14		3.0 (HP)	13.0		
	25.0	881				18	5-7-7 N=14		3.0 (HP)	12.5		
	25		***Boring Terminated at 25 Feet***									

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ 5 ft while drilling
No water observed at completion of drilling

Drill Rig
Geoprobe

Hammer Type
Automatic

Driller
J.W.

Logged by

Boring Started
12-06-2022

Boring Completed
12-06-2022

Notes

Advancement Method
3¼" HSA

Abandonment Method
Backfilled with auger cuttings and a bentonite chip plug near the surface. Pavement restored with a concrete pavement patch.

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Boring Log No. B-06

Location: See Exploration Plan

Latitude: 41.4277° Longitude: -85.0187°

Depth (Ft.) Elevation: 907 (Ft.) +/-

Model Layer	Depth (Ft.)	Elevation	Description	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
	0.5	906.5	**ASPHALT**									
2	6.0	901	**SAND (SP)**, fine to medium grained, brown, moist, very loose to loose, (possible fill)			10	2-3-5 N=8					
						8	2-1-1 N=2				NP	2
1	11.0	896	**SILTY CLAY WITH SAND (CL-ML)**, trace gravel, brown, hard, (possible fill)			16	3-4-4 N=8		4.5 (HP)	10.7		
						16	3-5-7 N=12		4.0 (HP)	10.8		
	13.0	894	**LEAN CLAY WITH SAND (CL)**, trace gravel, brown to gray near 12 ft, stiff			10	3-6-8 N=14		1.25 (HP)	12.6		
						16	2-5-5 N=10		3.0 (HP)	18.1		
						18	2-3-4 N=7		1.5 (HP)	19.5		
						18	3-3-4 N=7		1.25 (HP)	17.7		
						18	3-4-5 N=9		2.0 (HP)	18.1		
	25.0	882	**LEAN CLAY (CL)**, trace gravel, trace sand, gray, stiff to very stiff			18	4-4-6 N=10		1.25 (HP)	19.0		
			Boring Terminated at 25 Feet									

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No water observed while drilling

No water observed at completion of drilling

Drill Rig
Geoprobe

Hammer Type
Automatic

Driller
J.W.

Logged by

Boring Started
12-06-2022

Boring Completed
12-06-2022

Notes

Advancement Method
3¼" HSA

Abandonment Method
Backfilled with auger cuttings and a bentonite chip plug near the surface. Pavement restored with a concrete pavement patch.

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Boring Log No. B-07

Location: See Exploration Plan

Latitude: 41.4266° Longitude: -85.0176°

Depth (Ft.) Elevation: 906 (Ft.) +/-

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
		0.5 **ASPHALT** 905.5									
1		**SILTY CLAY WITH SAND (CL-ML)**, trace gravel, brown, stiff, with silty sand seam near 1 ft 3.0 903									
		LEAN CLAY WITH SAND (CL), trace gravel, brown, medium stiff to hard			12	9-3-3 N=6					
					14	1-2-1 N=3		0.75 (HP)	16.7		
			▽		18	4-5-9 N=14		4.5 (HP)	22.9		
					18	6-8-11 N=19	1.7	4.25 (HP)	12.6	20-14-6	
		12.0 894			16	6-7-7 N=14		4.5 (HP)	15.4		
		LEAN CLAY (CL), trace gravel, trace sand, gray, moist, very stiff to stiff			18	5-7-9 N=16		3.75 (HP)	17.4		
					18	4-5-6 N=11		2.0 (HP)	18.2		
					18	5-5-7 N=12		1.25 (HP)	20.2		
					18	4-6-7 N=13		1.5 (HP)	19.1		
		25.0 881			18	5-6-7 N=13		1.75 (HP)	21.3		
		Boring Terminated at 25 Feet									

10 15 20 25

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
▽ 6 ft while drilling
No water observed at completion of drilling

Drill Rig
Geoprobe

Hammer Type
Automatic

Driller
J.W.

Logged by

Boring Started
12-07-2022

Boring Completed
12-07-2022

Notes

Advancement Method
3¼" HSA

Abandonment Method
Backfilled with auger cuttings and a bentonite chip plug near the surface. Pavement restored with a concrete pavement patch.

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Boring Log No. SP-01

Location: See Exploration Plan

Latitude: 41.4307° Longitude: -85.0101°

Model Layer	Depth (Ft.)	Elevation: 890 (Ft.) +/-	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
	0.5	**TOPSOIL** 889.5									
2		**CLAYEY SILTY SAND (SC-SM)**, trace gravel, fine to medium grained, brown, moist, very loose to medium dense			12	2-2-2 N=4					
					16	1-1-1 N=2			11.7	NP	19
	5				18	5-5-6 N=11					
	10				16	5-5-6 N=11					
	11.0	879									
		SAND (SP), trace gravel, fine to medium grained, brown to gray near 17 ft, moist to wet near 16.5 ft, medium dense			12	4-5-7 N=12					
					10	4-6-8 N=14					
	15				16	8-7-6 N=13				NP	5
					18	3-3-4 N=7					
	20										
	20.0	870									
		Boring Terminated at 20 Feet									

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
- 16.5 ft while drilling
- 13.5 ft at completion of drilling
- 13 ft after 24 hrs

Drill Rig
Geoprobe

Hammer Type
Automatic

Driller
J.W.

Logged by

Boring Started
12-05-2022

Boring Completed
12-05-2022

Notes

Advancement Method
3¼" HSA

Abandonment Method
Backfilled with auger cuttings and a bentonite chip plug near the surface.

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Boring Log No. SP-02

Location: See Exploration Plan

Latitude: 41.4302° Longitude: -85.0114°

Depth (Ft.) Elevation: 889 (Ft.) +/-

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1		**LEAN CLAY (CL)**, trace gravel, trace sand, brown to gray near 9 ft, medium stiff to hard									
					8	2-2-3 N=5		3.0 (HP)	21.3		
					14	8-10-12 N=22		4.5 (HP)	15.1	29-16-13	
		5			15	8-9-12 N=21		4.5 (HP)	16.6		
					16	4-5-7 N=12		2.25 (HP)	16.9		
		10			18	4-4-7 N=11		3.0 (HP)	13.1		
					0	3-4-5 N=9					
		15			18	3-3-5 N=8		1.0 (HP)	19.6		
					18	2-3-4 N=7		0.75 (HP)	17.6	29-14-15	
		20			18	2-3-5 N=8		1.25 (HP)	17.5		
					18	3-3-5 N=8		1.25 (HP)	18.2		
		25.0 864									
		Boring Terminated at 25 Feet									

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
- 14 ft while drilling
- 17.5 ft at completion of drilling
- 12.5 ft after 24 hrs

Drill Rig
Geoprobe

Hammer Type
Automatic

Driller
J.W.

