SUBSURFACE INVESTIGATION
HAYDEN RUN BOULEVARD – PHASE 3
HILLIARD/COLUMBUS, OHIO

S&ME Project No. 1117-14-038A

Report to:

Franklin County Engineer's Office
Columbus, Ohio

Prepared by:

S&ME

6190 Enterprise Ct.
Dublin, Ohio 43016

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1117-14-038A

Franklin County Engineer's Office
970 Dublin Road
Columbus, OH 43215

Attention: Mr. Jim Pajk, P.E.

Reference: **Subsurface Investigation**
Hayden Run Boulevard – Phase 3
Hilliard/Columbus, Ohio

Mr. Pajk:

In accordance with our revised proposal dated May 23, 2014, which was authorized by the Franklin County Engineer's office with Purchase Order No. 45401450 dated June 11, 2014, S&ME, Inc. (S&ME) has completed the Subsurface Investigation for the Hayden Run Boulevard – Phase 3 roadway project in Hilliard and Columbus, Ohio. This report contains the information obtained from the current and historic borings for design and construction of the roadway and storm improvements.

We appreciate having been given the opportunity to be of service. Please do not hesitate to contact our office if you have any questions concerning our report.

Respectfully submitted,

S&ME, Inc.
Columbus, Ohio

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1. INTRODUCTION

S&ME, Inc. (S&ME) has completed the subsurface investigation for the proposed Hayden Run Boulevard – Phase 3 project in Hilliard and Columbus, Ohio. The work was performed in general accordance with our revised proposal dated May 23, 2014. The purpose of this investigation was to obtain subsurface information to allow us to characterize the subsurface conditions along the proposed roadway alignment and to evaluate subgrade conditions for pavement design to be done by others and storm sewer design. This report describes our understanding of the project, presents the results of the field exploration and laboratory testing, and discusses our conclusions and recommendations.

2. SITE AND PROJECT DESCRIPTION

S&ME understands that the project is proposed to include the following:

- A new roadway connecting the existing intersection of Riggins and Wilcox Roads at the east end of the project and the proposed intersection of Hayden Run Boulevard and Avery Road on the west end of the project;
- A new roundabout at the Wilcox/Riggins intersection; and,
- New storm sewers.

Preliminary profile information provided to S&ME indicates the proposed vertical alignment of Hayden Run Boulevard is for the most part planned to be approximately the same to 2 feet lower than the existing ground surface, with a few area near Avery Road requiring up to 1.5 feet of fill. The proposed Hayden Run Boulevard - Phase 3 alignment will cross existing farm fields with relatively flat terrain that increases slightly in elevation toward Avery Road.

3. EXPLORATION

3.1 Field Investigation

The Franklin County Engineer's Office (FCEO) requested a boring program consisting of nine (9) borings. S&ME proposed an exploration program of seven (7) borings along the proposed Hayden Run Boulevard, and two (2) borings along existing Wilcox Road. S&ME provided these locations to the FCEO, who arranged for the borings to be staked in the field by surveyors from American Structurepoint, Inc. and EMH&T, Inc. On July 3 and 7, 2014, S&ME was on-site and performed the borings (designated as Borings B-101 through B-109). The approximate locations of the borings are shown on the Plan of Borings submitted as Plate 2 in Appendix A of this report. Boring locations and ground surface elevations were provided to S&ME by American Structurepoint and EMH&T.

Both truck and ATV-mounted drill rigs using 4½-inch outside diameter (O.D.) continuous-flight augers were used to advance the borings to depths of 6 to 15 feet below existing grade. Disturbed but representative soil samples were obtained by lowering a 2-inch O.D. split-barrel sampler to the bottom of the boring and then driving the sampler 18

inches into the soil with blows from a 140 pound hammer freely falling 30 inches (Standard Penetration Test, ASTM D-1586). Split-barrel samples were examined immediately after recovery and representative portions of each sample were placed in air-tight jars and retained for subsequent laboratory testing.

Additionally, the borings were observed for the presence of groundwater during sampling and again at the completion of each boring. Following obtaining the groundwater observations, the borings were backfilled with soil cuttings. Where borings were performed within pavement, the existing pavement surface was repaired with an equivalent thickness of cold-patch asphalt.

In the field, experienced personnel from S&ME supervised the drilling procedures and performed the following specific duties: preserved all recovered samples; prepared a log of each boring; made seepage and groundwater observations; obtained hand-penetrometer measurements in soil samples exhibiting cohesion; and, provided liaison between the field work and the undersigned S&ME personnel so that the program of explorations could be modified, if necessary, because of unanticipated conditions.

3.2 Laboratory Testing

In the laboratory, the samples were visually identified and on selected representative samples, moisture contents, liquid and plastic limit determinations, and grain size analyses were performed. Results of these tests permit an evaluation of strength and subgrade support characteristics of the soil by comparison with similar soils for which these characteristics have been previously determined. Based upon the results of the laboratory testing program, soil descriptions contained on the field boring logs were modified, if necessary, and laboratory-corrected logs are submitted as Plates 4 through 12 of Appendix A. Results of grain size analyses are presented on Plates 13 through 24 of Appendix A.

Soils described in this report have been classified generally in accordance with the Unified Soil Classification System. However, the system has been augmented by the use of special adjectives to designate the approximate percentages of minor soil components. An explanation of the symbols and terms used on the boring logs and definitions of the special adjectives used to denote the minor soil components are presented on Plate 3 of Appendix A.

4. FINDINGS

4.1 General Subsurface Stratigraphy

Borings B-101 through B-107 encountered 6 to 13 inches of topsoil or rootmat. Borings B-108 and B-109 were drilled in existing Wilcox Road and encountered 9 and 8 inches of asphalt pavement over 6 and 7 inches of granular base, respectively. Beneath these existing surficial materials, Boring B-101 encountered possible fill to a depth of 2.0 feet below the existing ground surface and Borings B-108 and B-109 encountered existing fill to 3.0 feet. The existing and possible fill were generally described as stiff to very-stiff SILTY CLAY (A-6b) or CLAY (A-7-6).

The natural soils encountered in the borings generally consisted of stiff to hard brown mottled with gray SILT AND CLAY (A-6a), SILTY CLAY (A-6b), and CLAY (A-7-6) underlain by SANDY SILT (A-4a). Weaker materials were encountered in two borings with Boring B-103-0-14 encountering medium-stiff to stiff CLAY (A-7-6) from 2.2 to 7.3 feet below the existing ground surface, and Boring B-107-0-14 encountering very-soft to soft SILT AND CLAY between 8.0 and 11.3 feet below the existing ground surface. Borings B-105 through B-109 were terminated in these cohesive soils.

Between the depths of 6.9 and 12.8 feet, Borings B-101 to B-104 encountered zones of medium-dense to very-dense GRAVEL WITH SAND (A-1-b). Borings B-101 and B-102 were terminated in the granular soil, whereas Borings B-103 and B-104 were terminated after penetrating 1.2 to 3.5 feet into very-stiff to hard SILT AND CLAY (A-6a). Cobbles were generally encountered within the granular deposits, and also within the deeper cohesive layers of Borings B-104, and B-105. Borings B-101 and B-102 were terminated after encountering auger refusal on probable boulders.

Atterberg limit testing was performed to provide engineering classifications of the on-site soils exhibiting cohesion. A total of seventeen (17) Atterberg limits were performed with liquid limits ranging from 23 to 61 percent, and plasticity indices ranging from 8 to 39 percent for the soils tested. Natural moisture content testing was performed on a total of seventeen (17) soil samples. The moisture contents of the on-site soils tested ranged from 14 to 21 percent. These values ranged from 4 percent below to 5 percent above their corresponding plastic limit.

For further detail of subsurface conditions encountered, please refer to the individual boring logs presented on Plates 4 through 12 of Appendix A. It should be noted that the borings were performed at wide spacing (approximately 500 feet apart) and conditions may vary along the length of the proposed roadway. Inferences should not be made to the subsurface conditions in the areas between or away from the borings without field verification.

4.2 Groundwater Observations

Groundwater observations were made as each boring was being advanced and measurements were made at the completion of drilling. Groundwater was encountered during drilling in 5 of the 9 borings at depths ranging from 5 to 10 feet below the existing ground surface. At the completion of drilling, water had accumulated in these borings to depths of 4.5 to 8.0 feet below the ground surface. Borings B-101, B-102, and B-107 were left open until the end of the day, and within a few hours of the completion of drilling, the level of water within these borings continued to rise to within 2.5 to 4.5 feet of the ground surface prior to backfilling. The remaining borings were noted as being "dry," that is to say no measurable amount of water had collected in the borehole prior to backfilling.

4.3 Historic Boring Information

In 2009, CTL Engineering, Inc. performed Borings SB-6 and SB-7 on the west and east sides of Avery Road, respectively, as part of an investigation for proposed Hayden Run Boulevard to the west of Avery Road. These borings encountered six (6) and three (3) inches of topsoil, respectively, at the existing ground surface. Boring SB-6 encountered medium-stiff brown and gray CLAY (A-7-6), stiff to very-stiff brown and gray SANDY SILT (A-4a), very-dense brown GRAVEL WITH SAND (A-1-b) and was terminated in a layer of hard SANDY SILT (A-4a). Boring SB-7, however, encountered 2.3 feet of soft gray ELASTIC CLAY (A-7-5), medium-stiff brown and gray CLAY (A-7-6), and medium-stiff to stiff brown and gray SANDY SILT (A-4a) over very-stiff gray SANDY SILT (A-4a). Water was noted 6.5 feet below the ground surface in Boring SB-6, whereas Boring SB-7 was noted as being "dry".

5. ROADWAY ANALYSIS AND RECOMMENDATIONS

5.1 General Geotechnical Evaluation

S&ME understands that it is currently proposed to construct Hayden Run Boulevard – Phase 3 from Avery Road to Wilcox Road. The total length of proposed roadway is approximately 3,600 feet. The proposed profile provided by American Structurepoint and EMH&T indicates the profile grade varies from approximately 1.5 feet of fill to 2 feet of cut. The soils close to the existing ground surface have a higher Plasticity Index, and granular soil was encountered with depth in several borings. Based on the results of the borings, the soil at the proposed subgrade elevation will likely require some form of remediation prior to paving.

5.2 Subgrade Support Parameters

It is anticipated that the subgrade for the pavements within the site will consist of natural stiff to hard cohesive soil deemed suitable for pavement support following favorable proofrolling, or newly placed controlled fill.

The table in Appendix B is the ODOT Geotechnical Bulletin GB1 spreadsheet (Ver. 12.0, updated 12/30/11) distributed by the ODOT Office of Geotechnical Engineering (OGE). The table summarizes the soil type (by ODOT/HRB classification), group indices, depth, blow-counts, and Atterberg Limit values for the proposed subgrade soils encountered in the borings drilled for this project. This table also computes an average of the estimated values of the California Bearing Ratio (CBR) for the soils encountered at or below the anticipated subgrade level of the proposed roadway profile.

Based on the preliminary profile information provided by American Structurepoint and EMH&T the proposed road will generally be at or slightly below the existing grade, the following California Bearing Ratio (CBR) is computed by the ODOT GB1 spreadsheet for the anticipated subgrade soils encountered during this investigation:

CBR: 6%

Based on this value, and Section 203.1 of the 2008 ODOT Pavement Design and Rehabilitation Manual, the following value of Resilient Modulus (M_R) may be used during new pavement section design for this project.

M_R: 7,200 psi

These subgrade support values may be used during the pavement design for this project provided that the entire proposed pavement subgrade is prepared in strict accordance with Item 204 of the 2013 ODOT or 2012 City of Columbus (CoC) Construction and Material Specifications (CMS), and that all borrow soil placed within 3 feet of the final subgrade level is capable of providing average subgrade support parameters which meet or exceed the above values. This subgrade evaluation also assumes that the subgrade for the new roadway is composed of the materials encountered in the borings. If, at the time of construction, it is determined that the subgrade may consist of materials significantly different than those encountered, the pavement design subgrade criteria should be reviewed and, if necessary, modified.

5.3 Unsuitable Subgrade Materials

None of the borings performed during the current investigation encountered soil within 3 feet of the anticipated subgrade level which ODOT GB1 considers to be unsuitable either by classification (A-4b, A-2-5, A-5, A-7-5, A-8a, A-8b), or by a Liquid Limit (LL) value in excess of 65%. However, it should be noted that the 2009 CTL Boring SB-7 encountered ELASTIC CLAY (A-7-5) below the topsoil to a depth of 2.5 feet. **As this soil is not considered a suitable subgrade soil by either the ODOT or City of Columbus CMS (Item 703.16.A and 703.15.A, respectively), it should be completely removed and replaced with suitable embankment fill (Item 203, or Item 204 where within 12 inches of proposed subgrade).** Table 5.1-1 on page 7 summarizes the estimated area where removal of this unsuitable soil is anticipated.

If deposits of other unsuitable soils such as silt or organic materials are encountered during earthwork or proofrolling operations, S&ME recommends that test pits or hand sampling methods be used to further investigate and delineate the extent of these deposits. Any silt deposits present within 3 feet of the proposed subgrade level should be removed (ODOT CMS Item 203.03.A).

Because of the variable nature of the existing soils encountered in the borings and the wide spacing of the explorations, it is possible that areas of unsuitable or organic subgrade materials not encountered in any of the borings may be encountered during proofrolling and earthwork operations. Visual observation of the proofrolling procedures by a geotechnical engineer or their designated representative may result in at least a partial reduction of undercutting of unsuitable soils in these areas.

5.4 ODOT GB1 Subgrade Analysis

ODOT's GB1 "Plan Subgrades" (dated August 7, 2013) indicates that a comparison of the laboratory-measured moisture content to the estimated optimum moisture content of the subgrade soil, along with the normalized blow-count (N_{60}) from SPT sampling, may

be used as an indicator of the potential need for subgrade treatment or remediation of unstable subgrade soil. The acceptable options presented by GB1 to remediate and establish a stable soil subgrade are either to "excavate and replace", or chemical stabilization.

The GB1 Table included in Appendix B summarizes the laboratory-measured moisture content for the samples from each boring with respect to the estimated optimum moisture contents, and the lowest N value (N_{60L}) obtained from the SPT performed in each of these borings. This table also indicates the recommended Item 204 "excavate and replace" depths per GB1 at each boring location, along with an overall assessment of the suitability of various types of chemical stabilization on this project.

The GB1 table indicates that 73% (8 of 11) of the borings encountered soil at or just below the anticipated subgrade surface with characteristics defined as problematic by the procedures recommended in GB1. ODOT GB1 indicates that when 30% or more of the proposed subgrade requires remediation, global remediation/stabilization of the entire project subgrade should be considered.

However, because the subgrade soil encountered in the borings along the length of the proposed roadway varied significantly (plasticity indices ranging from greater than 30 to less than 10), it is S&ME's opinion that a global chemical stabilization program using a single chemical additive will not provide a uniform level of subgrade improvement in all areas of the project.

As such, S&ME recommends that a subgrade remediation program utilizing an "excavate and replace" approach be implemented to repair areas of proposed subgrade which exhibit instability during construction.

5.5 Subgrade Remediation

Based on the proposed profile grades for the roadway provided by EMH&T and American Structurepoint and assuming an approximate 1.3-foot-thick new pavement section, the proposed subgrade elevation will be approximately 0.5 feet above to 3.4 feet below the existing ground surface elevation. Table 5.5-1 on the following page summarizes the general areas of the project where "excavate and replace" subgrade remediation may be required according to the GB1 spreadsheet. The depth of excavation recommended by the GB1 spreadsheet at each boring location is also included in Table 5.5-1. Actual decisions on the depths and limits of all excavations should be made in the field based on the results of a proofroll performed in accordance with ODOT/CoC CMS Item 204.

