April 3, 2023

Ms. Tamara Ross
IMEG Corp.
1817 South Avenue West, Suite A
Missoula, Montana 59801

RE: Preliminary Geotechnical Evaluation
Miramonte Mary Jane South
North of O'Leary Street
Missoula, Montana
ALLWEST Project No. 723-010G

Ms. Ross,

ALLWEST has completed the following preliminary geotechnical evaluation for the proposed Miramonte Mary Jane South residential development to be located north of O'Leary Street in Missoula, Montana. The purpose of this evaluation was to characterize the soil and geologic conditions on the property. The attached report presents the results of the field evaluation and our recommendations to assist with design and construction of the proposed project.

We appreciate the opportunity to provide these services to you on this project. If you have any questions or need additional information, please call us at (406) 206-5911.

Sincerely,

ALLWEST

Prepared by:

Andrew Warren. P.E.
Senior Geotechnical Engineer

Reviewed by:

Shawn Turpin, P.E.
Senior Geotechnical Engineer

PRELIMINARY GEOTECHNICAL EVALUATION
MIRAMONTE MARY JANE SOUTH
NORTH OF O'LEARY STREET
MISSOULA, MONTANA
ALLWEST PROJECT NO. 723-010G

April 3, 2023

Prepared for:
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EXECUTIVE SUMMARY

ALLWEST has completed the authorized preliminary geotechnical evaluation for the proposed Miramonte Mary Jane South project located north of O'Leary Street in Missoula, Montana. The general location of the project is shown on the Vicinity Map, Figure A-1, in Appendix A of this report. The purpose of the evaluation was to assess the subsurface conditions throughout the project site with respect to the proposed design and construction. This report details the results of the field evaluation and presents recommendations to assist in the design and construction of the proposed development. A summary of geotechnical considerations follows:

- The general subsurface soil profile observed in the test pits consisted of a thin layer of topsoil covering varying thicknesses of silt. Poorly graded gravel with sand and cobbles was generally observed below the silt to the maximum depth explored, approximately 10 feet. The gravel contained regular to frequent cobbles up to approximately 10 inches in nominal size.
- Pavement sections consisting of 2.5 inches of asphalt over 8 inches of base course and 2.5 inches of asphalt over 10 inches of base course are recommended for use on local asphalt streets and minor collector roadways, respectively.
- This geotechnical evaluation was prepared based on preliminary plans that were made available at the time of exploration. The geotechnical engineer must be informed of future changes to the site layout, proposed structure locations/layout, and/or loading criteria that differ from the assumptions stated in this report.

Close monitoring of the construction operations discussed herein will be critical in achieving the design subgrade support. If we are not retained to provide required construction observation and materials testing services, we cannot be responsible for soil engineering related construction errors or omissions. This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The report section titled *10.0 EVALUATION LIMITATIONS* should be read for an understanding of the report limitations.

1.0 SCOPE OF SERVICES

To complete this geotechnical evaluation, ALLWEST accomplished the following scope of services:

1) Performed a field evaluation by observing the excavation of six test pits throughout the project site. Subsurface conditions observed in the test pits were described and visually classified, and the subsurface profiles were logged.

2) Performed infiltration testing at each of the six test pit locations in accordance with Appendix 6-F of the current City of Missoula Public Works Standards and Specifications Manual.

3) Performed laboratory tests on soil samples to assess the appropriate engineering soil properties and characteristics for the proposed development.

4) Performed engineering analyses and prepared recommendations to assist project planning, design, and construction.

Services were provided in general accordance with ALLWEST's proposal 723-010P dated February 14, 2023.

2.0 PROJECT DESCRIPTION

The project will consist of the development of approximately 16.8 acres into a subdivision containing a variety of residential units and mixed-use units. Preliminary drawings provided by IMEG Corp. indicate approximately 162 units will be situated on 55 individual lots. Stormwater is planned to be managed on-site.

Several asphalt paved roadways and alleys will also be constructed throughout the development serving the various lots. Preliminary anticipated traffic conditions were not available to ALLWEST at the time the report was prepared. However, based on the type of development proposed, a mixture of passenger car and occasional delivery vehicle traffic is anticipated.

Site grading plans were not provided to ALLWEST at the time of report preparation, but it is assumed that cut on the order of 2 feet or less is anticipated for construction of the structures and associated foundations. Fill above existing grades is anticipated to be 2 feet or less to match surrounding site contours and to provide positive drainage away from the new structures.

3.0 EVALUATION PROCEDURES

To complete this evaluation, ALLWEST reviewed soil and geologic literature for the project area. Subsurface conditions were evaluated at the site by excavating six test pits at the project site on February 27, 2023. The test pits were excavated using a track-mounted Sany SY5OU mini-excavator equipped with a 30-inch soil excavation bucket. Approximate locations of the test pits are shown on Figure A-2, Test Pit Location Map in Appendix A.