Logged by

Boring Started
12-05-2022

Boring Completed
12-05-2022

Notes

Advancement Method
3¼" HSA

Abandonment Method
Backfilled with auger cuttings and a bentonite chip plug near the surface.

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Boring Log No. SP-03

Location: See Exploration Plan

Latitude: 41.4300° Longitude: -85.0107°

Depth (Ft.) Elevation: 889 (Ft.) +/-

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
		0.5 **TOPSOIL** 888.5									
2		**SILTY SAND (SM)**, trace gravel, fine to medium grained, brown, moist, loose									
					16	3-3-8 N=11					
					18	4-4-3 N=7					
		5									
					18	2-3-3 N=6			17.0	NP	65
					16	2-2-3 N=5					
		10									
						1-2-2 N=4			18.1		
						2-2-3 N=5					
		15 15.0 874									
		Boring Terminated at 15 Feet									

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
No water observed while drilling

No water observed at completion of drilling

Drill Rig
Geoprobe

Hammer Type
Automatic

Driller
J.W.

Logged by

Boring Started
12-05-2022

Boring Completed
12-05-2022

Notes

Advancement Method
3¼" HSA

Abandonment Method
Backfilled with auger cuttings and a bentonite chip plug near the surface.

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Test Pit Log No. TP-1

Model Layer	Graphic Log	Location: See Exploration Plan Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
		FILL - LEAN CLAY WITH GRAVEL (CL), brown, with plastic tubing and other construction debris	5					1.8		16.6		
		8.0 ***Test Pit Terminated at 8 Feet***										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations

Notes

Advancement Method
Test pits were advanced with an excavator

Abandonment Method
Backfilled with excavated soils.

Excavator
Komatsu-138US-LC

Hammer Type
Automatic

Operator
D.R.

Logged by

Test Pit Started
01-12-2023

Test Pit Completed
01-12-2023

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Test Pit Log No. TP-2

Model Layer	Graphic Log	Location: See Exploration Plan Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
		FILL - LEAN CLAY WITH SAND (CL), gray, with cobbles, construction debris, and wires								17.7		
		7.0	5									
		FILL - SILTY CLAY, brown						1.8		18.5		
		10.0	10									
		Test Pit Terminated at 10 Feet										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations

Notes

Advancement Method
Test pits were advanced with an excavator

Abandonment Method
Backfilled with excavated soils.

Excavator
Komatsu-138US-LC

Hammer Type
Automatic

Operator
D.R.

Logged by

Test Pit Started
01-12-2023

Test Pit Completed
01-12-2023

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Test Pit Log No. TP-3

Model Layer	Graphic Log	Location: See Exploration Plan Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Recovery (In.)	Field Test Results	Organic Content (%)	HP (tsf)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
		FILL - SILTY CLAY (CL-ML), brown, with plastic pieces and other construction debris	5							17.8		
		8.0 ***Test Pit Terminated at 8 Feet***										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations

Notes

Advancement Method
Test pits were advanced with an excavator

Abandonment Method
Backfilled with excavated soils.

Excavator
Komatsu-138US-LC

Hammer Type
Automatic

Operator
D.R.