Table 5.5-1: Estimated Item 204 Excavate and Replace Limits

Boring Number	Estimated Extents	Recommended Depth of "Excavate & Replace"
SB-6	STA 111+75 to STA 112+31	21 Inches
SB-7	STA 112+31 to STA 114+75 **	30 Inches
B-101	STA 114+75 to STA 119+50	18 inches
B-102	STA 119+50 to STA 125+00	15 inches
B-103	STA 125+00 to STA 130+25	21 inches
B-104	STA 130+25 to STA 135+25	15 inches
B-105	STA 135+25 to STA 139+50	15 inches
B-109	STA 13+50 to STA 14+75	21 inches

** Unsuitable soil requiring removal (see Section 5.3)

In accordance with ODOT GB1, the lateral extent of the undercuts should extend to 18 inches outside the proposed pavement or paved shoulders.

These estimated GB1 undercut depths are based on the conditions encountered at the time of this subsurface investigation. However, because the estimated amount of remediation is strongly dependent on the moisture content of the subgrade soil at the time of construction, **ODOT Geotechnical Bulletin GB1 states that the ultimate decision on the required undercut limits and depths should be made during the proofrolling operations**. It is recommended that a geotechnical engineer be present at the time of proofrolling in an effort to minimize the amount of undercut.

5.6 Earthen Embankment Construction

Prior to commencing earthwork operations and subsequent pavement construction, it is recommended that all existing pavement, structures, topsoil, organic material, existing trees including their entire root mass, vegetation or other unsuitable material should be stripped from the proposed roadway alignment. Following stripping and any necessary undercutting, the entire exposed subgrade soils should be examined by the Geotechnical Engineer of Record or designated representative to identify any weak, wet, organic, or otherwise unsuitable soils that were not encountered during the subsurface investigation, particularly in at grade and fill areas. This is of particular importance in the vicinity of Boring B-103 and Boring SB-7 where either medium-stiff or unsuitable A-7-5 soils were encountered at and slightly below the proposed subgrade level.

5.6.1 Fill Areas

In areas where new fill is required to attain the proposed subgrade elevation, S&ME recommends that consideration be given to test-rolling the exposed embankment foundation prior to commencing fill placement in these areas. This additional proofrolling, performed in accordance with Item 204.06 of the ODOT/CoC Construction and Material Specifications (CMS) and Section 204 of the ODOT Construction Inspection Manual of Procedures, would assist in identifying soft, wet or weak zones that may be present in areas where the thickness of new fill embankment is insufficient to "bridge" an underlying weak or wet soil. If any such zones are present, the materials

contained in these zones should be either scarified, dried, and thoroughly recompacted in place in accordance with ODOT Item 203.07, or be removed and the overexcavation filled in a controlled manner with compacted, suitable embankment material (Item 203.02) and the recommendations presented in the following section of this report.

Although Item 203.05 permits the use of a "bridge lift" to aid in spanning soft or wet foundation areas, S&ME recommends that this practice not be permitted, on this project, as only relatively thin amount of new fill will be required to attain the proposed subgrade elevation. Soft, weak, or wet soils that are not removed from beneath a thin layer of fill may result in significant difficulties in achieving the compaction percentages required for the new fill (Items 203.07 or 204.03) such that final subgrade acceptance proofrolling may require overexcavation of the new fill where weak soils were "bridged" by a minimal thickness of new fill.

5.6.2 "At-Grade" and "Cut" Areas

Once the desired subgrade elevation has been attained in all "cut" and "at-grade" areas, and after overexcavation of all existing unsuitable subgrade materials has been completed (see Table 5.1-1, the subgrade soil beneath the entire roadway and shoulder pavement area should be scarified and recompacted to a depth of 12 inches below the subgrade level in accordance with ODOT Item 204.03. During recompaction, the moisture content of the subgrade soil should be maintained or adjusted in accordance with ODOT Item 203.07.A.

Following the completion of the scarification and recompaction of the subgrade these cut and at-grade areas, it is strongly recommended that construction traffic be restricted from traveling on the compacted subgrade until final acceptance proofrolling has been performed. Cohesive subgrade soils subjected to repeated moisture fluctuations, which may occur as a result of exposure to rainfall and/or surface water runoff, may exhibit subgrade instability.

5.6.3 Borrow Requirements and Compaction Criteria

New fill should consist of inorganic soil free of all miscellaneous materials, cobbles, and boulders, which is placed in uniform, thin layers and then compacted in accordance with either Item 203, *"Roadway Excavation and Embankment"*, or when within 12 inches of the proposed subgrade level, Item 204 *"Subgrade Compaction and Proofrolling"*, of the either the ODOT or CoC CMS. Borrow materials should not be placed in a frozen condition or upon a frozen surface, and any sloping surfaces on which new fill is to be placed should first be benched in accordance with either Item 203.05 or ODOT GB2, depending on the slope of the existing ground surface at each location.

As recommended in Section 5.2 of this report, any borrow materials to be used as new fill or backfill within 3 feet of the proposed subgrade level be tested in the laboratory to determine that the borrow materials are capable of exhibiting subgrade support characteristics that are no less than the CBR value used during the pavement design.

Compaction requirements for the construction of earthen embankments are based on ODOT/CoC CMS Item 203.07.B (or Item 204.03 when within 12 inches of subgrade level), which specifies a minimum percent compaction based on the dry unit weight of the type of soil fill being placed as borrow. At the time of this submittal, it is unknown if a borrow source will be required for this project. S&ME recommends that, if a borrow site is required, that sampling and testing of this borrow material be performed prior to construction to verify that the borrow soils are suitable for the planned construction.

5.6.4 Compaction/Moisture Conditioning Concerns

It should also be noted that the cohesive soils encountered in the borings performed for this project, if exposed to inclement weather or rainfall, may rapidly absorb additional moisture and weaken. It is imperative that these soil types not be exposed to rainfall while in a loosened state (such as during disking and drying for moisture conditioning). Should these materials become sufficiently saturated that additional moisture conditioning is impractical, the material should be wasted. Therefore, it is recommended that moisture conditioning only be performed when extended periods of suitable weather are anticipated, and that only the amount of borrow soil be exposed that may be moisture conditioned and properly compacted during suitable weather periods.

In addition to proper subgrade preparation, we recommend that the pavement design and construction include surface and subsurface drainage measures. Water which infiltrates the pavement and remains trapped within the pavement components during traffic loading is one of the leading causes of premature pavement failure. Effective design measures include the use of perimeter swales, perimeter edge drains, curbs, or a combination of these features to collect surface water runoff from areas adjacent to the pavement. Cohesive subgrade soils should be crowned or sloped to promote drainage of infiltrating water towards subsurface drainage collection systems.

5.6.5 Final Subgrade Preparation

Once the design subgrade elevation has been attained for the proposed roadway embankments, the subgrade should be compacted and proofrolled in accordance with Item 204 of the ODOT/CoC Construction and Material Specifications, with any weak or unsuitable areas being repaired in accordance with Item 204.07.

5.7 Groundwater Considerations

Based upon observations made at the time of this investigation, significant groundwater problems are not anticipated in connection with shallow excavations for the proposed roadway construction. Shallow excavations, such as subgrade over-excavations, extending through only cohesive soil may encounter small amounts of seepage. Deeper excavations, such as excavations for any utilities, extending through granular seams, pockets/lenses, or layers may encounter larger groundwater flows. Construction dewatering can likely be handled by pumping from temporary sump pumps. If pumping from sumps is not adequately maintaining groundwater below bearing surfaces, then S&ME should be retained to provide additional recommendations.

6. STORM SEWER RECOMENDATIONS

6.1 Proposed Storm Sewer

S&ME understands that a storm sewer is also to proposed to generally parallel the proposed Hayden Run Boulevard – Phase 3 alignment. Although specific profile information for the proposed storm sewer was not available at the time of this report, S&ME anticipates the storm sewer will have an invert level ranging from approximately 5 to 10 feet below the proposed Hayden Run Boulevard profile.

Based on the results of the borings, it is anticipated that excavations for the proposed storm sewer will encounter both cohesive and granular soil, and also cobbles and boulders. Concerns regarding sewer installation are as follows:

- sloughing and caving of the trench walls during construction;
- the presence of cobbles; and,
- the presence of groundwater.

These items are discussed in the following sections.

6.1.1 Excavation Conditions

The borings encountered both cohesive and granular soil at this site, and numerous cobbles and boulders were encountered in several of the borings. Although likely discontinuous, deposits of granular soils were encountered in Borings B-101 through B-104 and SB-6 at elevations that are likely above the planned sewer invert. Several borings also noted that the level of groundwater accumulating within the boreholes continued to rise for several hours after drilling was completed and until the water level was within 2.5 to 4.5 feet of the existing ground surface before backfilling.

The majority of the alignment of the proposed roadway and sewer are in agricultural fields. Although not encountered in the borings, the possible presence of field tiles should be considered. If field tiles are encountered provisions should be made to redirect the pipes or tie them into proposed storm systems.

6.1.2 Trench Wall Behavior and Support

Sloughing and caving should be expected for unbraced excavations, not only where granular soils are present, but also where layers of weaker cohesive soils, zones of cohesive soil containing seams and lenses of granular soils, or seepage/groundwater zones are encountered. **All excavations should be sloped back or braced in accordance with the most recent OSHA excavation rules and regulations**.

If there are any existing underground utilities or structures within the influence zone of an open-cut trench for the proposed sewer, the existing structure/utility may be subjected to lateral movements if excavations for the new sewer are not fully braced. The influence zone of a trench excavation may be determined by extending an imaginary line from the base of the excavation to the ground surface using an inclination of approximately 45 degrees with the horizontal. Therefore, if the lateral distance to and depth of the existing

utility are known, a determination may be made as to whether the adjacent underground utility is in the zone which may be affected by the proposed excavation. The risk of lateral movement within the influence zone increases with both the length of the excavation and the time the trench remains open. Thus, requiring the contractor to limit the length of open trench excavation to that which can be backfilled same day as the excavation would help reduce the risk of lateral movement of the trench side walls.

Where other existing underground utilities or structures are located within the potential influence zone and there is no tolerance for potential lateral movement, S&ME recommends that the trench excavations be directly braced at the time of the excavation. To be effective, the bracing must be designed to minimize deflection along the entire excavation height and be constructed "tight" against the retained soil, such as sheeting driven prior to excavation with bracing added as the excavation is lowered. If lateral movement cannot be tolerated, a bracing system cannot be installed after the excavation is made.

6.1.3 Pipe Support

The currently anticipated invert of the proposed sewer ranges from approximately 5 to 10 feet below the proposed Hayden Run Boulevard – Phase 3 profile. Based on the results of the borings, the soil encountered at these depths should provide adequate support for the storm pipe. In general, the soil excavated weigh more than the pipe to be installed, so that bearing should be adequate and settlement minimal.

If areas of weak cohesive or loose granular soil are encountered at the invert elevation, then overexcavations may be required. These types of soils may also be sensitive to disturbance during excavation, especially in the presence of water. If zones of unsuitable soil are encountered at the proposed invert elevations, or if the soil becomes disturbed by construction activities, it is recommended that the disturbed materials be overexcavated and backfilled with a compacted granular bedding material, such as No. 57 or No. 2 stone. If deemed necessary, a mud mat consisting of several inches of a lean concrete may also be placed. The typical required granular bedding material may then be placed on top of the stone backfill or mud mat.

6.1.4 Backfill Recommendations

Any fill placed in utility trenches located beneath or within the zone of influence of pavement or buildings/structures should be placed and compacted in accordance with ODOT Item 203, "Embankment Compaction", of the current ODOT *Construction and Material Specifications*, or Item 204 when within 12 inches of the proposed subgrade level. For utility trenches lying outside the zone of influence of pavement loads and any future building/structure loads, consideration may be given to specifying that trench backfill may be compacted to a dry unit weight no less than 96% of the maximum dry unit weight as determined by AASHTO T 99. Regardless of the compactive effort applied, S&ME recommends that the moisture content of all backfill be maintained between -2% to +2% of the optimum moisture content during all compaction operations.

Native materials from the trench excavations may be considered for re-use as backfill for utility trenches. However, all soil used as new fill or backfill within 3 feet of the proposed subgrade level of Hayden Run Boulevard – Phase 3 must be capable of providing subgrade support characteristics in a final compacted state that are no less than the value used for the design of new pavement (see "Subgrade Support Parameters" section of this report). Also if chemical subgrade stabilization is anticipated soil used within 3 feet of the proposed subgrade will need to have a PI that is compatible with the modifier.

6.1.5 Groundwater Considerations

Five (5) of the nine (9) borings performed as part of the current investigation along the proposed alignment encountered groundwater. Long term groundwater measurements were not taken in any of the borings, but at or within a few hours of the completion of drilling, groundwater had accumulated in several of these borings to depths within 2.5 to 5.5 feet of the existing ground surface. Based on these observations, it should be anticipated that groundwater will be encountered during trench excavation and pipe installation.

If a system of sumps and pumps cannot sufficiently maintain the water level below the invert elevation, then more extensive dewatering techniques, such as wells or a well-point system, may be necessary for dewatering. It should be recognized that the lowering of the groundwater table in permeable granular strata will influence the water level of the aquifer in the surrounding area, and the water supply to nearby shallow wells might be temporarily affected. Also, a significant lowering of the water table can cause subsidence in the nearby soils. Such issues should be considered if dewatering of a large area will be required.

The presence of water in trenches, coupled with construction activity, will soften and weaken any cohesive soils, and these disturbed zones might cause settlement beneath the pipe following backfilling. Therefore, the trench bottom should be kept free of standing water and any soft/weak or disturbed cohesive soils should be removed and replaced with stone or a mud mat as described in the Pipe Support section of this report.