Prior to mobilization, Montana 811 was contacted to request the location and clearance of public underground utilities. Observation of the site was also performed to determine possible access limitations to proposed exploration locations prior to excavation.

Disturbed grab and bulk samples representative of soil conditions from select locations were obtained from excavation spoils.

Subsurface conditions observed in the test pits were visually described and classified in general accordance with ASTM D2488 and the subsurface profiles were logged by an ALLWEST geotechnical engineer. Detailed descriptions of the soil observed in the test pits are presented on the test pit logs found in Appendix B of this report. The descriptive soil terms used on the test pit logs, and in this report, can be referenced by the Unified Soil Classification System (USCS). A summary of the USCS is included in Appendix B.

4.0 SITE CONDITIONS

The project site is a vacant parcel bisected in a north-south direction by Mary Jane Boulevard. Existing site topography is relatively flat, with less than five feet of elevation difference across the site. The property is bordered by residential development to the north and east, Flynn Lane to the west, and additional vacant property to the south.

4.1 GENERAL GEOLOGIC CONDITIONS

The site is in an area mapped as Quaternary alluvium of the alluvial terrace (Qat) by the Montana Bureau of Mines and Geology (MBMG). Based on the mapping and previous experience at nearby project sites, soil and geologic conditions in the site vicinity were expected to consist of varying thicknesses of silt overlying gravel and sand. The natural soils observed in the test pits were generally consistent with the MBMG geologic mapping and assumptions made by ALLWEST.

4.2 SEISMICITY

ALLWEST anticipates the 2018 International Residential Code (IRC) will be used as the basis for design of the proposed structures as part of this project. Based on laboratory testing results, subsurface exploration information, and knowledge of the local geology, the natural soils at the site can be characterized as Site Class D for seismic design, in accordance with the previously referenced standard. Soils categorized as Site Class D have a generally stiff relative consistency, with average standard penetration resistance values ranging from 15 to 50 blows per foot in the upper 100 feet. These blow counts correlate to average undrained shear strengths of 1,000 to 2,000 pounds per square foot (psf).

The following seismic parameters may be used for design of the proposed structures:

Parameter	Value	Description
Latitude (degrees)	46.89194°	Project site geographic position
Longitude (degrees)	-114.052523°	Project site geographic position
Seismic Site Class	D	Seismic Design Site Classification
Risk Category	II	Seismic design risk category
S_S	0.426	MCE_R ground motion (period = 0.2s)
S_1	0.143	MCE_R ground motion (period = 1.0s)
S_{DS}	0.415	Numeric seismic design value at 0.2s SA
S_{D1}	0.22	Numeric seismic design value at 1.0s SA
F_a	1.459	Site amplification factor at 0.2s
F_v	2.315	Site amplification factor at 1.0s
PGA	0.189	MCE_G peak ground acceleration
F_{PGA}	1.421	Site amplification factor at PGA
PGA_M	0.269	Site modified peak ground acceleration

5.0 SUBSURFACE CONDITIONS

General characterization of the subsurface profile observed follows, grouping soils with similar physical and engineering properties. The test pit logs should be referenced for more detailed descriptions of the soil types and their estimated depths. It should be noted that depths shown as boundaries between various strata on boring logs are approximate. Transitions between soil types/layers may be gradual. In addition, subsurface conditions may vary between exploration locations from those observed at discrete boring locations. Such changes in conditions would not be apparent until construction. If subsurface conditions deviate from those observed in the test pits, construction timing, plans, and costs may change.

The general subsurface soil profile observed in the test pits consisted of a thin layer of topsoil covering varying thicknesses of silt. Poorly graded gravel with sand and cobbles was generally observed below the silt to the maximum depth explored, approximately 10 feet. The gravel contained regular to frequent cobbles up to approximately 10 inches in nominal size.

5.1 TOPSOIL

Topsoil was observed from the surface to depths on the order of 6 inches in the test pits.

5.2 SILT

Silt with varying sand content was observed in each of the test pits below the topsoil to depths on the order of 2 to 7.5 feet. The silt was non-plastic to low plasticity, and generally tan/beige to brown. Test pit observations indicate the fine-grained soils ranged in relative consistency from medium stiff to stiff. Trace pinholes were observed in the silt throughout the project area but did not appear to be to an extent that they present a significant hydro-collapse hazard if the soil is significantly wetted.

5.3 CLAY

Sandy lean clay was observed in test pit TP-02 below silt from approximately 5 to 8 feet below existing grade. The clay was low plasticity, slightly moist, and generally brown to reddish-brown. Test pit observations indicate the clay was stiff in relative consistency.