Logged by

Test Pit Started
01-12-2023

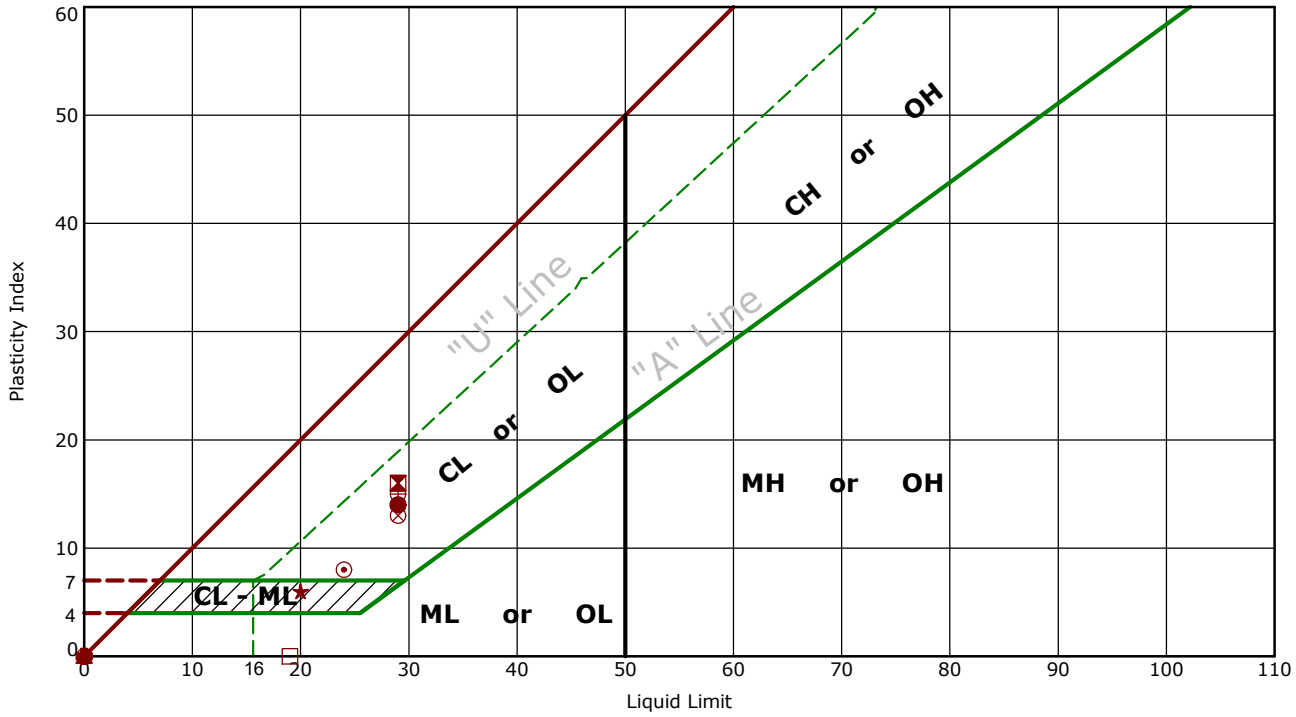
Test Pit Completed
01-12-2023

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Atterberg Limit Results

ASTM D4318



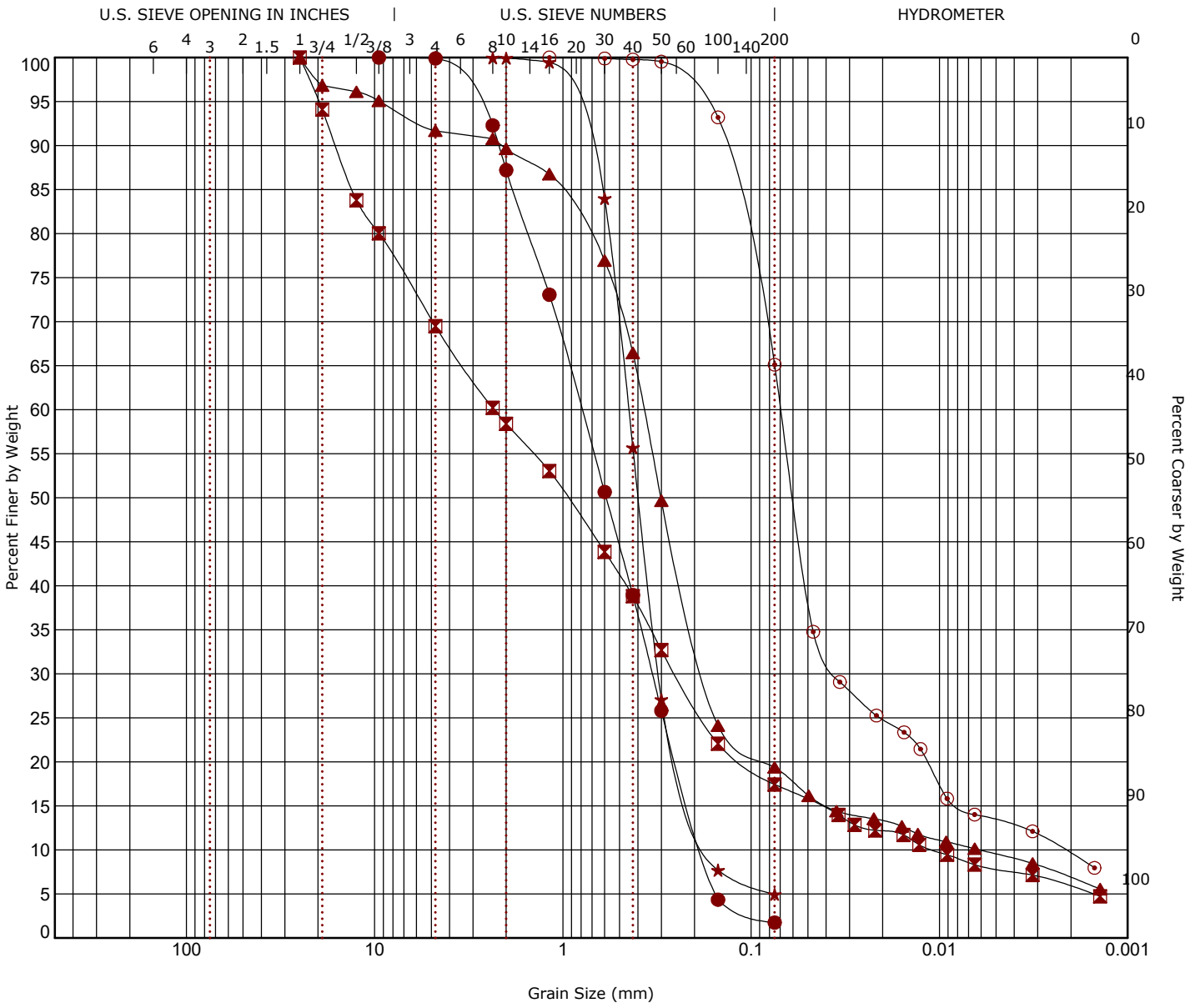
	Boring ID	Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	B-01	13.5 - 15	29	15	14		CL	LEAN CLAY
⊠	B-04	16 - 17.5	29	13	16		CL	LEAN CLAY
▲	B-06	3.5 - 5	NP	NP	NP	1.8	SP	POORLY GRADED SAND
★	B-07	8.5 - 10	20	14	6		CL-ML	SILTY CLAY
⊙	Composite 1	0 - 8	24	16	8		CL	LEAN CLAY
✿	Composite 2	0 - 8	NP	NP	NP	17.4	SM	SILTY SAND with GRAVEL
○	SP-01	3.5 - 5	NP	NP	NP	19.4	SM	SILTY SAND
△	SP-01	16 - 17.5	NP	NP	NP	4.9	SP	POORLY GRADED SAND
⊗	SP-02	3.5 - 5	29	16	13		CL	LEAN CLAY
⊕	SP-02	18.5 - 20	29	14	15		CL	LEAN CLAY
□	SP-03	6 - 7.5	19	19	NP	65.1	ML	SANDY SILT