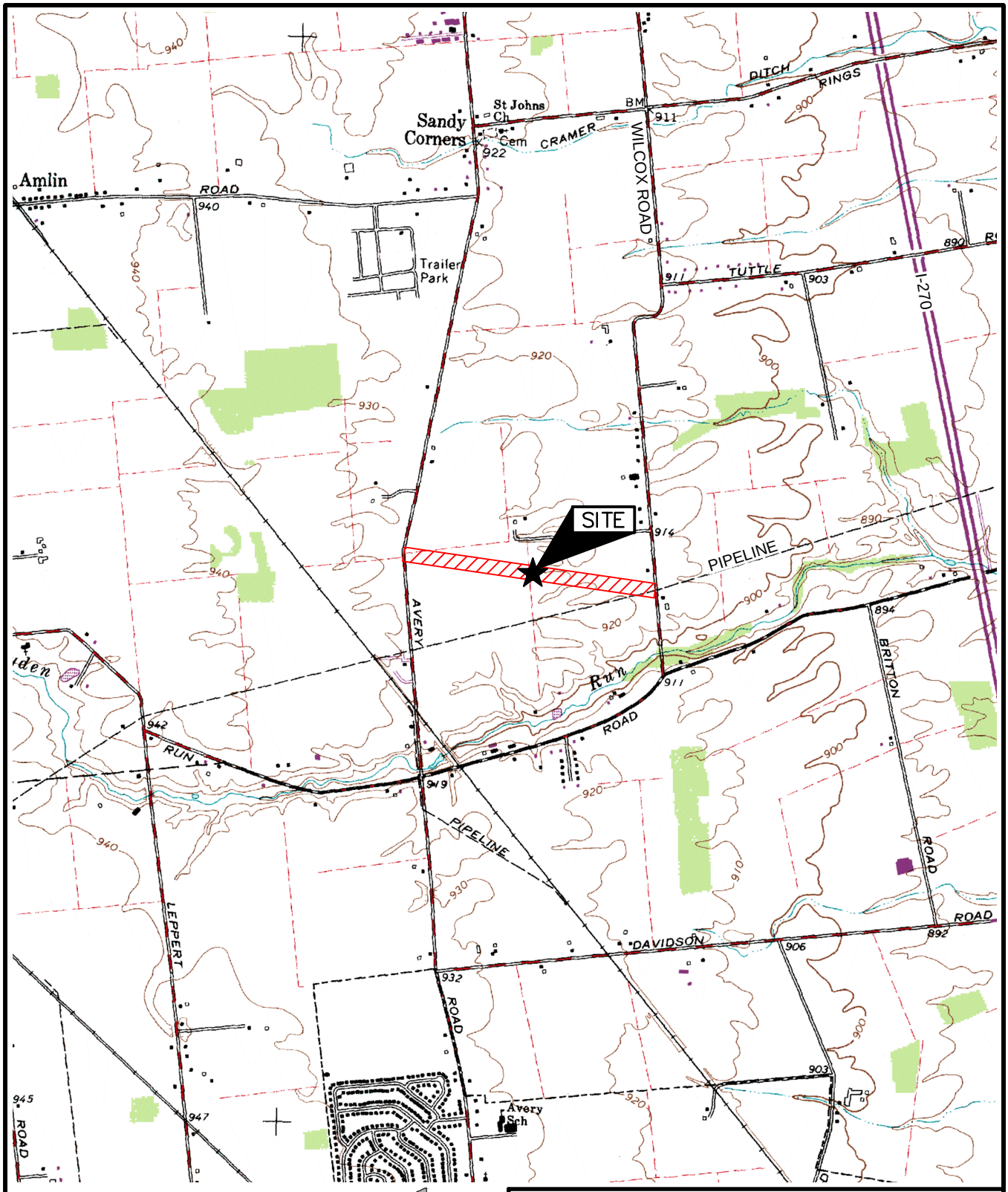
7. FINAL CONSIDERATIONS

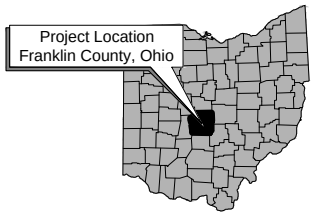
The analyses, conclusions and recommendations presented in this report are based on project information provided by FCEO. S&ME should be retained to review the final design plans and specifications to verify that the intent of our engineering recommendations have been properly incorporated into the design documents. It is also recommended that S&ME be retained to observe the subgrade proofrolling, perform fill/backfill testing, and observe construction to confirm that our recommendations are valid or to modify them accordingly. S&ME cannot assume responsibility or liability for the adequacy of recommendations if we are not retained to observe construction.

The contents of this report are also based on the subsurface conditions as they existed at the time of our field investigation, and further on the assumption that the exploratory borings are representative of actual subsurface conditions throughout the area investigated. It should be noted that actual subsurface conditions between and beyond

the borings might differ from those encountered at the boring locations. If subsurface conditions are encountered during construction that vary from those discussed in this report, S&ME should be notified immediately so that we may evaluate the effects, if any, on design and construction.

APPENDIX A





USGS Mapping:
Hilliard Quad

0 2000 4000

SCALE IN FEET

VICINITY MAP

HAYDEN RUN BOULEVARD
PHASE 3
FRANKLIN COUNTY, OHIO

Project: 1117-14-038A		
Drawing Date: 8-7-2014		
Last Updated: 8-7-2014		
Drawn By: IDT		
Approved By: NDA		
Scale: GRAPHIC	1:1	

S&ME
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ENGINEERING FIRM. 03530

PLATE 1

Images: ~ Aerial.jpg ~ Hilliard Quad.tiff
Xrefs:
File Last Updated: Aug 07, 2014
Plot Info: 8-7-2014 @ 1:52pm By: ithompson
S&ME Filename: I:\DEPTS\cadd\Drawings\BST Projects\1117-Geotechnical\1117-14-038\1117-14-038AIPLANSIV-Map & POB Phase 3.dwg Layout: V-Map

Images: ~ Aerial.jpg ~ Hilliard Quad.tiff
Xrefs:
File Last Updated: Aug 13, 2014
Plot Info: 8–13–2014 @ 4:56pm By: prock
S&ME Filename: I:\DEPTS\cadd\Drawings\BST Projects\1117-Geotechnical\1117-14-038\1117-14-038A\PLANS\V-Map & POB Phase 3.dwg Layout: POB

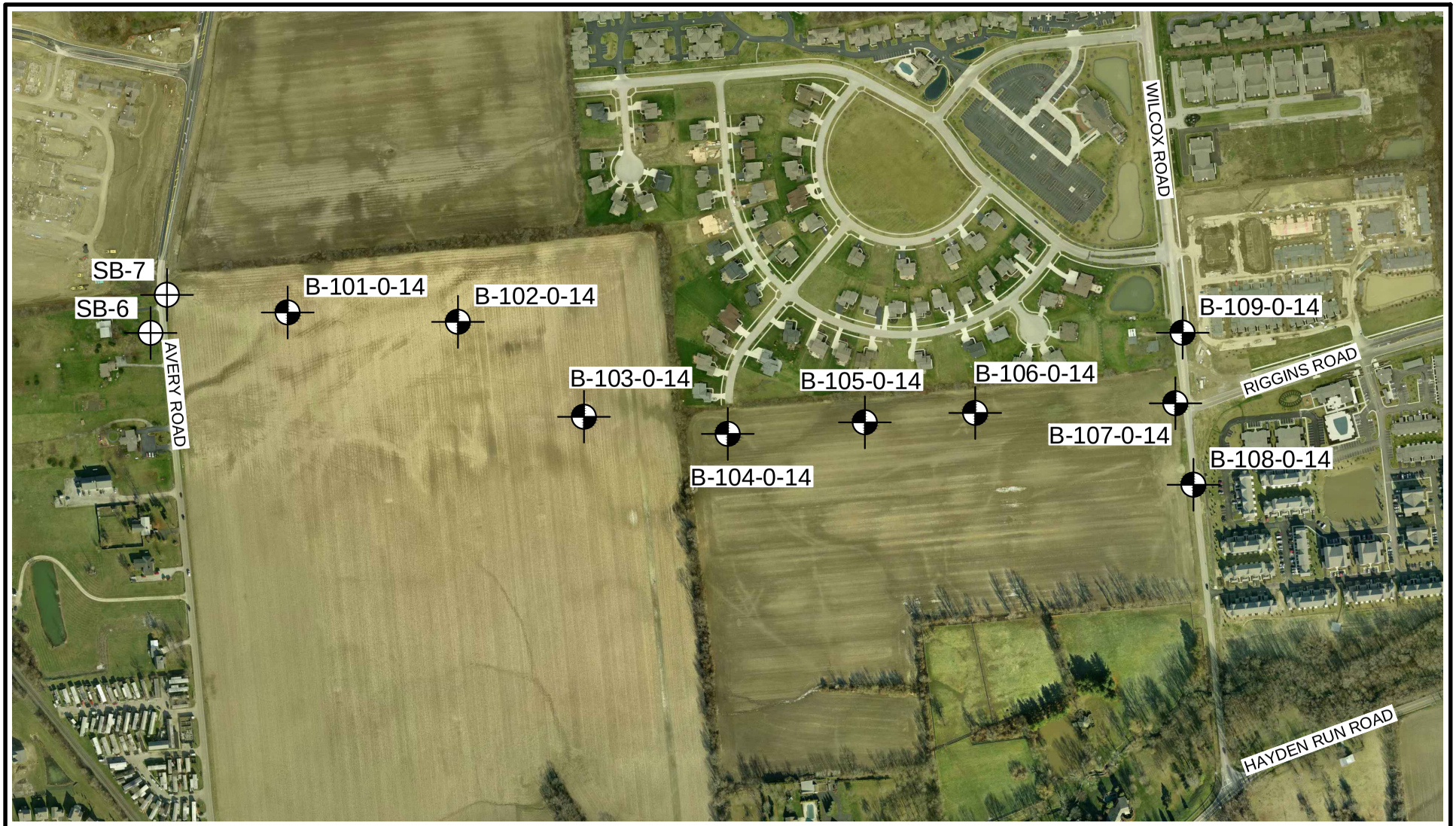

PLATE 2

0 500 1000
SCALE IN FEET

LEGEND

B-101-0-14
BORING NUMBER AND LOCATION

SB-6
APPROXIMATE 2009 CTL BORING

PLAN OF BORINGS

HAYDEN RUN BOULEVARD
PHASE 3
FRANKLIN COUNTY, OHIO

Project: 1117-14-038A	Drawn By: IDT		
Drawing Date: 8-7-2014	Approved By: NDA		
Last Updated: 8-13-2014	Scale: GRAPHIC	1:1	

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ENGINEERING FIRM. 03530

EXPLANATION OF SYMBOLS AND TERMS USED ON BORING LOGS FOR SAMPLING AND DESCRIPTION OF SOIL

SAMPLING DATA

- ▯ - Indicates sample was attempted within this depth interval.
- 2 3 5 - The number of blows required for each 6-inch increment of penetration of a "Standard" 2-inch O.D. split-barrel sampler, driven a distance of 18 inches by a 140-pound hammer freely falling 30 inches (SPT). The raw "blowcount" or "N" is equal to the sum of the second and third 6-inch increments of penetration.
- N_{60} - Corrected Blowcount = [(Drill Rod Energy Ratio) / (0.60 Standard)] X N
- SS - Split-barrel sampler, any size.
- ST - Shelby tube sampler, 3″ O.D., hydraulically pushed.
- R - Refusal of sampler in very-hard or dense soil, or on a resistant surface.
- 50-0.3′ - Number of blows (50) to drive a split-barrel sampler a certain distance (0.3 feet), other than the normal 6-inch increment.

DEPTH DATA

- W - Depth of water or seepage encountered during drilling.
- ▼ AD - Depth to water in boring after drilling (AD) is terminated.
- ▼ 5 days - Depth to water in monitoring well or piezometer in boring a certain number of days (5) after termination of drilling.
- TR - Depth to top of rock.

SOIL DESCRIPTIONS

Soils have been classified in general accordance with Section 603 of the most recent ODOT SGE, and described in general accordance with Section 602, including the use of special adjectives to designate approximate percentages of minor components as follows:

Adjective	Percent by Weight
trace	1 to 10
little	10 to 20
some	20 to 35
"and"	35 to 50

The following terms are used to describe density and consistency of soils:

Term (Granular Soils)	Blows per foot (N_{60})
Very-loose	Less than 5
Loose	5 to 10
Medium-dense	11 to 30
Dense	31 to 50
Very-dense	Over 50

Term (Cohesive Soils)	Qu (tsf)
Very-soft	Less than 0.25
Soft	0.25 to 0.5
Medium-stiff	0.5 to 1.0
Stiff	1.0 to 2.0
Very-stiff	2.0 to 4.0
Hard	Over 4.0

S&ME JOB: 1117-14-038A

PROJECT: HAYDEN RUN BLVD. PH 3	DRILLING FIRM / OPERATOR: S&ME / M. WOLF	DRILL RIGS: S&ME ATV 550X (AW)(13)	STATION / OFFSET: 116+61, 2.6 RT	EXPLORATION ID: B-101-0-14
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / M. WOLF	HAMMER: CME AUTOMATIC	ALIGNMENT: HAYDEN RUN BLVD. CL	
PID: 4290 BR ID:	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 8/2/13	ELEVATION: 925.2 (MSL) EOB: 9.9 ft.	PAGE 1 OF 1
START: 7/7/14 END: 7/7/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 84	LAT / LONG: 40.063513 N, 83.159395 W	

MATERIAL DESCRIPTION AND NOTES	ELEV. 925.2	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
TOPSOIL/ROOTMAT - 12 INCHES	924.2																	
Possible Fill: Stiff to very-stiff brown mottled with gray and dark-brown **SILTY CLAY**, some fine to coarse sand, trace fine gravel, damp.	923.2	2 hr	3 3 3	8	39	SS-1	1.75-2.5	5	9	14	37	35	37	18	19	19	A-6b (11)	
Hard brown mottled with gray **SANDY SILT**, some clay, trace fine gravel, desicated, damp.			5 8 9	24	89	SS-2	4.5+	-	-	-	-	-	27	17	10	16	A-4a (V)	
		AD	4 7 7	20	78	SS-3	4.5+	-	-	-	-	-	-	-	-	-	A-4a (V)	
	918.3	W																
Dense to very-dense brown **GRAVEL WITH SAND**, some silt, trace clay, many cobbles, wet.	915.3	EOB	8 28 50-0.4'	-	59	SS-4	-	24	26	25	- 25 -		-	-	-	-	A-1-b (V)	

- Encountered water at 6.0'.
- Encountered cobbles at 7.0' and 8.5'.
- Encountered auger refusal at 9.9' on probable boulder.
- Water at completion 5.5'.
- After boring open for about 2 hours water rose to 2.5'.

NOTES: SEE ABOVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SME ODOT LOG(8.5X11)-CURRENT WITH PLATES - OH DOT.GDT - 8/13/14 16:23 - T:\RESOURCES\CS\GINT\WPROJECTS\111714038A.GPJ

PLATE 4

S&ME JOB: 1117-14-038A

S&ME

PROJECT: HAYDEN RUN BLVD. PH 3	DRILLING FIRM / OPERATOR: S&ME / M. WOLF	DRILL RIGS: S&ME ATV 550X (AW)(13)	STATION / OFFSET: 122+51, 24.0 LT
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / M. WOLF	HAMMER: CME AUTOMATIC	ALIGNMENT: HAYDEN RUN BLVD. CL
PID: 4290 BR ID:	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 8/2/13	ELEVATION: 922.7 (MSL) EOB: 10.5 ft.
START: 7/7/14 END: 7/7/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 84	LAT / LONG: 40.063436 N, 83.157291 W

EXPLORATION ID **B-102-0-14**

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 922.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
TOPSOIL/ROOTMAT - 11 INCHES	921.8																	
Stiff to very-stiff brown mottled with gray **CLAY**, "and" silt, little fine to coarse sand, trace fine gravel, damp.		1	3 3 4	10	67	SS-1	1.75-2.75	2	1	4	43	50	52	21	31	25	A-7-6 (18)	
		1 hr 2	2 3 4	10	72	SS-2	1.0-2.5	-	-	-	-	-	-	-	-	-	A-7-6 (V)	
		3 4 5	2 3 3	8	67	SS-3	1.5-3.0	-	-	-	-	-	-	-	-	-	A-7-6 (V)	
	915.9	6																
Hard brown **SANDY SILT**, some clay, little fine gravel, damp.		AD 7 8																
	913.6	9	8	-	100	SS-4A	4.5+	-	-	-	-	-	-	-	-	-	A-4a (V)	
Dense gray **GRAVEL WITH SAND**, little silt, few cobbles, wet.	912.2	W 10 EOB	14 20	48	67	SS-4B	-	72	10	5	- 13 -		-	-	-	-	A-1-b (V)	

- Encountered water at 10.0'.
- Encountered auger refusal at 10.5' on probable boulder.
- Water at completion 8.0'.
- After boring open for about 1 hour water rose to 3.5'.