5.4 GRAVEL

Gravel generally classifying as poorly graded gravel with sand and cobbles was observed in each of the test pits except for TP-02 below silt soils at various depths throughout the subject parcel to the maximum depth explored, approximately 10 feet. The gravel contained regular to frequent cobbles up to approximately 10 inches in nominal size. The gravel varied in color from brown to multi-colored, was fine- to coarse-grained, subangular to subrounded, and appeared medium dense to dense in relative density.

5.5 SAND

Poorly graded sand with silt and trace fine gravel was observed from approximately 8 feet to the maximum depth explored (approximately 10 feet) in test pit TP-02. The sand was brown in color, slightly moist, medium-grained, generally subrounded, and appeared loose to medium dense in relative density.

5.6 GROUNDWATER CONDITIONS

At the time of exploration, groundwater was not observed in any of the test pits to the maximum depth explored, approximately 10 feet. A review of groundwater well data indicates the static groundwater level in this area is variable but is likely 25 to 30 feet in depth below existing grades. Changes in precipitation, irrigation, construction, or other factors may impact depth to groundwater and surface water flow on the property and therefore, conditions may be different during construction.

6.0 INFILTRATION TESTING

In-situ infiltration testing was performed at each of the six test pit locations to assist in on-site stormwater management design. Infiltration testing was performed in accordance with the procedures outlined in Appendix 6-F (Test Pit Infiltration Method) of the current Missoula Public Works Standard Specifications Manual.

At each testing location, test pits were excavated to depths on the order of 9 to 10 feet below existing grades. Upon excavation to depth, solid 4-inch schedule 40 PVC pipe was installed to the bottom of the excavation, and the excavation surrounding the pipe was backfilled with excavation spoils.

ALLWEST returned to the site to perform infiltration testing March 6 and 9, 2023. Approximately 4 to 6 inches of pea gravel was placed in the PVC pipes for a splash guard. Approximately 1-foot of water head was then introduced into the PVC pipe for a one-hour saturation period. Following the saturation period of one hour, an approximate 6-foot head of water was used to begin each trial, and the time for the water column to drop 24 inches was recorded. Per test method procedures, locations requiring less than one hour for the water column to drop 24 inches, the average rate of the final four trials not varying by more than 10 percent for each test is reported as the infiltration rate. For locations requiring more than one hour for the water column to drop 24 inches, the final trial following two consecutive trials not varying by more than 10 percent is reported as the infiltration rate. These data are presented in the following table. It is recommended the civil engineer apply appropriate factors of safety to the measured values or select lower values based on previously observed and documented performance of drywells in the vicinity of the project.

Test Location	Depth of Test Below Ground Surface (in)	Infiltration Rate (in/hr)	Soil Classification (USCS)
TP-01	73	4,617	Poorly graded gravel with sand and cobbles (GP)
TP-02	99	42.0	Poorly graded sand with silt (SP-SM)
TP-03	96	4,941	Poorly graded gravel with sand and cobbles (GP)
TP-04	83	9,900	Poorly graded gravel with sand and cobbles (GP)
TP-05	84	4.0	Poorly graded gravel with sand and cobbles (GP)
TP-06	90	16.9	Poorly graded gravel with sand and cobbles (GP)

Substantial variability of infiltration rates were observed in the poorly graded gravel with sand and cobbles. Such variability could occur for several reasons. Most notable of these reasons is variations in the subsurface, which may include increased silt or clay content or lenses of silt and clay which are less permeable than the gravel and sand. Although not specifically observed in the test pits to the depths explored, if present below the PVC pipe, silt or clay lenses/layers or other subsurface variations can result in slower infiltration rates. Additionally, if the PVC pipe was seated on or very near a relatively large cobble, it could significantly slow the infiltration rate acting as a plug.

7.0 LABORATORY TESTING

ALLWEST performed laboratory testing to supplement field classifications and to assess the appropriate soil engineering properties for use in design of the proposed structures.

The laboratory testing program conducted for this evaluation included the following tests:

Test Performed:	Information Acquired:
Natural Water Content (ASTM D2216)	Water content representative of soil conditions at the time and location samples were collected
Particle-size Distribution (ASTM D6913)	Size and distribution of soil particles (i.e., gravel, sand, and silt/clay) of a particular sample
Atterberg Limits (ASTM D4318)	Effects of varying water content on the consistency of fine-grained soils present in a particular sample
Moisture-Density Relationship (ASTM D698)	Relationship between the laboratory maximum dry density and corresponding water content of a soil for a particular compaction effort
California Bearing Ratio (ASTM D1883)	The ability of a soil to support a particular pavement section subjected to known traffic loading

Laboratory test results are presented in Appendix C. Discussion of some of the laboratory testing results follows.