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Grain Size Distribution

ASTM D422 / ASTM C136



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

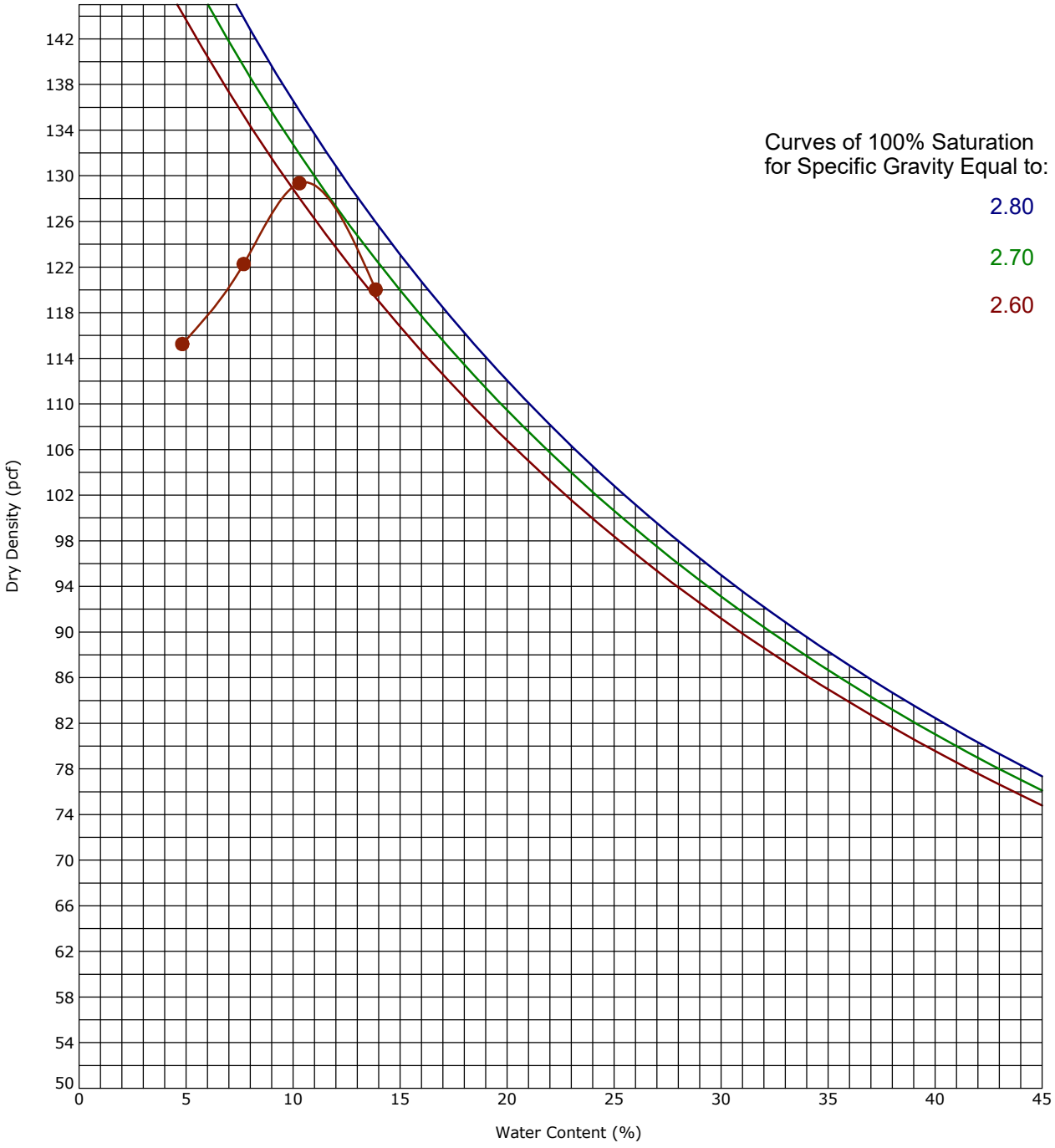
Boring ID		Depth (Ft)	USCS Classification	AASHTO Classification	USDA Textural Classification
●	B-06	3.5 - 5	POORLY GRADED SAND (SP)		
⊠	Composite 2	0 - 8	SILTY SAND with GRAVEL (SM)		
▲	SP-01	3.5 - 5	SILTY SAND (SM)		
★	SP-01	16 - 17.5	POORLY GRADED SAND (SP)		
⊙	SP-03	6 - 7.5	SANDY SILT (ML)		

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Moisture-Density Relationship

ASTM D1557-Method A



Boring ID	Depth (Ft)	Description of Materials
Composite 1 through 3	0 - 8	LEAN CLAY

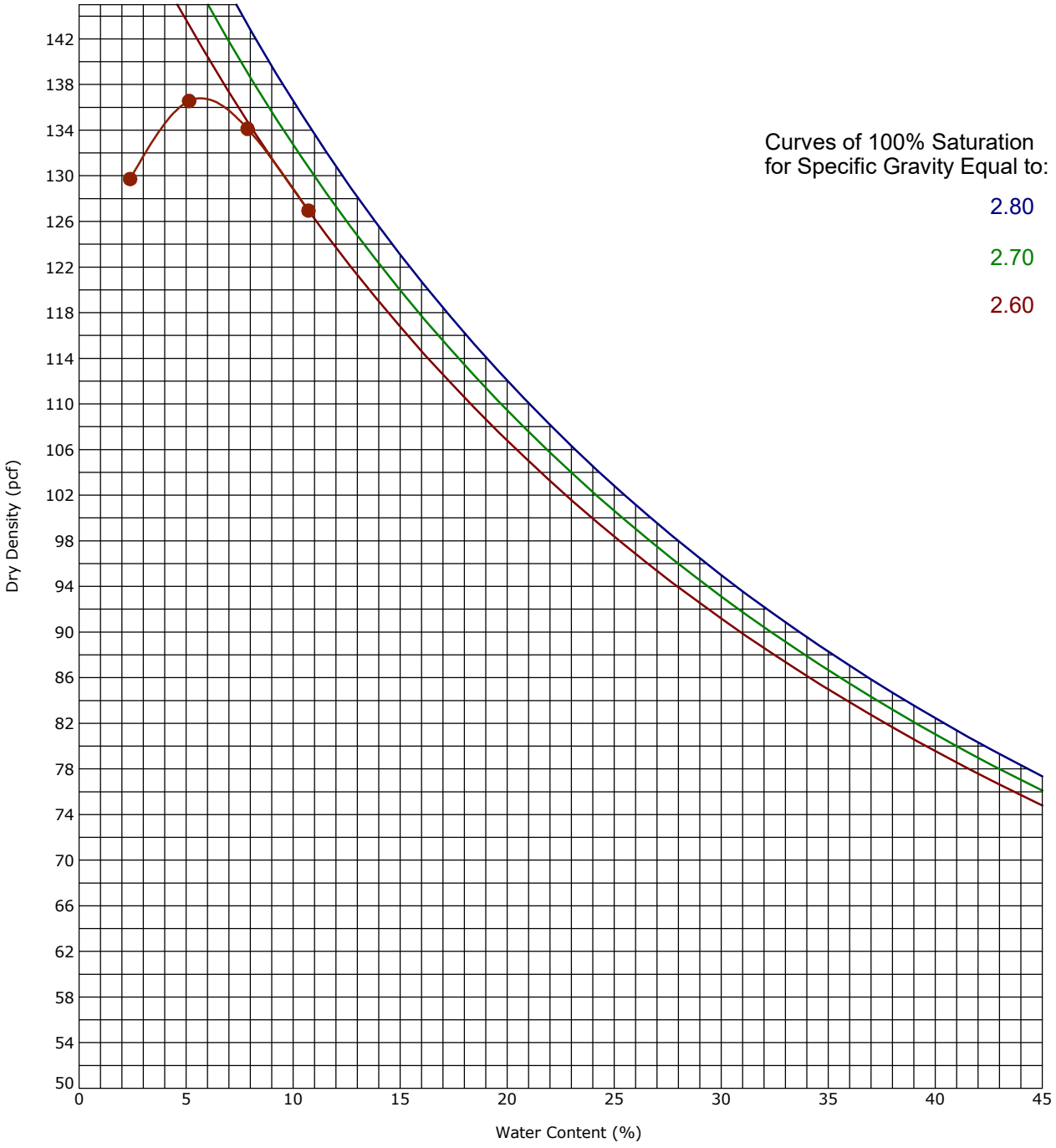
Fines (%)	Fraction > mm size	LL	PL	PI	Test Method	Maximum Dry Density (pcf)	Optimum Water Content (%)
	0.0	24	16	8	ASTM D1557-Method A	129.4	10.5