NOTES: SEE ABOVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SME ODOT LOG(8.5X11)-CURRENT WITH PLATES - OH DOT.GDT - 8/13/14 16:23 - T:\RESOURCES\CS\GINT\WPROJECTS\1117140038A.GPJ

PLATE 5

S&ME JOB: 1117-14-038A

S&ME

PROJECT: HAYDEN RUN BLVD. PH 3	DRILLING FIRM / OPERATOR: S&ME / M. WOLF	DRILL RIGS: S&ME ATV 550X (AW)(13)	STATION / OFFSET: 127+88, 35.5 RT
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / M. WOLF	HAMMER: CME AUTOMATIC	ALIGNMENT: HAYDEN RUN BLVD. CL
PID: 4290 BR ID:	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 8/2/13	ELEVATION: 923.0 (MSL) EOB: 15.0 ft.
START: 7/7/14 END: 7/7/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 84	LAT / LONG: 40.062544 N, 83.155723 W

EXPLORATION ID **B-103-0-14**

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 923.0	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
TOPSOIL/ROOTMAT - 13 INCHES	921.9																	
Stiff to very-stiff brown mottled with gray **CLAY**, "and" silt, trace fine to coarse sand, trace fine gravel, damp.	920.8		2 2 3	7	39	SS-1	1.5-3.0	2	1	6	42	49	53	23	30	26	A-7-6 (19)	
Medium-stiff to stiff brown mottled with gray **CLAY**, "and" silt, little to some fine to coarse sand, trace fine gravel, dessicated, few stiff to very-stiff zones, damp to moist.			2 3 5	11	100	SS-2	0.75-1.0	-	-	-	-	-	46	20	26	23	A-7-6 (V)	
		▼ AD	2 2 2	6	89	SS-3	0.5-1.0	-	-	-	-	-	-	-	-	-	A-7-6 (V)	
	915.7	W																
Hard brown **SILT AND CLAY**, "and" fine to coarse sand, some fine to coarse gravel, damp.			17 12 11	32	100	SS-4	4.5+	-	-	-	-	-	-	-	-	-	A-6a (V)	
	910.2																	
Medium-dense to dense brown **GRAVEL WITH SAND**, some silt.	909.2		8	-	100	SS-5A	-	41	22	10	27	-	-	-	-	-	A-1-b (V)	
Very-stiff brown mottled with gray **SILT AND CLAY**, some fine to coarse sand, trace fine gravel.	908.0	EOB	12 13	35	17	SS-5B	2.0	-	-	-	-	-	-	-	-	-	A-6a (V)	

- Encountered seepage at 5.0'.
- Encountered water at 7.5'.
- Water at completion 5.5'.

NOTES: SEE ABOVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SME ODOT LOG(8.5X11)-CURRENT WITH PLATES - OH DOT.GDT - 8/13/14 16:23 - T:\RESOURCES\CS\GINT\WPROJECTS\1117140038A.GPJ

PLATE 6

S&ME JOB: 1117-14-038A

S&ME

PROJECT: HAYDEN RUN BLVD. PH 3	DRILLING FIRM / OPERATOR: S&ME / M. WOLF	DRILL RIGS: S&ME ATV 550X (AW)(13)	STATION / OFFSET: 132+84, 0.3 RT
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / M. WOLF	HAMMER: CME AUTOMATIC	ALIGNMENT: HAYDEN RUN BLVD. CL
PID: 4290 BR ID:	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 8/2/13	ELEVATION: 919.8 (MSL) EOB: 15.0 ft.
START: 7/7/14 END: 7/7/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 84	LAT / LONG: 40.062391 N, 83.153945 W

EXPLORATION ID **B-104-0-14**

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 919.8	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
TOPSOIL/ROOTMAT - 9 INCHES	919.0																	
Very-stiff brown mottled with gray **SILTY CLAY**, some fine to coarse sand, trace fine gravel, damp.	917.5		3 3 4	10	61	SS-1	2.0-2.75	3	6	13	39	39	36	18	18	17	A-6b (11)	
Very-stiff to hard brown mottled with gray **SILT AND CLAY**, some fine to coarse sand, trace fine to coarse gravel, damp.	911.3	AD	5 7 7	20	100	SS-2	4.5+	-	-	-	-	-	28	17	11	15	A-6a (V)	
			5 6 6	17	78	SS-3	3.5-4.5+	-	-	-	-	-	-	-	-	-	A-6a (V)	
Very-dense brown **GRAVEL WITH SAND**, little silt, many cobbles, moist to wet.	908.3	W	13 28 21	69	67	SS-4	-	-	-	-	-	-	-	-	-	-	A-1-b (V)	
Hard brown mottled with gray **SILTY CLAY**, some fine to coarse sand, trace fine to coarse gravel, contains many cobbles, damp.	904.8	EOB	11 15 17	45	56	SS-5	4.5+	-	-	-	-	-	-	-	-	-	A-6b (V)	

- Encountered water at 9.5'.
- Encountered cobbles at 9.0' and 12.5'.
- Water at completion 4.5'.

NOTES: SEE ABOVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SME ODOT LOG(8.5X11)-CURRENT WITH PLATES - OH DOT.GDT - 8/13/14 16:23 - T:\RESOURCES\CS\GINT\WPROJECTS\1117140038A.GPJ

PLATE 7

S&ME JOB: 1117-14-038A

S&ME

PROJECT: HAYDEN RUN BLVD. PH 3	DRILLING FIRM / OPERATOR: S&ME / M. WOLF	DRILL RIGS: S&ME ATV 550X (AW)(13)	STATION / OFFSET: 137+59, 0.1 LT
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / M. WOLF	HAMMER: CME AUTOMATIC	ALIGNMENT: HAYDEN RUN BLVD. CL
PID: 4290 BR ID:	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 8/2/13	ELEVATION: 917.3 (MSL) EOB: 15.0 ft.
START: 7/7/14 END: 7/7/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 84	LAT / LONG: 40.062510 N, 83.152254 W

EXPLORATION ID **B-105-0-14**

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 917.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
TOPSOIL/ROOTMAT - 8 INCHES	916.6																	
Very-stiff to hard brown mottled with gray **CLAY**, "and" silt, little to some fine to coarse sand, trace to little fine to coarse gravel, damp.	914.8		2 3 3	8	44	SS-1	2.0	3	5	11	39	42	47	18	29	23	A-7-6 (17)	
Very-stiff to hard brown mottled with gray **SILTY CLAY**, some fine to coarse sand, trace to little fine gravel, damp.	910.3		3 3 6	13	100	SS-2	2.75-4.0	-	-	-	-	-	39	20	19	21	A-6b (V)	
			4 5 6	15	94	SS-3	4.0-4.5+	-	-	-	-	-	-	-	-	-	A-6b (V)	
Hard brown **SILT AND CLAY**, some fine to coarse sand, trace to little fine to coarse gravel, few cobbles, damp.	902.3	EOB	7 11 13	34	100	SS-4	4.5	-	-	-	-	-	-	-	-	-	A-6a (V)	
			9 8 7	21	78	SS-5	4.5+	-	-	-	-	-	-	-	-	-	A-6a (V)	

- No seepage noted.
- Encountered cobbles at 10.5'.

NOTES: SEE ABOVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SME ODOT LOG(8.5X11)-CURRENT WITH PLATES - OH DOT.GDT - 8/13/14 16:23 - T:\RESOURCES\CS\GINT\WPROJECTS\1117140038A.GPJ

PLATE 8

S&ME JOB: 1117-14-038A

S&ME

PROJECT: HAYDEN RUN BLVD. PH 3	DRILLING FIRM / OPERATOR: S&ME / M. WOLF	DRILL RIGS: S&ME ATV 550X (AW)(13)	STATION / OFFSET: 141+43, 0.2 LT
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / M. WOLF	HAMMER: CME AUTOMATIC	ALIGNMENT: HAYDEN RUN BLVD. CL
PID: 4290 BR ID:	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 8/2/13	ELEVATION: 915.3 (MSL) EOB: 15.0 ft.
START: 7/7/14 END: 7/7/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 84	LAT / LONG: 40.062606 N, 83.150890 W

EXPLORATION ID **B-106-0-14**

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 915.3	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
TOPSOIL/ROOTMAT - 9 INCHES	914.6																	
Very-stiff to hard brown mottled with gray **SILT AND CLAY**, some fine to coarse sand, trace fine to coarse gravel, damp.	912.8	1	3 3 6	13	56	SS-1	2.5-4.5	4	9	15	36	36	32	17	15	16	A-6a (9)	
Hard brown mottled with gray **SANDY SILT**, some fine to coarse sand, trace fine gravel, damp.	911.3	3	5 7 7	20	100	SS-2	4.5	-	-	-	-	-	23	15	8	14	A-4a (V)	
Hard brown mottled with gray **SILT AND CLAY**, some fine to coarse sand, trace fine gravel, damp.	906.8	5	5 5 6	15	89	SS-3	4.5+	-	-	-	-	-	-	-	-	-	A-6a (V)	
Hard brown **SILT AND CLAY**, some fine to coarse sand, little fine to coarse gravel, damp.	900.3	9	14 14 15	41	100	SS-4	4.5+	-	-	-	-	-	-	-	-	-	A-6a (V)	
EOB		15	9 11 10	29	89	SS-5	4.5+	-	-	-	-	-	-	-	-	-	A-6a (V)	

- No seepage noted.

NOTES: SEE ABOVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SME ODOT LOG(8.5X11)-CURRENT WITH PLATES - OH DOT.GDT - 8/13/14 16:23 - T:\RESOURCES\CS\GINT\WPROJECTS\1117114038A.GPJ

PLATE 9

S&ME JOB: 1117-14-038A

S&ME

PROJECT: HAYDEN RUN BLVD. PH 3	DRILLING FIRM / OPERATOR: S&ME / M. WOLF	DRILL RIGS: S&ME ATV 550X (AW)(13)	STATION / OFFSET: 148+36, 24.4 RT
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / M. WOLF	HAMMER: CME AUTOMATIC	ALIGNMENT: HAYDEN RUN BLVD. CL
PID: 4290 BR ID:	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 8/2/13	ELEVATION: 912.6 (MSL) EOB: 15.0 ft.
START: 7/7/14 END: 7/7/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 84	LAT / LONG: 40.062711 N, 83.148415 W

EXPLORATION ID **B-107-0-14**

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 912.6	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
TOPSOIL/ROOTMAT - 6 INCHES	912.1																	
Very-stiff to hard brown mottled with gray **SILTY CLAY**, some fine to coarse sand, trace fine gravel, damp.	908.6		2 4 6	14	67	SS-1	3.5-4.5	3	4	10	42	41	39	18	21	18	A-6b (12)	
			4 5 8	18	67	SS-2	4.0-4.5	-	-	-	-	-	41	19	22	18	A-6b (V)	
Hard brown **SILT AND CLAY**, some fine to coarse sand, trace fine to coarse gravel, damp.	904.6	AD	4 5 10	21	78	SS-3	4.0-4.5	-	-	-	-	-	-	-	-	-	A-6a (V)	
Very-soft to soft brown **SILT AND CLAY**, some to "and" fine to coarse sand, trace fine gravel, wet.	901.3	W	9 3 3	8	0	--	-	-	-	-	-	-	-	-	-	-		
			4	-	100	SS-4	0.0-0.5	-	-	-	-	-	-	-	-	-	A-6a (V)	
Hard brown **SANDY SILT**, some fine to coarse sand, little fine gravel, damp.	897.6	EOB	23 21 21	59	72	SS-5	4.5+	-	-	-	-	-	-	-	-	-	A-4a (V)	

- Encountered water at 10.0'.
- Water at completion 7.0'
- After boring open for a few hours water rose to 4.5'.

NOTES: SEE ABOVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SME ODOT LOG(8.5X11)-CURRENT WITH PLATES - OH DOT.GDT - 8/13/14 16:23 - T:\RESOURCES\CS\GINT\WPROJECTS\1117114038A.GPJ

PLATE 10

S&ME JOB: 1117-14-038A

S&ME

PROJECT: HAYDEN RUN BLVD. PH 3	DRILLING FIRM / OPERATOR: S&ME / M. WOLF	DRILL RIG: S&ME TRK 45 (AW)(13)	STATION / OFFSET: 148+73, 310.5 RT
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / M. WOLF	HAMMER: SAFETY HAMMER	ALIGNMENT: HAYDEN RUN BLVD. CL
PID: 4290 BR ID:	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 2/19/13	ELEVATION: 913.7 (MSL) EOB: 6.0 ft.
START: 7/3/14 END: 7/3/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 84	LAT / LONG: 40.061939 N, 83.148187 W

EXPLORATION ID **B-108-0-14**

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 913.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GR	CS	FS	SI	CL	LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
ASPHALT - 9 INCHES	913.0																	
GRANULAR BASE - 6 INCHES	912.4																	
Fill: Very-stiff brown mottled with gray **CLAY**, some silt, little fine to coarse sand, little fine gravel, damp.	910.7	1	3 5 5	14	100	SS-1	2.5-3.75	9	5	9	34	43	44	20	24	18	A-7-6 (14)	
Very-stiff to hard brown **SANDY SILT**, some clay, little fine gravel, damp.	907.7	2 3 4 5	8 9 12	29	100	SS-2	4.0-4.5+	-	-	-	-	-	23	15	8	13	A-4a (V)	
		EOB 6	8 10 10	28	100	SS-3	3.5-4.0	-	-	-	-	-	-	-	-	-	A-4a (V)	

- No seepage noted.

NOTES: SEE ABOVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SME ODOT LOG(8.5X11)-CURRENT WITH PLATES - OH DOT.GDT - 8/13/14 16:23 - T:\RESOURCES\CS\GINT\WPROJECTS\1117114038A.GPJ

PLATE 11

S&ME JOB: 1117-14-038A

S&ME

PROJECT: HAYDEN RUN BLVD. PH 3	DRILLING FIRM / OPERATOR: S&ME / M. WOLF	DRILL RIG: S&ME TRK 45 (AW)(13)	STATION / OFFSET: 148+81, 218.0 LT
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: S&ME / M. WOLF	HAMMER: SAFETY HAMMER	ALIGNMENT: HAYDEN RUN BLVD. CL
PID: 4290 BR ID:	DRILLING METHOD: 4.5" CFA	CALIBRATION DATE: 2/19/13	ELEVATION: 913.1 (MSL) EOB: 6.0 ft.
START: 7/3/14 END: 7/3/14	SAMPLING METHOD: SPT	ENERGY RATIO (%): 84	LAT / LONG: 40.063382 N, 83.148334 W

EXPLORATION ID **B-109-0-14**

PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 913.1	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
ASPHALT - 8 INCHES	912.4																	
GRANULAR BASE - 7 INCHES	911.8																	
Fill: Very-stiff brown, gray and dark-brown **SILTY CLAY**, some fine to coarse sand, little fine gravel, damp.	910.1	1 2 3 4	4 2 3	7	39	SS-1	3.0-3.5	14	14	12	34	26	34	18	16	14	A-6b (7)	
Stiff to very-stiff brown mottled with gray **CLAY**, some silt, little to some fine to coarse sand, trace fine gravel, damp.	907.1	5	3 3 4	10	67	SS-2	1.5-4.0	-	-	-	-	-	61	22	39	26	A-7-6 (V)	
		EOB 6	2 3 3	8	100	SS-3	1.5-3.5	-	-	-	-	-	-	-	-	-	A-7-6 (V)	

- No seepage noted.