Division II - Sanitary System Improvements
Waterloo, Indiana
Terracon Project No. CJ225454

Terracon
7770 W New York St
Indianapolis, IN

Moisture-Density Relationship

ASTM D1557-Method A



Boring ID	Depth (Ft)	Description of Materials
Composite 4	0 - 8	SILTY SAND with GRAVEL(SM)

Fines (%)	Fraction > mm size	LL	PL	PI	Test Method	Maximum Dry Density (pcf)	Optimum Water Content (%)
17	0.0	NP	NP	NP	ASTM D1557-Method A	136.8	5.7

Supporting Information

Contents:

Note: All attachments are one page unless noted above.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING

WATER LEVEL

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

N	**Standard Penetration Test Resistance (Blows/Ft.)**
(HP)	**Hand Penetrometer**
(T)	**Torvane**
(DCP)	**Dynamic Cone Penetrometer**
(PID)	**Photo-Ionization Detector**
(OVA)	**Organic Vapor Analyzer**

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		**CONSISTENCY OF FINE-GRAINED SOILS** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (tsf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

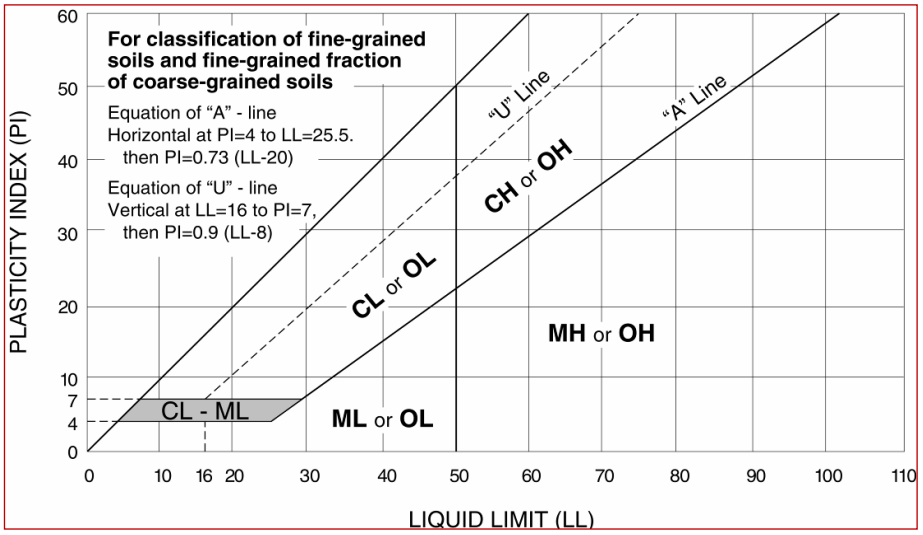
Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

Terracon

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 4 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu≥4 and 1≤Cc≤3 [E]	GW	Well-graded gravel [F]
			Cu<4 and/or [Cc<1 or Cc>3.0] [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu≥6 and 1≤Cc≤3 [E]	SW	Well-graded sand [I]
			Cu<6 and/or [Cc<1 or Cc>3.0] [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
[E] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.



SECTION 330561 – MONOLITHIC AND PRE-CAST CONCRETE MANHOLE STRUCTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Contract documents including drawings and general provisions of the Contract, including General and Supplementary Conditions.
B. Specifications Section 013300 – Submittal Procedures.
C. Manholes shall comply with all applicable requirements of 327 IAC 3-6-16.

1.2 REFERENCES

A. ASTM International:

1. ASTM C33 – Standard Specification for Concrete Aggregates
2. ASTM C150 - Standard Specification for Portland Cement
3. ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete
4. ASTM C443 – Standard Specification for Joints for Concrete Pipe and Manholes, using Rubber Gaskets
5. ASTM C478 – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
6. ASTM A536 - Standard Specification for Ductile Iron Castings.
7. ASTM A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
8. ASTM C877 – Standard Specification for External Sealing Bands for Concrete Pipe, Manholes and Precast Box Sections
9. ASTM C890 - Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
10. ASTM C891 - Standard Practice for Installation of Underground Precast Utility Structures.
11. ASTM C913 - Standard Specification for Precast Concrete Water and Wastewater Structures.
12. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joints Sealants.
13. ASTM A1064 – Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
14. ASTM C1244 - Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test Prior to Backfill
15. ASTM D4101 – Standard Classification System and Basis for Specification for Polypropylene Injection and Extrusion Materials.

1.3 SUBMITTALS

A. Submittal Procedures: Requirements for submittals. See Specification Section 013300.
B. Shop Drawing: Indicate plan, location and inverts of connecting piping.
C. Product Data: Submit data on all structures, pipe entrances, sealing methods and appurtenances.
D. Manufacturer's Certificates: Submit Statement of Compliance and supporting data from materials

suppliers attesting that precast concrete structures provided meet or exceed ASTM Standards and specification requirements.

E. Manufacturer's Installation Instructions: Submit special procedures for precast concrete structure installation.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Accurately record actual locations and inverts of buried pipe, components and connections.

1.5 QUALITY ASSURANCE

A. Maintain one copy of record documents on site.

1.6 DELIVERY, STORAGE AND HANDLING

A. Transport and handle precast concrete units with equipment designed to protect units from damage.
B. Do not place concrete units in position to cause overstress, warp or twist.

PART 2 - PRODUCTS

2.1 TYPES OF MANHOLE CONSTRUCTION

A. The ENGINEER will accept/allow Monolithic (Cast-in-Place) and/or Precast manholes conforming to the specifications herein.

2.2 MONOLITHIC (CAST-IN-PLACE) MANHOLES

A. Should a CONTRACTOR elect to build monolithic manholes, shop drawings showing at a minimum the concrete mix, steel reinforcement details, pipe connections and manhole dimensions shall be submitted to the ENGINEER for approval of each structure to be built. The shop drawings are to be reviewed and certified by a Professional Engineer registered in the State of Indiana prior to submittal to the ENGINEER. Verification of pipe sizes and depths as well as grade shall be the CONTRACTOR's responsibility prior to manufacture of structures.

2.3 PRECAST CONCRETE STRUCTURES

A. Precast concrete structures to be installed in drives and roadways shall be manufactured in accordance with ATM C478, latest revision, or ASTM C913, latest revision, and shall be designed for HS-20 Live Loads.
B. Precast concrete structures shall be of approved design and sufficient strength to withstand the loads to be imposed upon them. An approved watertight joint shall be provided between precast concrete sections.
C. Mark date of manufacture and name or trademark of manufacturer on inside of precast concrete chamber section. Size of precast concrete structures shall be as shown on the drawings.

D. All concrete in precast units shall be stone aggregate and develop a strength of 4,000 psi at 28 days and shall conform to the following specifications:

1. All concrete furnished and installed for precast concrete structures shall be in accordance with ACI 318 Code for Reinforced Concrete.
2. Materials:

    a. Cement: Portland Cement, ASTM C150, Type I or Type II.
    b. Admixtures: Admixtures other than air entraining shall not be used. Air entraining admixture shall conform to ASTM C260. Air content of concrete with ¾-inch maximum size aggregate shall be 6 percent plus or minus 1 percent volume.
    c. Water: Clean and free from injurious amounts of oils, acids, alkalis, organic materials, or other substances.
    d. Aggregates: aggregates shall conform to ASTM C33, latest revision. Course aggregate shall be size number 67 (nominal ¾- inch to No. 4).
    e. Proportions of materials in concrete and strength of concrete shall be subject to the following conditions: 1) Minimum 28-day compressive strength – 4,000 psi. 2) Maximum water to cement ration by weight – 0.45. 3) Minimum cement content 600 lbs/cubic yard.

E. All precast concrete shall be manufactured by wet cast methods only. All manhole sections shall be steam or heat-and-water-mist cured and shall not be installed until at least five (5) days after they are cast.
F. All precast concrete shall be reinforced. Reinforcing shall be designed for all applicable loads and forces encountered. Steel reinforcing shall be ASTM A1064 615 Grade 60-60 KSI.
G. All joints between precast manhole elements shall be made with an approved rubber gasket in accordance with ASTM C-443, latest edition, or Butyl rubber gaskets in accordance with ASTM C990 and a 1/2-inch diameter non-asphaltic mastic (Kent Seal or approved equal) conforming to AASHTO M-198 and Federal Specifications SS-521-A.
H. The CONTRACTOR shall field apply a butyl-rubber or approved asphaltic backplaster to the entire exterior surface of all sanitary manhole structures prior to backfill. Factory applied waterproof coatings may be accepted by the ENGINEER, but the CONTRACTOR shall physically seal the joints and any damaged coating areas following the placement of the structure with the butyl-rubber or approved asphaltic backplaster.

2.4 CASTING, FRAME AND COVER

A. All castings shall be as indicated on the plans and conform to the following requirements:

1. Casting shall be of uniform quality, free from blowholes, porosity, hard spots, shrinkage, distortion or other defects. They shall be smooth and well cleaned by shot blasting or other approved method.
2. Casting shall be imprinted with the words “SANITARY SEWER” on the lid of each sanitary sewer manhole. Casting shall be imprinted with the words “STORM SEWER” on the lid of each storm sewer manhole. Minimum letter height shall be two (2) inches for words in the lids.
3. All casting lids shall be provided with watertight, concealed pickholes. Casting lids with open pickholes will not be accepted for any sanitary sewer manhole applications.

4. All sanitary sewer manhole casting frames and lids shall be provided with a “Self-Sealing” application.

B. Setting frames and covers:

1. Manhole frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the plans or as directed. Frames shall be set concentric with the top of the masonry and on a double row of nonasphaltic mastic and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.
2. Manhole covers shall be left in place in the frames on completion of other work at the manholes.

2.2 STRUCTURE CONFIGURATION

A. Provide size and shape as indicated on Drawings.
B. Precast reinforced concrete bottom integral with bottom section.

2.3 ACCESSORIES

A. Steps: Manhole steps shall be polypropylene; polypropylene coated steel reinforcing or an approved non-corrosive fiberglass material. The copolymer polypropylene shall meet the requirements of ASTM D-4101 reinforced with deformed 3/8-inch minimum diameter reinforcing steel conforming to the requirements of ASTM A-615, Grade 60. Cast Iron steps are not acceptable. Manhole steps shall be 12” on center (maximum), no more than 24” from the top of casting, and no more that 24” from the lowest invert elevation.
B. Strap Anchors: Stainless steel capable of supporting pipe or accessories indicated on Drawings, minimum 1 inch wide x 1/8 inch thick.

2.5 BEDDING AND BACKFILL MATERIALS

A. Bedding: Clean coarse aggregate gradation No. 8 conforming to Indiana Department of Transportation Standard Specifications, latest revision.
B. Backfill around Structures: B Borrow and Structural Backfill Conforming to INDOT Standard Specifications, latest revision.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify items provided by other Sections of Work are properly sized and located.
B. Verify built-in items are in proper location and ready for roughing into Work.
C. Verify correct size of delivered structures and structure excavation.

3.2 PREPARATION

A. Coordinate placement of inlet and outlet pipes.
B. Do not install structures where site conditions induce loads exceeding structural capacity of structures.
C. Inspect precast concrete structures immediately prior to placement in excavation to verify structures are internally clean and free from damage. Remove and replace damaged units.

3.3 INSTALLATION

A. Excavation and Backfill:

    1. Excavate and backfill for structures in location and to depth shown. Provide clearance around sidewalls of structure for construction operations and placement of backfill.
    2. When groundwater is encountered, prevent accumulation of water in excavations. Place structures in dry trench. Where possibility exists of watertight structure becoming buoyant in flooded excavation, anchor manhole or structure to avoid flotation.