NOTES: SEE ABOVE.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SME ODOT LOG(8.5X11)-CURRENT WITH PLATES - OH DOT.GDT - 8/13/14 16:23 - T:\RESOURCES\CS\GINT\WPROJECTS\1117114038A.GPJ

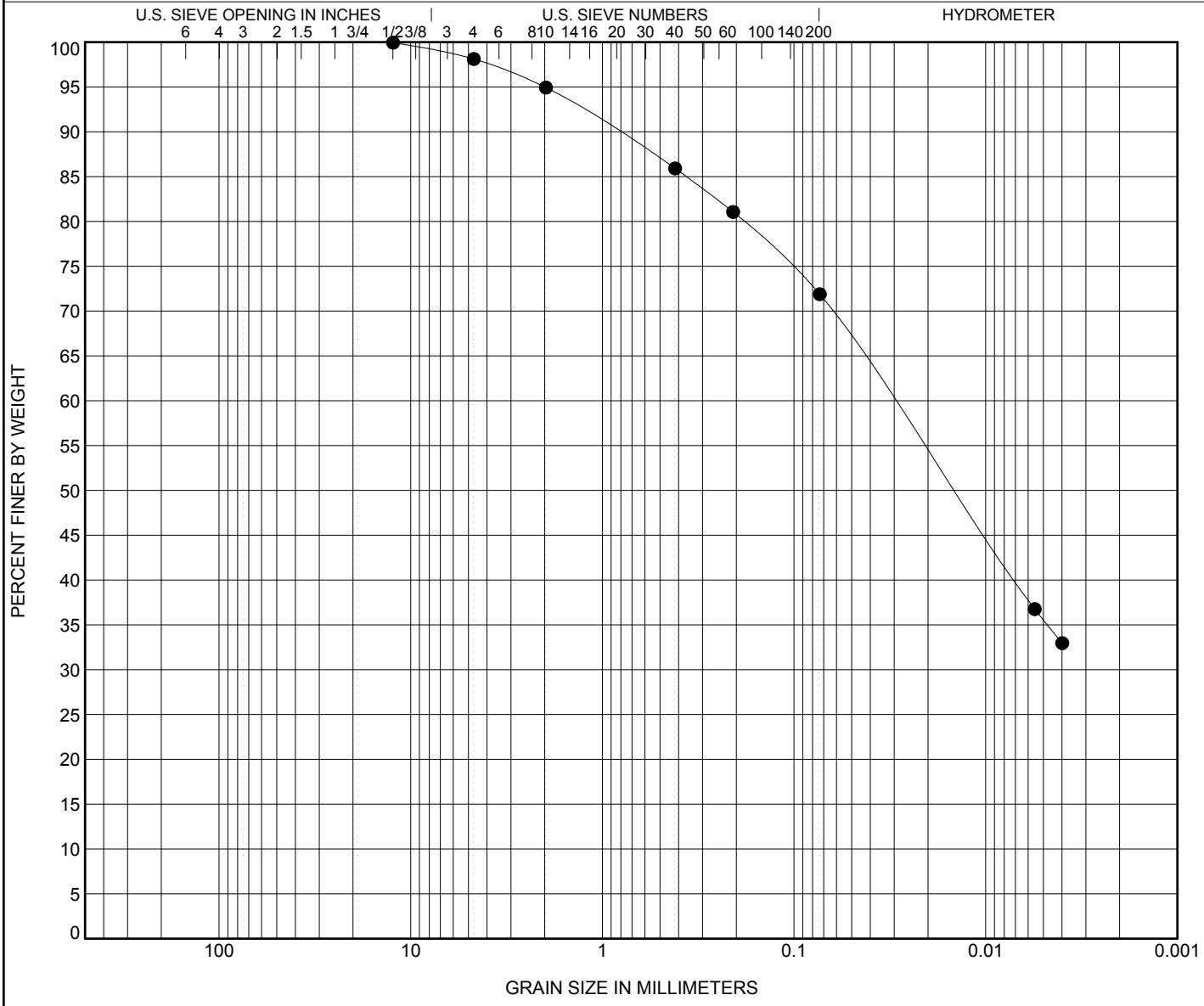
PLATE 12

S&ME, Inc
6190 Enterprise Ct.
Dublin, Ohio 43016
Telephone: 614-793-2226
Fax: 614-793-2410

GRAIN SIZE DISTRIBUTION

PROJECT 1117-14-038A **PID** 4290

OGE NUMBER HAYDEN RUN BLVD. PH 3 **PROJECT TYPE** ROADWAY



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● **B-101-0-14**	**1.0**	**SILTY CLAY**	**37**	**18**	**19**		

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **B-101-0-14**	**1.0**	**12.5**	**0.031**			**5**	**23**	**37**	**35**

GRAIN SIZE - OH DOT.GDT - 8/12/14 14:11 - T:\RESOURCES\CS\GINTWPROJECTS\1117\14038A.GPJ

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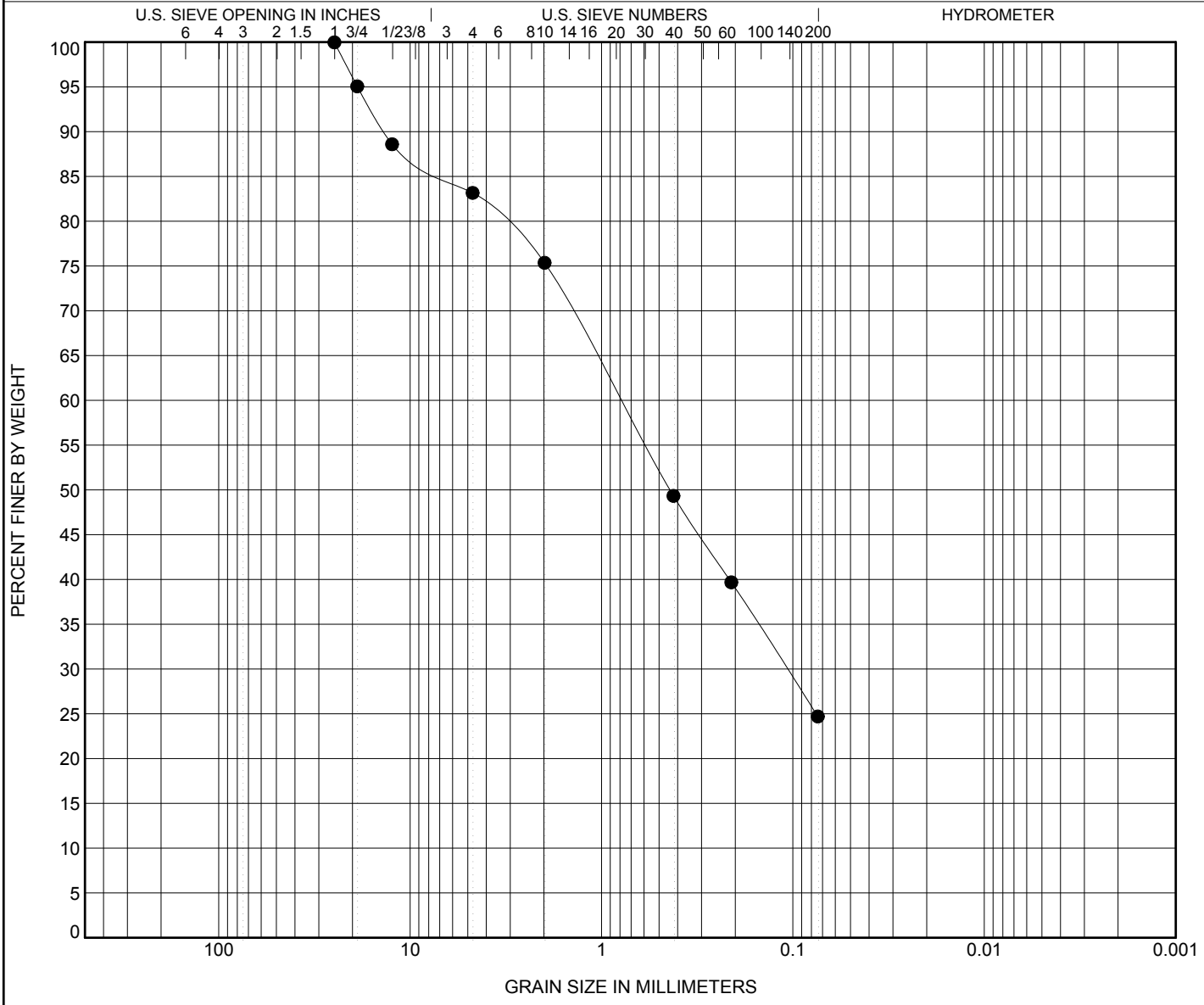
GRAIN SIZE DISTRIBUTION

PROJECT 1117-14-038A **PID** 4290

OGE NUMBER HAYDEN RUN BLVD. PH 3 **PROJECT TYPE** ROADWAY



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-101-0-14**	**8.5**	**GRAVEL WITH SAND**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-101-0-14**	**8.5**	**25**	**0.798**	**0.108**		**24**	**51**	**25**	

GRAIN SIZE - OH DOT.GDT - 8/12/14 14:11 - T:\RESOURCES\CS\GINTWPROJECTS\1117\14038A.GPJ

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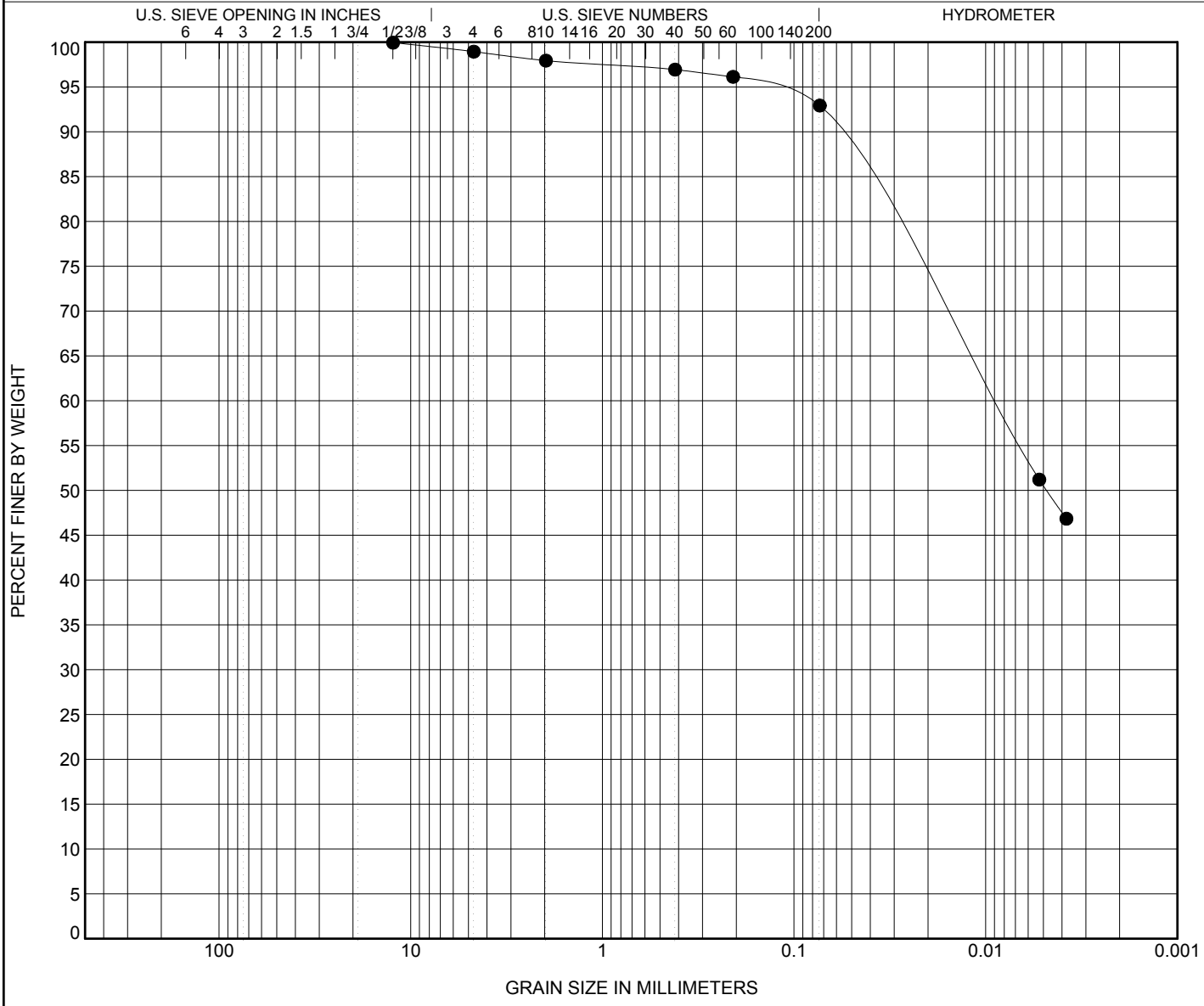
GRAIN SIZE DISTRIBUTION

PROJECT 1117-14-038A **PID** 4290

OGE NUMBER HAYDEN RUN BLVD. PH 3 **PROJECT TYPE** ROADWAY



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-102-0-14**	**1.0**	**CLAY**	**52**	**21**	**31**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-102-0-14**	**1.0**	**12.5**	**0.009**			**2**	**5**	**43**	**50**

GRAIN SIZE - OH DOT.GDT - 8/12/14 14:11 - T:\RESOURCES\CS\GINTWPROJECTS\1117\14038A.GPJ

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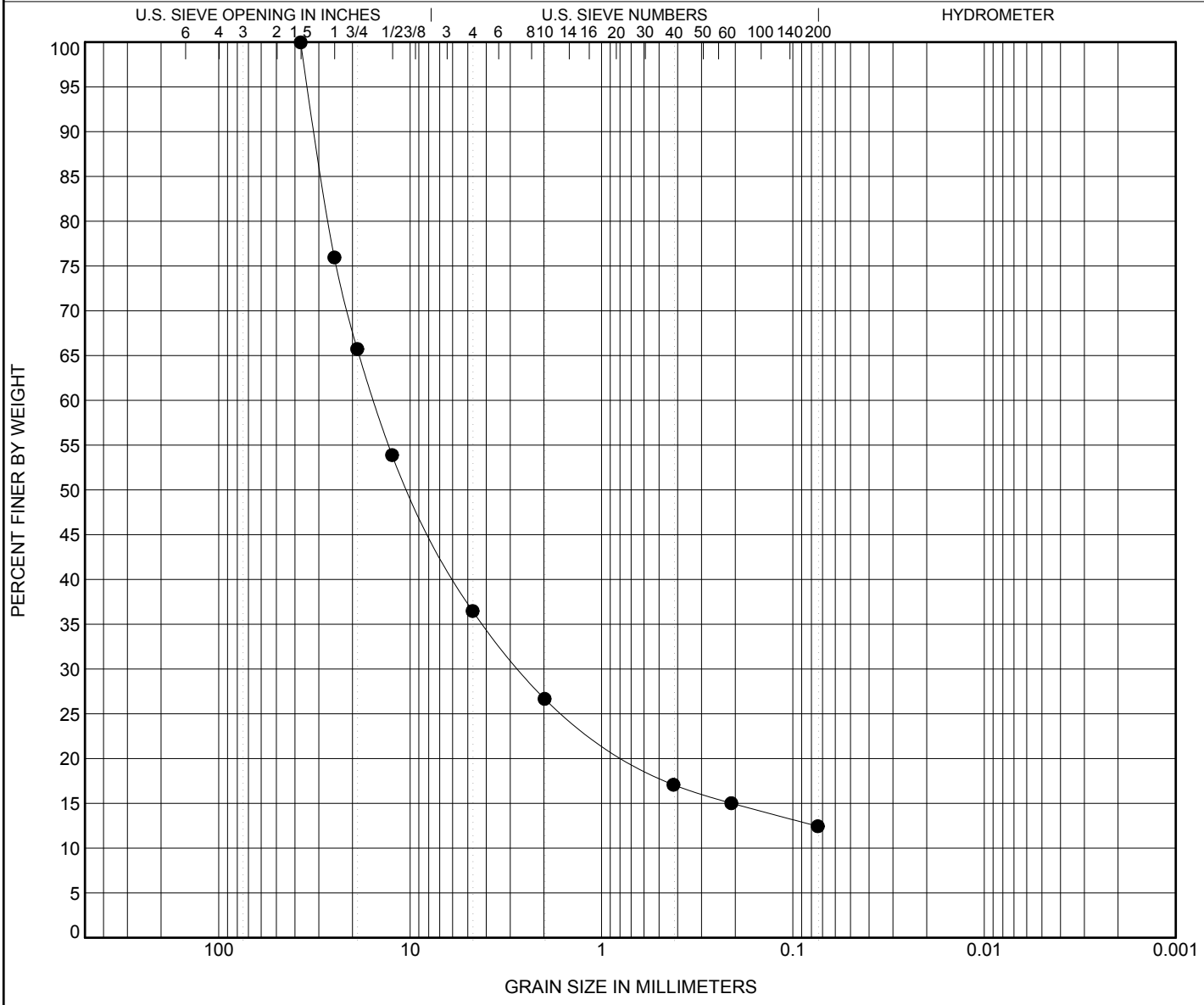
GRAIN SIZE DISTRIBUTION