B. Place bedding.
C. Install underground precast utility structures in accordance with ASTM C891.
D. Lift precast structures at lifting points designated by manufacturer.
E. When lowering structures into excavations and joining pipe to units, take precautions to ensure interior of pipeline and structure remains clean.
F. Set precast structures bearing firmly and fully on stone bedding, thickness as shown on the plans, compacted to 95 percent maximum density.
G. Assemble multi-section structures by lowering each section into excavation. Install rubber gasket joints between precast sections in accordance with manufacturer's recommendations. Lower, set level, and firmly position base section before placing additional sections.
H. Remove foreign materials from joint surfaces and verify sealing materials are placed properly. Maintain alignment between sections by using guide devices affixed to lower section. The outside and inside joint shall be filled with a non-shrink mortar and finished flush with the adjoining surfaces. Backfilling shall be accomplished bringing the fill up evenly on all sides. If leaks appear in the structures, the inside joints shall be caulked with non-shrink grout to the satisfaction of the Engineer. The Contractor shall install the precast sections in a manner that will result in a watertight joint.
I. Joint sealing materials shall be installed on site. All joints shall be installed with an exterior joint seal to be compliant with ASTM specification C877 Type II. The joint seal shall be MacWrap Exterior Joint Sealer as manufactured by MarMac Construction Products Company or an approved equal and shall be installed according to the manufacturer's recommendations. The seal shall consist of a band (*) inches wide (*- 12" and 14" widths are appropriate for new installs of most precast manhole or wet well structures). The band shall have an outer cover of polyethylene with an under layer of rubberized mastic that is reinforced with woven polypropylene. There shall be a peelable protective release film against the mastic that is removed when the seal is applied to the joint. Within the seal, a minimum of two steel compression bands 5/8" wide shall be located a minimum of one inch (1") from each outer edge of the band. The straps shall be in tubes that isolate them from the mastic and allow them to slip freely when tightened around the pipe. The seal shall

be designed so that when it is applied around the joint of the pipes to be connected, the ends of the seal overlap a minimum of eight inches (8”). When the straps are tensioned and secured, the work closure flap shall completely cover the straps protecting them from moisture and corrosion. The seal shall be placed around the structure, mastic side to the joint gap, and then the protective release film shall be progressively removed and product applied. The steel strap will then be tensioned and secured with preinstalled ratchet tensioners or with proper tools. The closing flap shall cover all remaining exposed straps, completing the installation. Backfill can commence immediately following the inspection of proper sealing band installation.

J. Verify structures installed satisfy required alignment and grade.

K. Remove knockouts or cut structure to receive piping without creating openings larger than required to receive pipe. Fill annular space with link seal and non-shrink grout.

L. Floors and channels of the manholes shall be constructed of concrete as shown on the plans and as specified. The floor of the manholes shall be shaped to provide a slope of at least ½" per foot from manhole sides to main sewer channels and shall be wood float finished to provide a smooth and well-drained surface.

M. All holes in sections used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose or with no shrink mortar. The mortar shall be one-part hydraulic cement to 1-1/2 parts sand, mixed slightly damp to the touch (just short of “balling”), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

3.4 FIELD QUALITY CONTROL

A. Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. All precast concrete structures shall be free from visible leakage. Each structure shall be tested for leaks and inspected and all leaks shall be repaired in a manner subject to the Engineer’s approval.

C. All sanitary manholes installed in this project shall be air tested in accordance with ASTM C 1244, latest revision, Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test to insure water tightness and integrity. Tests shall be conducted prior to acceptance and placement into service. The CONTRACTOR shall notify the OWNER and ENGINEER prior to test and no test results will be accepted unless witnessed by the OWNER's Representative and/or the ENGINEER’s Representative. All testing costs for equipment, labor, etc. shall be included in the CONTRACTORs bid price to the OWNER. Any manholes failing the test shall be corrected in a manner acceptable to the ENGINEER and shall be retested by the CONTRACTOR until satisfactory test results are achieved. The CONTRACTOR shall be responsible for any costs incurred by the OWNER and ENGINEER for testing of failed manholes.

D. The procedure for testing shall be in accordance with the following steps:

1. Each manhole shall be tested immediately after assembly and prior to backfilling if possible. If the CONTRACTOR elects to perform tests after backfilling, he shall be responsible for re-excavation to locate and correct any leaks that may be necessary.
2. All lift holes shall be plugged with non-shrink grout.
3. All pipes entering the manhole shall be plugged and adequately braced within the manhole.
4. The test head shall be placed at the top of the manhole in accordance with the manufacturer's recommendations.

5. A vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off.
6. The time for the vacuum to drop from 10 inches to 9 inches of mercury shall be measured. Compliance shall be measured in accordance with TABLE 1 of ASTM C 1244, latest revision, or as otherwise directed by the OWNER's Representative.

E. The OWNER's Representative shall witness all tests. All equipment used shall be specifically designed for the purpose of testing manholes. If a test fails, corrections shall be made and the manhole shall be retested until a satisfactory test is achieved. No manhole shall be placed into service or accepted by the OWNER until it has passed the testing requirement.

F. Grading at structures:

1. All precast concrete structures in unpaved areas shall be constructed as shown or directed to an elevation 6 inches higher than the original ground.
2. The ground surface shall be graded to drain away from structure. Fill shall be placed around them to a level of the upper rim of the frame and cover, and the surface evenly graded on 1 to 5 slope to the existing surrounding ground. The slope shall be covered with 4 inches of topsoil, seeded, and maintained.
3. All precast structures installed with or under pavement areas shall be constructed to an elevation which permits the frame and cover to be set flush with the final paving grade.

END OF SECTION 330517

REVISED BID PROPOSAL -ADDENDUM #1
FOR
WASTEWATER IMPROVEMENTS PROJECT
DIVISION II -SANITARY SEWER COLLECTION SYSTEM IMPROVEMENTS
FOR
TOWN OF WATERLOO
MARSHALL COUNTY, INDIANA