PROJECT 1117-14-038A **PID** 4290

OGE NUMBER HAYDEN RUN BLVD. PH 3 **PROJECT TYPE** ROADWAY



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-102-0-14**	**9.0**	**GRAVEL WITH SAND**					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-102-0-14**	**9.0**	**37.5**	**15.473**	**2.657**		**72**	**15**	**13**	

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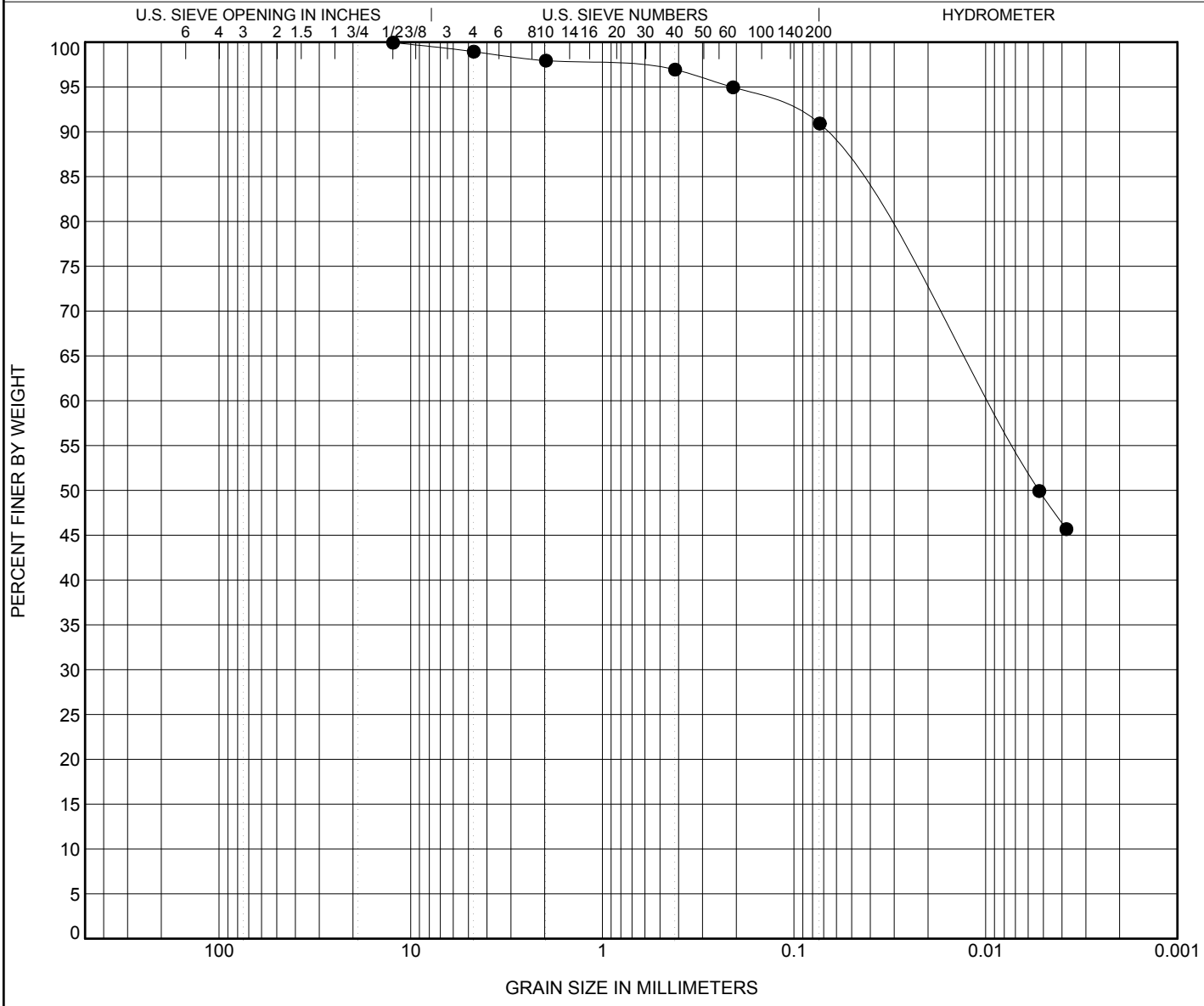
PROJECT 1117-14-038A **PID** 4290

OGE NUMBER HAYDEN RUN BLVD. PH 3 **PROJECT TYPE** ROADWAY



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-103-0-14**	**1.0**	**CLAY**	**53**	**23**	**30**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-103-0-14**	**1.0**	**12.5**	**0.01**			**2**	**7**	**42**	**49**

GRAIN SIZE - OH DOT.GDT - 8/12/14 14:11 - T:\RESOURCES\CS\GINTWPROJECTS\1117\14038A.GPJ

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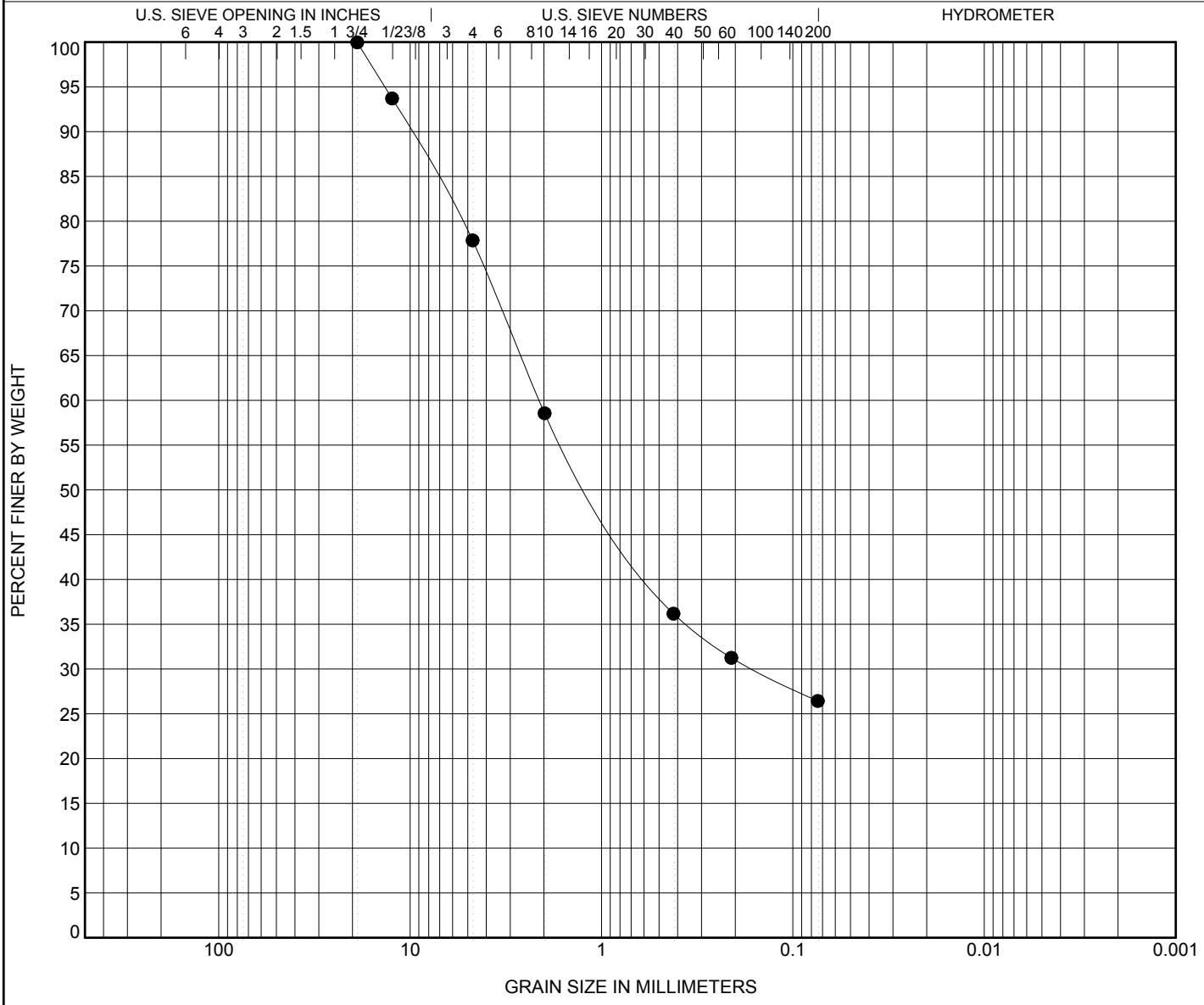
GRAIN SIZE DISTRIBUTION

PROJECT 1117-14-038A **PID** 4290

OGE NUMBER HAYDEN RUN BLVD. PH 3 **PROJECT TYPE** ROADWAY



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● **B-103-0-14**	**13.5**	**GRAVEL WITH SAND**					

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● **B-103-0-14**	**13.5**	**19**	**2.127**	**0.158**		**41**	**32**	**27**	

GRAIN SIZE - OH DOT.GDT - 8/12/14 14:11 - T:\RESOURCES\CS\GINTWPROJECTS\1117\14038A.GPJ

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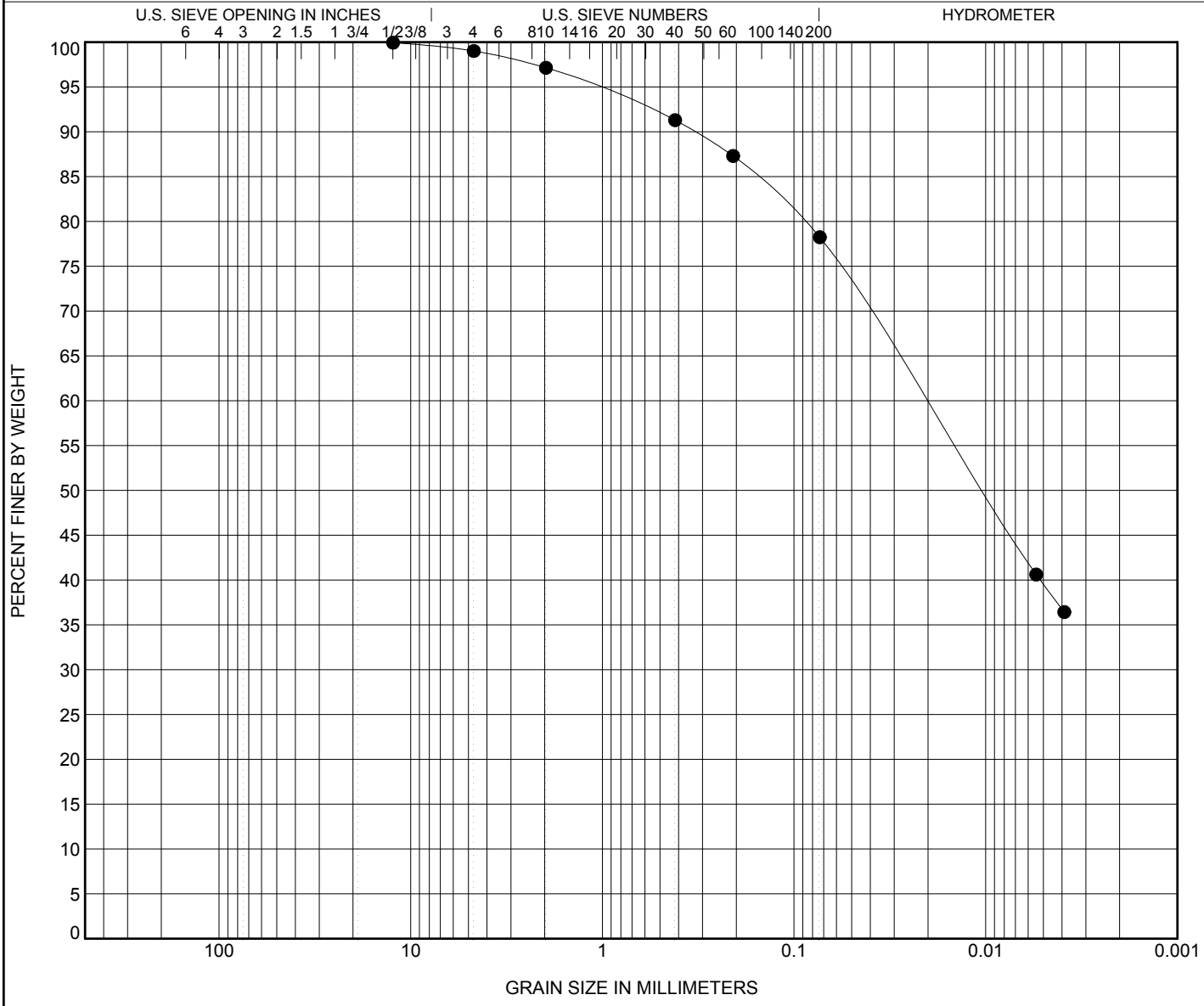
GRAIN SIZE DISTRIBUTION

PROJECT 1117-14-038A **PID** 4290

OGE NUMBER HAYDEN RUN BLVD. PH 3 **PROJECT TYPE** ROADWAY



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-104-0-14**	**1.0**	**SILTY CLAY**	**36**	**18**	**18**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-104-0-14**	**1.0**	**12.5**	**0.021**			**3**	**19**	**39**	**39**

GRAIN SIZE - OH DOT.GDT - 8/12/14 14:11 - T:\RESOURCES\CS\GINTWPROJECTS\1117\14038A.GPJ

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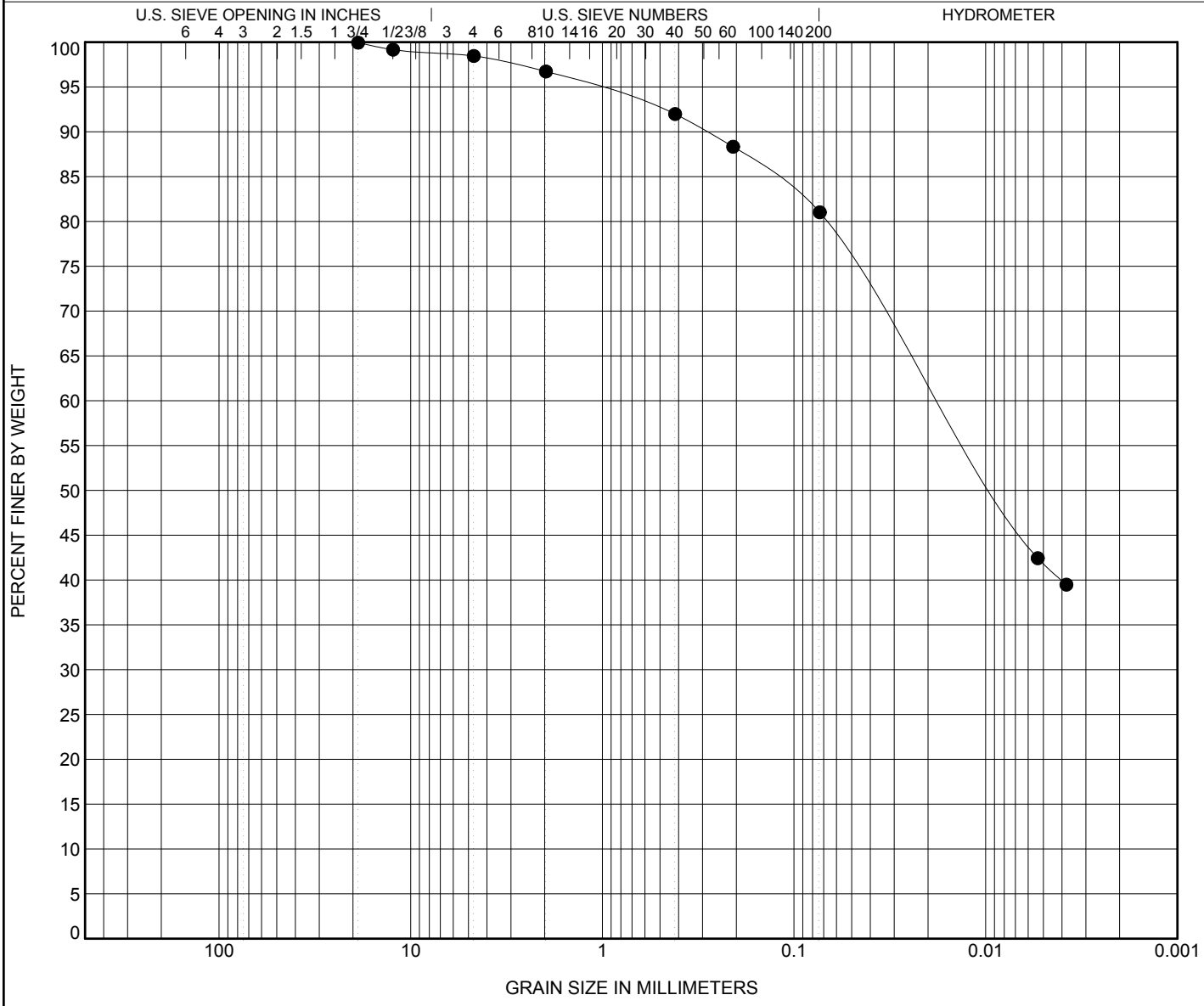
GRAIN SIZE DISTRIBUTION

PROJECT 1117-14-038A **PID** 4290

OGE NUMBER HAYDEN RUN BLVD. PH 3 **PROJECT TYPE** ROADWAY



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-105-0-14**	**1.0**	**CLAY**	**47**	**18**	**29**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-105-0-14**	**1.0**	**19**	**0.018**			**3**	**16**	**39**	**42**

GRAIN SIZE - OH DOT.GDT - 8/12/14 14:11 - T:\RESOURCES\CS\GINTWPROJECTS\1117\14038A.GPJ

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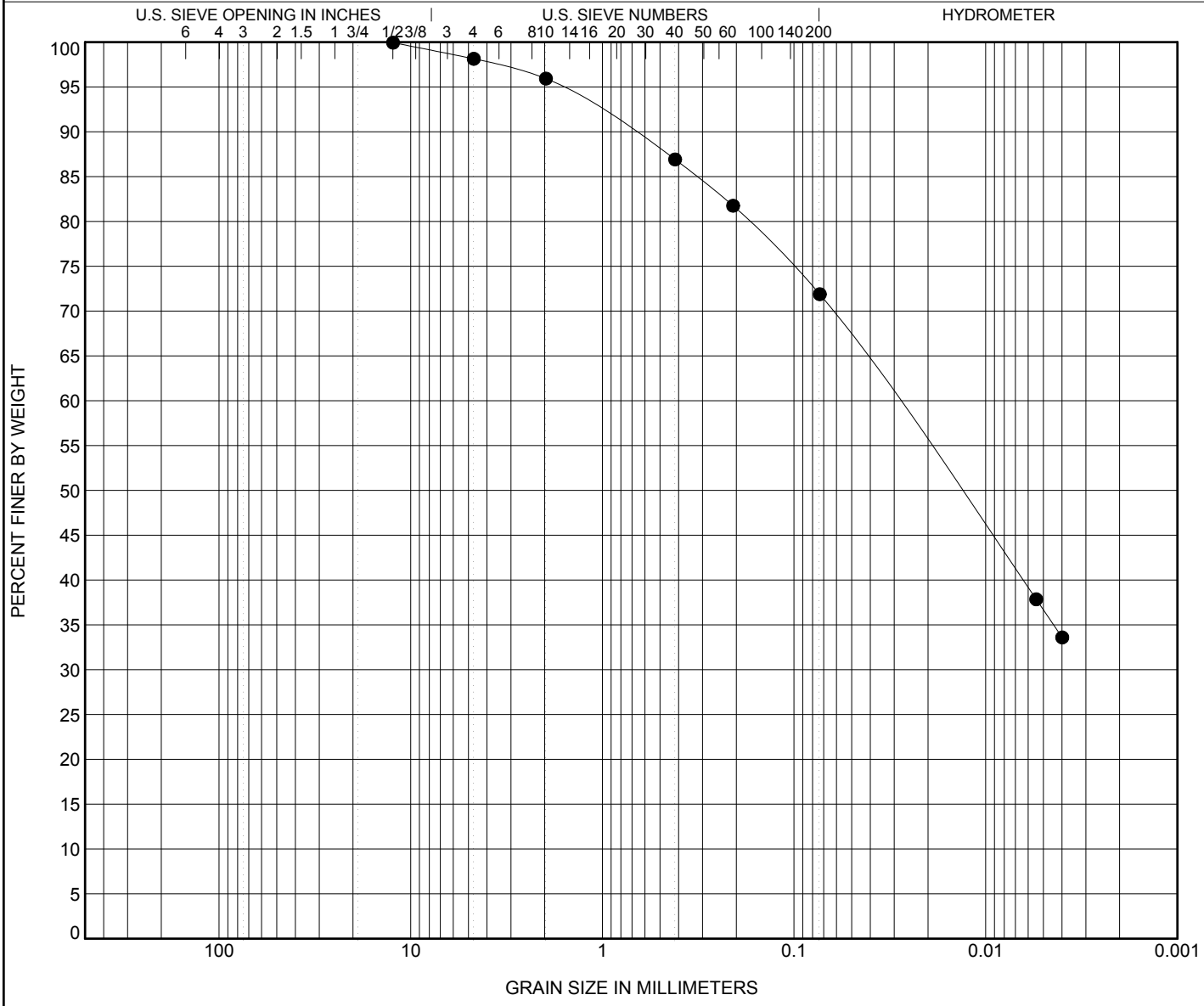
GRAIN SIZE DISTRIBUTION

PROJECT 1117-14-038A **PID** 4290

OGE NUMBER HAYDEN RUN BLVD. PH 3 **PROJECT TYPE** ROADWAY



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-106-0-14**	**1.0**	**SILT AND CLAY**	**32**	**17**	**15**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-106-0-14**	**1.0**	**12.5**	**0.03**			**4**	**24**	**36**	**36**

GRAIN SIZE - OH DOT.GDT - 8/12/14 14:11 - T:\RESOURCES\CS\GINTWPROJECTS\1117\14038A.GPJ

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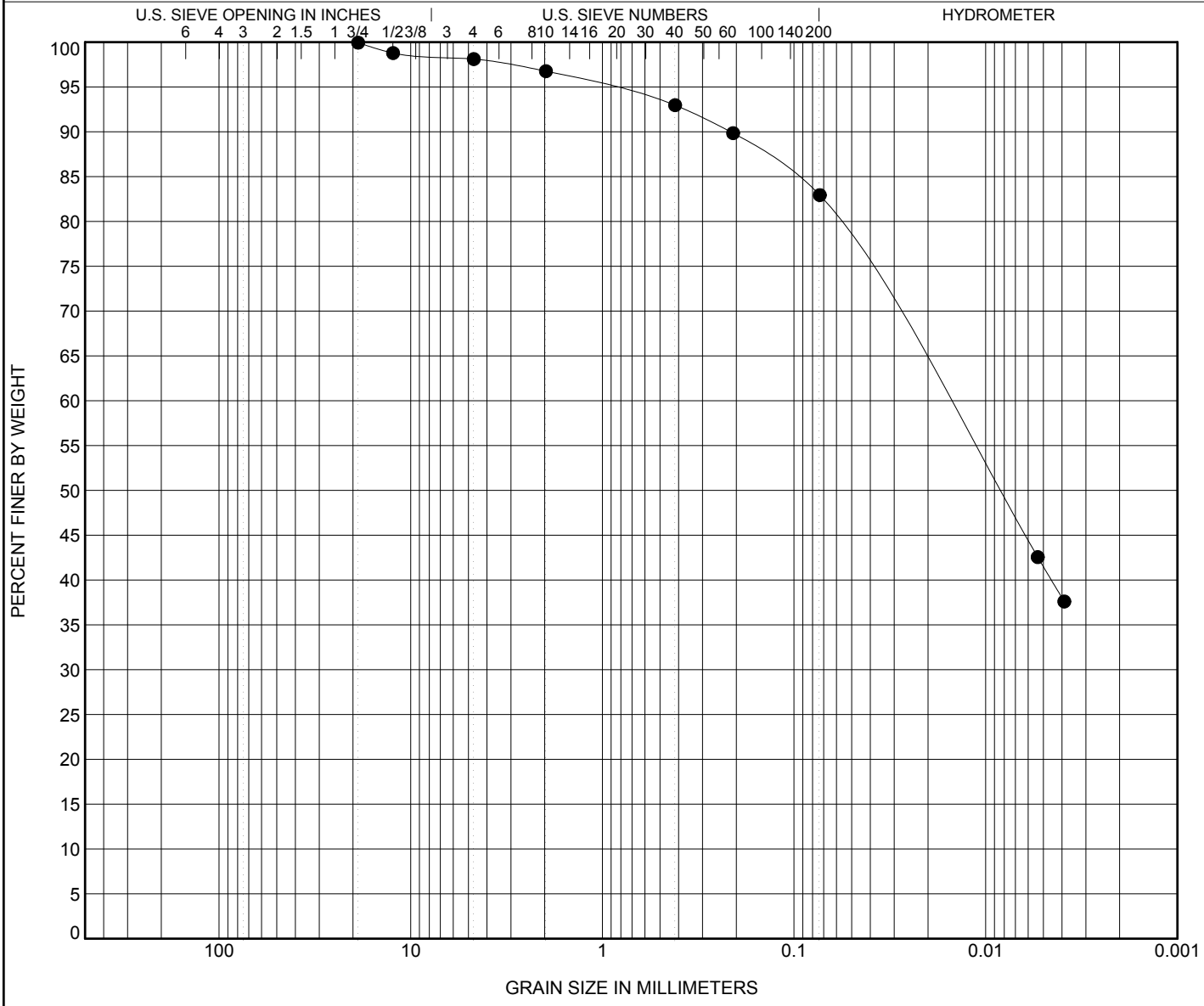
GRAIN SIZE DISTRIBUTION

PROJECT 1117-14-038A **PID** 4290

OGE NUMBER HAYDEN RUN BLVD. PH 3 **PROJECT TYPE** ROADWAY



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-107-0-14**	**1.0**	**SILTY CLAY**	**39**	**18**	**21**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-107-0-14**	**1.0**	**19**	**0.017**			**3**	**14**	**42**	**41**

GRAIN SIZE - OH DOT.GDT - 8/12/14 14:11 - T:\RESOURCES\CS\GINTWPROJECTS\1117\14038A.GPJ

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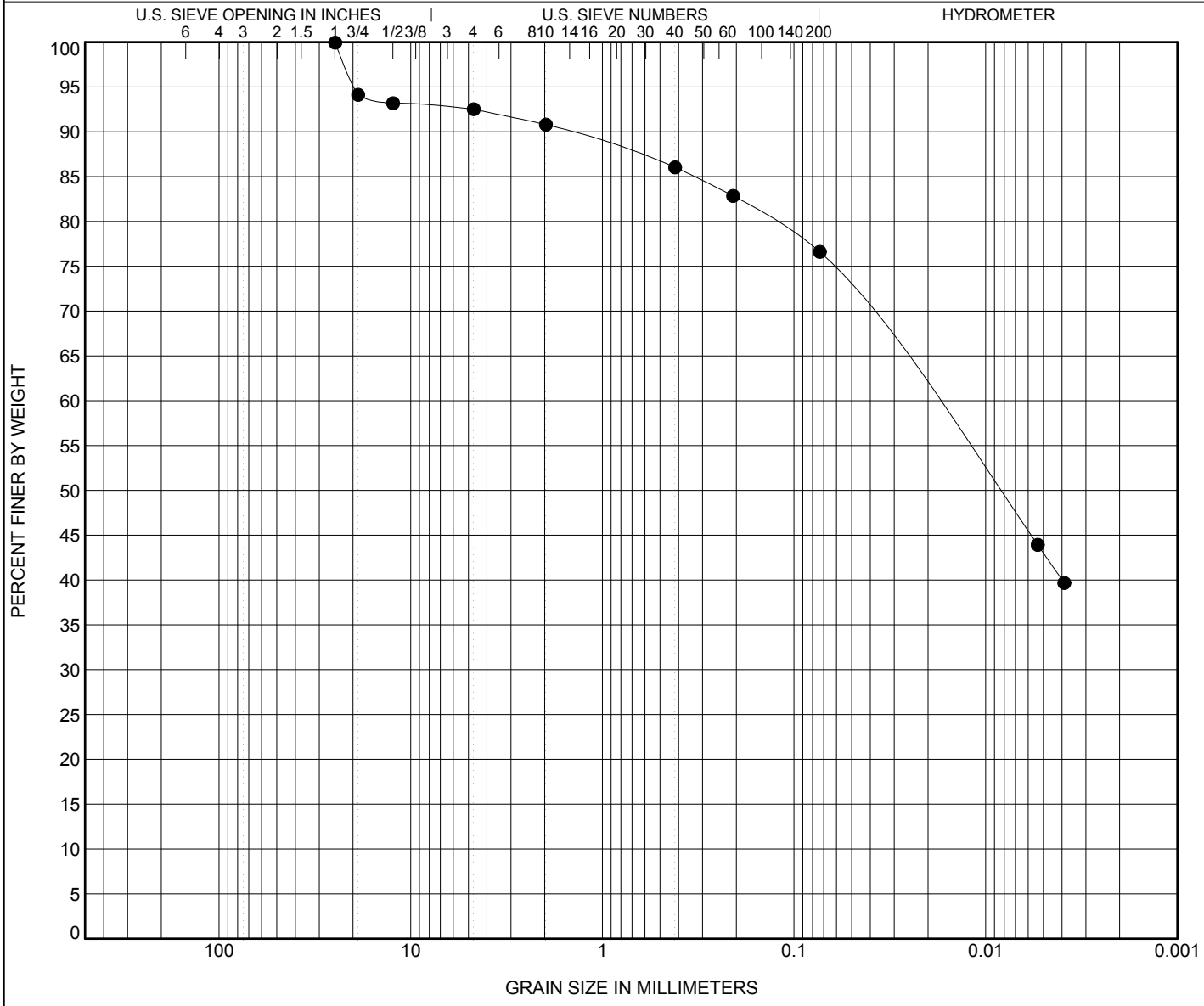
GRAIN SIZE DISTRIBUTION

PROJECT 1117-14-038A **PID** 4290

OGE NUMBER HAYDEN RUN BLVD. PH 3 **PROJECT TYPE** ROADWAY



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-108-0-14**	**1.5**	**CLAY**	**44**	**20**	**24**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-108-0-14**	**1.5**	**25**	**0.02**			**9**	**14**	**34**	**43**