BASE BID

ITEM NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL PRICE
1.	6" SDR-35 PVC SANITARY SEWER (10-12' DEPTH) W/ STRUCTURE BACKFILL	LF	30		
2.	8" SDR-35 PVC SANITARY SEWER (0-8' DEPTH) W/ STRUCTURE BACKFILL	LF	20		
3.	8" SDR-35 PVC SANITARY SEWER (8-10' DEPTH) W/ STRUCTURE BACKFILL	LF	140		
4.	8" SDR-35 PVC SANITARY SEWER (10-12' DEPTH) W/ STRUCTURE BACKFILL	LF	181		
5.	12" SDR-35 PVC SANITARY SEWER (0-8' DEPTH) W/ STRUCTURE BACKFILL	LF	362		
6.	12" SDR-35 PVC SANITARY SEWER (8-10' DEPTH) W/ STRUCTURE BACKFILL	LF	329		
7.	12" SDR-35 PVC SANITARY SEWER (10-12' DEPTH) W/ STRUCTURE BACKFILL	LF	643		
8.	12" SDR-35 PVC SANITARY SEWER (12-14' DEPTH) W/ STRUCTURE BACKFILL	LF	30		
9.	12" SDR-35 PVC SANITARY SEWER (14-16' DEPTH) W/ STRUCTURE BACKFILL	LF	315		
10.	18"F-679 PVC SANITARY SEWER (10-12' DEPTH) W/ STRUCTURE BACKFILL	LF	10		
11.	24" F-679 PVC SANITARY SEWER (0-8' DEPTH) W/ STRUCTURE BACKFILL	LF	38		
12.	24" F-679 PVC SANITARY SEWER (8-10' DEPTH) W/ STRUCTURE BACKFILL	LF	868		
13.	24" F-679 PVC SANITARY SEWER (12-14' DEPTH) W/ STRUCTURE BACKFILL	LF	238		
14.	24" F-679 PVC SANITARY SEWER (14-16' DEPTH) W/ STRUCTURE BACKFILL	LF	443		
15.	24" F-679 PVC SANITARY SEWER (16-18' DEPTH) W/ STRUCTURE BACKFILL	LF	1163		
16.	24" F-679 PVC SANITARY SEWER (18-20' DEPTH) W/ STRUCTURE BACKFILL	LF	459		
17.	30" F-679 PVC SANITARY SEWER (0-8' DEPTH) W/ CLEAN BACKFILL	LF	228		
18.	30" F-679 PVC SANITARY SEWER (0-8' DEPTH) W/ STRUCTURE BACKFILL	LF	110		
19.	6" HDPE DR-11 FORCEMAIN INSTALLED BY DIRECTIONAL DRILLING	LF	873		
20.	12" HDPE DR-11 FORCEMAIN INSTALLED BY DIRECTIONAL DRILLING	LF	1206		
21.	EXISTING 4" FORCEMAIN RECONNECTION	LF	40		

22.	SANITARY SEWER LATERALS	LF	1460		
23.	24" STEEL CASING INSTALLED BY JACK AND BORE W/ 12" HDPE DR-11 CARRIER PIPE	LF	106		
24.	48" STANDARD SANITARY MANHOLE (0-8' DEPTH)	EA	3		
25.	48" STANDARD SANITARY MANHOLE (8-10' DEPTH)	EA	2		
26.	48" STANDARD SANITARY MANHOLE (10-12' DEPTH)	EA	3		
27.	48" STANDARD SANITARY MANHOLE (12-14' DEPTH)	EA	1		
28.	48" STANDARD SANITARY MANHOLE (16-18' DEPTH)	EA	1		
29.	48" STANDARD SANITARY MANHOLE (18-20' DEPTH)	EA	1		
30.	60" STANDARD SANITARY MANHOLE (0-8' DEPTH)	EA	2		
31.	60" STANDARD SANITARY MANHOLE (8-10' DEPTH)	EA	2		
32.	60" STANDARD SANITARY MANHOLE (10-12' DEPTH)	EA	1		
33.	60" STANDARD SANITARY MANHOLE (14-16' DEPTH)	EA	1		
34.	60" STANDARD SANITARY MANHOLE W/ OUTSIDE DROP (14-16' DEPTH)	EA	1		
35.	60" STANDARD SANITARY MANHOLE W/ OUTSIDE DROP (16-18' DEPTH)	EA	5		
36.	WAYNE ST LIFT STATION MODIFICATIONS	LS	1		
37.	US 6 LIFT STATION MODIFICATIONS	LS	1		
38.	SUBBASE AND ASPHALT PAVEMENT REPAIR	LF	7,200		
39.	EROSION CONTROL	LS	1		
40.	SEEDING/GENERAL RESTORATION	LS	1		
41.	CONSTRUCTION ENGINEERING	LS	1		
42.	MAINTENANCE OF TRAFFIC	LS	1		
43.	BONDS, INSURANCE AND MOBILIZATION (NOT TO EXCEED 5% OF TOTAL BID)	LS	1		

TOTAL BASEBID _____

(Figures)

_____

Total Bid Price (In Words)

MANDATORY BID ALTERNATES

ITEM NO.	DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT PRICE	TOTAL PRICE
MA-1	MANHOLE SET #1 (PM-01, PM-02, PM-03)	EA	3		
MA-2	MANHOLE SET #2 (PM-04)	EA	1		
MA-3	MANHOLE SET #3 (PM-05, PM-06, PM-07)	EA	3		
MA-4	MANHOLE SET #4 (PM-08, PM-09, PM-10)	EA	3		
MA-5	MANHOLE SET #5 (PM-11, PM-12, PM-13, PM-14)	EA	4		
MA-6	MANHOLE SET #6 (PM-15, PM-16)	EA	2		
MA-7	MANHOLE SET #7 (PM-17)	EA	1		
MA-8	MANHOLE SET #8 (PM-18)	EA	1		
MA-9	MANHOLE SET #9 (PM-19, PM-20)	EA	2		
MA-10	MANHOLE SET #10 (PM-21)	EA	1		
MA-11	MANHOLE SET #11 (PM-22)	EA	1		
MA-12	MANHOLE SET #12 (PM-23, PM-24, PM-25, PM-26)	EA	4		
MA-13	MANHOLE SET #13 (PM-27, PM-28)	EA	2		
MA-14	MANHOLE SET #14 (PM-29)	EA	1		
MA-15	MANHOLE SET #15 (PM-30, PM-31, PM-32)	EA	3		
MA-16	MANHOLE SET #16 (PM-33, PM-34)	EA	2		
MA-17	ONE SPARE PUMP - WAYNE ST. LIFT STATION PUMP PER SPECIFICATION SECTION 221333A - PUMP ONLY	EA	1		

TOTAL MANDATORY BID ALTERNATE _____

(Figures)

_____

Total Bid Price (In Words)

NOTE: THE BASIS OF AWARD MAY CONSIDER THE BASE BID OR THE BASE BID WITH ANY COMBINATION OF THE MANDATORY BID ALTERNATE ITEMS IN THE

Respectfully submitted:

Signature	Address
Title	Date
(SEAL) (If BID is by a Corporation)	License Number (if applicable)