GRAIN SIZE - OH DOT.GDT - 8/12/14 14:11 - T:\RESOURCES\CS\GINTWPROJECTS\1117\14038A.GPJ

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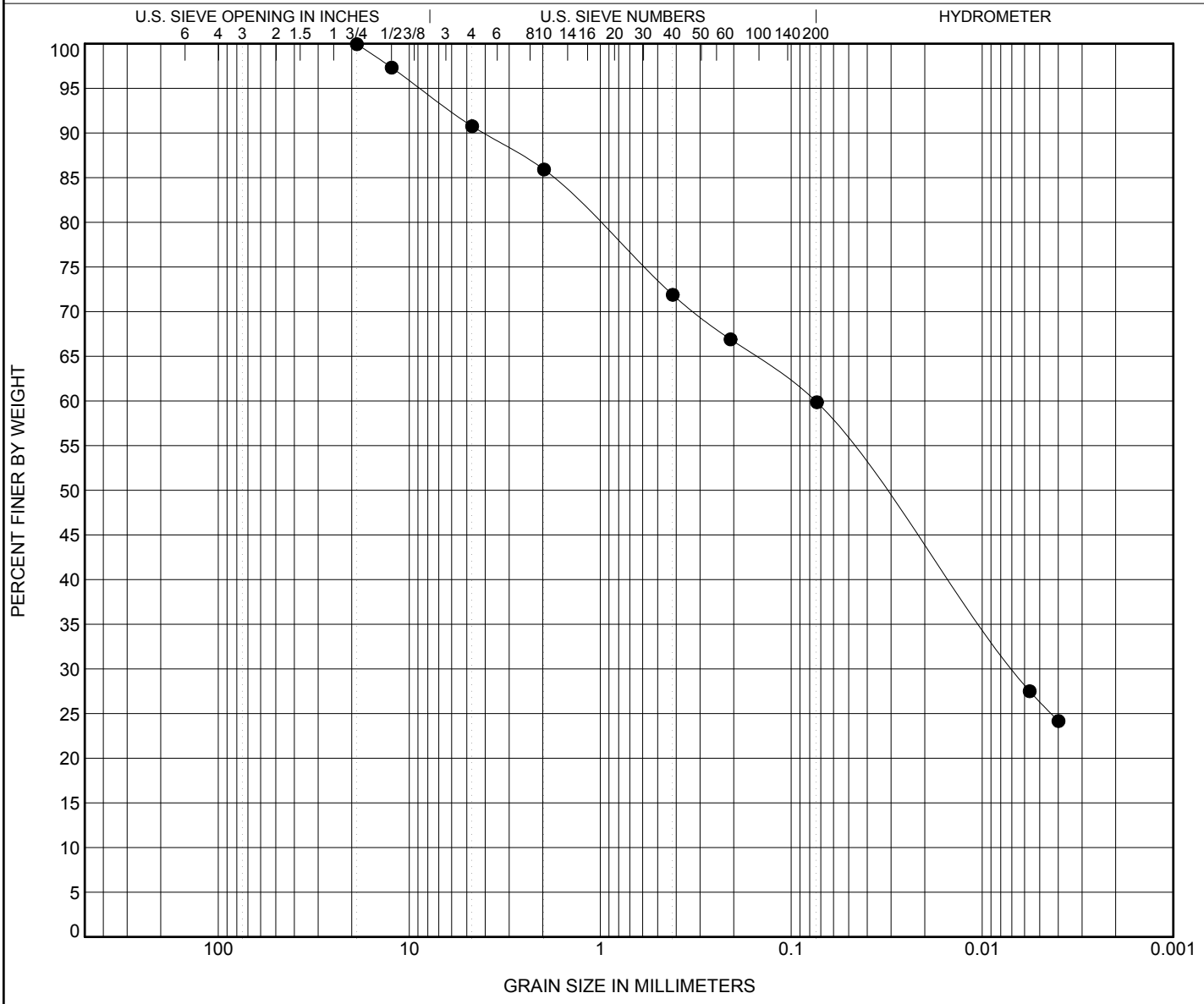
GRAIN SIZE DISTRIBUTION

PROJECT 1117-14-038A **PID** 4290

OGE NUMBER HAYDEN RUN BLVD. PH 3 **PROJECT TYPE** ROADWAY



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-109-0-14**	**1.5**	**SILTY CLAY**	**34**	**18**	**16**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-109-0-14**	**1.5**	**19**	**0.075**	**0.007**		**14**	**26**	**34**	**26**

GRAIN SIZE - OH DOT.GDT - 8/12/14 14:11 - T:\RESOURCES\CS\GINTWPROJECTS\1117\14038A.GPJ

APPENDIX B

Table B.1: ODOT GEOTECHNICAL BULLETIN GB1 - SUBGRADE ANALYSIS SPREADSHEET
HAYDEN RUN BOULEVARD - PHASE 3, FRANKLIN COUNTY, OHIO

Subgrade Analysis V. 12.00 12/30/11

Design CBR 6

Global Options		
320	R&R	No
206	CS	No
	LS	Option
	LKD	No
206	Depth	14

Classification Counts by Sample																	
R	1a	1b	3	3a	2-4	2-5	2-6	2-7	4a	4b	5	6a	6b	7-5	7-6	8a	8b
0	0	2	0	0	0	0	0	0	7	0	0	9	7	1	13	0	0
		5%							18%			23%	18%	3%	33%		
0%	5%								95%								

Surface Class		
2-5	0	
4b	0	
5	0	
7-5	1	9%
7-6	5	45%
8a	0	
8b	0	
R	0	

% Borings	
N_{60L}<= 5	0%
<=10	82%
>=20	0%
M+	73%
R	0%

% Surface	
73%	
9%	73%

Rig	ER
A	84
B	84
C	87
D	85
E	
F	
G	
H	

Total Borings	11
PID	4290
Location	Hayden Run Boulevard Phase 3

	N_{60}	N_{60L}		PI		Clay		M	M_{OPT}		GI
Average	19.7	8.6		21.1		40.6		19.0	14.9		11.16
Maximum	109	14	61	32	39	50	50	93	32	21	19
Minimum	6	6	23	15	8	34	26	60	6	6	5

UC @ Surface
21.0
36
15

	Boring					Subgrade		Standard Penetration						Physical Characteristics						Moisture		Class		Comments	Problem		Undercuts		Analysis
#	B #	Boring Location	Depth	To	Cut Fill *	Depth	To	n_2	n_3	N	Rig	N_{60}	N_{60L}	LL	PL	PI	% Silt	% Clay	P 200	M	M_{OPT}	Ohio DOT	GI		w/ Class	w/ MN	UC Class	UC MN	
1	SB-6	Approximate 111+75 Rt.	1.0	2.5	-0.8	0.2	1.7	2	3	5	C	7		49	22	27	50	42	92	27	19	7-6	17			N		21	
			2.5	4.0		1.7	3.2	2	4	6		9		49	24	25	45	48	93	19	21	7-6	16			N		16	Exc./Replace 21"
			4.0	5.5		3.2	4.7	5	6	11		16								16	10	4a	5			M			or LS 14"
													7																
2	SB-7	Approximate 112+75 Lt.	1.0	2.5	-0.3	0.7	2.2	2	2	4	D	6		55	32	23	47	34	81	32		7-5	16		Un	N	36/All	24	
			2.5	4.0		2.2	3.7	3	4	7		10		46	23	23	43	43	86	25	20	7-6	14			N		15	Exc./Replace 24"
													6																or LS 16"
3	B-	116+61, 2.6 Rt.	1.0	2.0	-1.3	-0.3	0.7	3	3	6	A	8		37	18	19	37	35	72	19	16	6b	11			N		18	
	101-	Prop Hayden	2.5	3.8		1.2	2.5	8	9	17		24		27	17	10				16	12	4a	5						Exc./Replace 18"
	0-	Run Boulevard	4.0	5.2		2.7	3.9	7	7	14		20								10	10	4a	5						or LS/LKD 14"
	14	CL	8.5	9.3		7.2	8.0	28	50	78		109	8							6	6	1b							
4	B-	122+51, 24.0' Lt.	1.0	2.0	-0.2	0.8	1.8	3	4	7	A	10		52	21	31	43	50	93	25	18	7-6	18			N		15	
	102-	Prop Hayden	2.5	3.6		2.3	3.4	3	4	7		10									18	7-6	14			N		15	Exc./Replace 15"
	0-	Run Boulevard	4.0	5.0		3.8	4.8	3	3	6		8									18	7-6	14			N		18	or LS 14"
	14	CL	8.5	9.1		8.3	8.9	14	20	34		48	8								10	4a							
5	B-	127+88, 35.5' Rt.	1.0	1.9	-2.1	-1.1	-0.2	2	3	5	A	7		53	23	30	42	49	91	26	20	7-6	19			N		21	
	103-	Prop Hayden	2.5	4.0		0.4	1.9	3	5	8		11		46	20	26				23	18	7-6	14			N		14	Exc./Replace 21"
	0-	Run Boulevard	4.0	5.3		1.9	3.2	2	2	4		6									18	7-6	14			N		24	or LS 16"
	14	CL	8.5	10.0		6.4	7.9	12	11	23		32	6								14	6a							
6	B-	132+84, 0.3' Rt.	1.0	1.9	-2.1	-1.1	-0.2	3	4	7	A	10		36	18	18	39	39	78	17	16	6b	11			N		15	
	104-	Prop Hayden	2.5	4.0		0.4	1.9	7	7	14		20		28	17	11				15	14	6a	8						Exc./Replace 15"
	0-	Run Boulevard	4.0	5.2		1.9	3.1	6	6	12		17									14	6a	8						or CS/LKD 14"
	14	CL	8.5	9.5		6.4	7.4	28	21	49		69	10								6	1b							
7	B-	137+59, 0.1' Lt.	1.0	1.7	-2.3	-1.3	-0.6	3	3	6	A	8		47	18	29	39	42	81	23	18	7-6	17			N		18	
	105-	Prop Hayden	2.5	4.0		0.2	1.7	3	6	9		13		39	20	19				21	16	6b	10			MN		12	Exc./Replace 15"
	0-	Run Boulevard	4.0	5.4		1.7	3.1	5	6	11		15									16	6b	10						or LS 14"
	14	CL	8.5	10.0		6.2	7.7	11	13	24		34	8								14	6a							
8	B-	141+43, 0.2' Lt.	1.0	1.8	-2.6	-1.6	-0.8	3	6	9	A	13		32	17	15	36	36	72	16	14	6a	9						
	106-	Prop Hayden	2.5	4.0		-0.1	1.4	7	7	14		20		23	15	8				14	10	4a	5						
	0-	Run Boulevard	4.0	5.3		1.4	2.7	5	6	11		15									14	6a	8						
	14	CL	8.5	10.0		5.9	7.4	14	13	27		38	13								14	6a							
9	B-	148+36, 24.4' Rt.	1.0	2.0	-3.4	-2.4	-1.4	4	6	10	A	14		39	18	21	42	41	83	18	16	6b	12						
	107-	Prop Hayden	2.5	3.5		-0.9	0.1	5	8	13		18		41	19	22				18	16	6b	10						
	0-	Run Boulevard	4.0	5.2		0.6	1.8	5	10	15		21									14	6a	8						
	14	CL	8.5	92.0		5.1	88.6	3	3	6		8	8								14	6a				N		18	
10	B-	148+73, 310.5' Rt.	1.5	3.0	-1.3	0.2	1.7	5	5	10	B	14		44	20	24	34	43	77	18	18	7-6	14						
	108-	Prop Hayden	3.0	4.5		1.7	3.2	9	12	21		29		23	15	8				13	10	4a	5						
	0-	Run Boulevard	4.5	6.0		3.2	4.7	10	10	20		28									10	4a	5						
	14	CL											14																
11	B-	148+81, 218.0' Lt.	1.5	2.1	-1.3	0.2	0.8	2	3	5	B	7		34	18	16	34	26	60	14	16	6b	7			N		21	
	109	Prop Hayden	3.0	4.0		1.7	2.7	3	4	7		10		61	22	39				26	19	7-6	14			N		15	Exc./Replace 21"
	0-	Run Boulevard	4.5	6.0		3.2	4.7	3	3	6		8									18	7-6	14			N		18	or LS 14"
	14	CL											7																

* The estimated cut/fill quantities considers an approximate 1.3 foot thick pavement section will be placed.

APPENDIX C

LOG OF BORING

Date Started 4/17/09 Sampler: Type SS Dia. 1.375" Project Identification: EMH&T
Date Completed 4/17/09 Casing: Length ____ Dia. 3.25" Hayden Run Blvd, Columbus, Ohio
Water Elev. 920.6ft
Boring No. SB-6 Station & Offset 111+81.22, 42.17' Rt Surface Elev. 927.1ft CTL Project No. 09050029COL

Elev. (ft)	Depth (ft)	Std. Pen./ RQD	Rec. (ft)	Loss (ft)			Description	Sample No.	Physical Characteristics % Agg	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	ODOT Class
927.1	0					0.5'	Topsoil (6")										
926.6																	
926.1		2/2/3					Medium stiff, brown and gray CLAY and silt, trace sand, trace gravel, moist	1	2	1	5	50	42	49	27	27	A-7-6
	2																
924.6		3/2/4					Medium stiff, brown and gray CLAY and silt, little sand, trace gravel, moist	2	1	2	4	45	48	49	25	19	A-7-6
923.1	4					4.0'											
		4/5/6					Stiff, brown and gray SANDY SILT, little clay, trace gravel with cobbles, moist	3								16	VIS.
921.6																	
	6	8/10/12					Very stiff, brown and gray SANDY SILT, little clay, little gravel with cobbles, moist	4	13	9	18	44	16	23	8	10	A-4a
	8																
918.6						8.5'											
		7/31/41					Very dense, brown GRAVEL AND/OR STONE FRAGMENTS WITH SAND, wet	5								13	VIS.
	10																
	12																
913.6						13.5'											
	14	11/20/22					Hard, brown SANDY SILT, little gravel with cobbles, moist	6								10	VIS.
912.1						15.0'											
							Bottom of boring										

Particle Sizes: Agg => 2.00mm, Coarse Sand = 2.00-0.42mm, Fine Sand = 0.42-0.074mm, Silt = 0.074-0.005mm, Clay =< 0.005mm.

LOG OF BORING

Date Started 4/15/09 Sampler: Type SS Dia. 1.375" Project Identification: EMH&T
Date Completed 4/15/09 Casing: Length ____ Dia. 3.25" Hayden Run Blvd, Columbus, Ohio
Water Elev. Dry
Boring No. SB-7 Station & Offset 50+91.38, 19.35' Rt Surface Elev. 925.9ft CTL Project No. 09050029COL

Elev. (ft)	Depth (ft)	Std. Pen./ RQD	Rec. (ft)	Loss (ft)			Description	Sample No.	Physical Characteristics % Agg	% C.S.	% F.S.	% Silt	% Clay	L.L.	P.I.	W.C.	ODOT Class
925.9	0					0.3'	Topsoil (3")										
925.6																	
924.9		1/2/2					Soft, gray ELASTIC CLAY and silt, little sand, trace gravel, moist	1	1	7	11	47	34	55	23	32	A-7-5
	2					2.5'											
923.4		2/3/4					Medium stiff, brown and gray CLAY and silt, trace sand, trace gravel, moist	2	1	2	10	44	43	46	23	25	A-7-6
921.9	4					4.0'											
		3/3/5					Medium stiff, brown and gray SANDY SILT, some clay, trace gravel, moist	3	7	12	19	41	21	21	6	13	A-4a
920.4						5.5'											
	6	4/4/5					Stiff, brown SANDY SILT, little clay, trace to little gravel with cobbles, moist	4								13	VIS.
	8																
917.4		4/4/11					Stiff, brown SANDY SILT, trace clay, little gravel with cobbles, moist	5								11	VIS.
	10																
	12																
912.4						13.5'											
	14	5/7/10					Very stiff, gray SANDY SILT, little clay, trace gravel, till, damp	6								14	VIS.
910.9						15.0'											
							Bottom of boring										

Particle Sizes: Agg => 2.00mm, Coarse Sand = 2.00-0.42mm, Fine Sand = 0.42-0.074mm, Silt = 0.074-0.005mm, Clay =< 0.005mm.