7.1 MOISTURE CONTENT

Results of natural water content testing of representative samples obtained at the time of exploration indicates the near surface subsurface materials are generally slightly moist and are likely below or near the presumed optimum moisture content for compaction. Please refer to the in-situ moisture content laboratory test results shown on the test pit logs for further details of existing soil-moisture conditions (at the time of exploration).

7.2 CLASSIFICATION

Gradation analyses in conjunction with Atterberg limits testing were performed on representative samples from test pits TP-02 (1 to 3 feet and 8 to 10 feet), TP-04 (3 to 6 feet), and TP-06 (1 to 3 feet). Soil classifications of silt with sand, sandy silt, poorly graded sand with silt, and poorly graded gravel with sand and cobbles were determined by the testing of each sample. Atterberg limits testing performed on the portion passing the No. 40 sieve indicate the sand and gravel are generally non-plastic, while testing of the silt determined liquid limits of 37 and 38 percent and plasticity indices of 10 and 11 percent. Graphical results of the laboratory testing are presented in Figures C-1 through C-4 in Appendix C.

7.3 MOISTURE-DENSITY RELATIONSHIP

Moisture-density relationship testing was performed on a composite sample of representative material obtained from test pit TP-02 (1 to 3 feet) in accordance with ASTM D698 (standard Proctor). Through a series of controlled trials using a variety of moisture contents, a moisture-density curve was established for the subject soil. Results of the testing indicate a maximum dry density of approximately 95.7 pounds per cubic foot (pcf) at an optimum moisture content of 22.7 percent for the sample tested (Figure C-5, Appendix C).

7.4 CALIFORNIA BEARING RATIO

California Bearing Ratio (CBR) testing was performed in accordance with ASTM D1883 on a composite sample of representative material obtained from test pit TP-02 (1 to 3 feet). Testing determined a CBR value of 4.6 percent when compacted to 95 percent of the maximum dry density (Figure C-6, Appendix C). CBR strengths in this range are considered a low strength subgrade for supporting pavements under controlled placement conditions.

8.0 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are presented to assist in planning and design of the proposed structures and improvements. Recommendations are based on ALLWEST's understanding of the proposed construction, conditions observed in the test pits, laboratory testing, and engineering analyses. If the construction scope changes, or if conditions are encountered during construction which are different than those described in this report, ALLWEST should be notified so the recommendations herein can be reviewed and revisions can be provided, if necessary. Additionally, ALLWEST should be given the opportunity to review plans and specifications to determine whether the recommendations presented in this report were properly incorporated as intended.

8.1 SITE GRADING

The following recommendations are provided for site grading considerations.

8.1.1 Clearing and Stripping

Prior to placement of fill, the site should be stripped of organics, debris, and other deleterious material in the construction footprint. Based on observations of subsurface conditions in the test pits and general site reconnaissance, the stripping depth for removal of topsoil within structure and pavement envelops is estimated to be on the order of 6 inches. Removed materials should be replaced with compacted granular structural fill to achieve design elevations, if required. Where feasible, extend removal of organics, and other debris or deleterious material a minimum of five feet beyond the perimeter of building footprints.

8.1.2 Excavation

Based on conditions observed in the test pits, it is anticipated that excavation of the on-site soil can be achieved with typical heavy-duty excavation equipment.

Unsupported vertical slopes or cuts deeper than 4 feet are not recommended if worker access is necessary. Cuts should be adequately sloped, shored, or supported to prevent injury to personnel from local sloughing and spalling. Excavations should conform to applicable federal, state, and local regulations. Regarding trench wall support, the site soil is considered Type C soil according to OSHA guidelines and therefore should not exceed a 1.5H:1V temporary slope.

8.1.3 Subgrade Preparation

ALLWEST defines the subgrade as the native soil exposed at the base of excavation prior to placement of fill, concrete, or asphalt. The subgrade requires an evaluation by the geotechnical engineer-of-record or staff under their supervision to confirm the site conditions are consistent with those observed during our geotechnical evaluation. Soils at pavement and exterior flatwork subgrade elevations are anticipated to consist of silt containing varying sand content.

The site silt soils are susceptible to pumping and rutting if subjected to significant and repeated traffic by rubber tire construction equipment. It is recommended tracked construction equipment be used to traffic the site and rubber tire equipment be limited to haul routes.

Prior to placement of fill, the exposed pavement subgrade soils should be scarified to a depth of approximately 8 inches, moisture conditioned to within 2 percentage points of the optimum moisture content and compacted to at least 95 percent of the maximum dry density as determined by ASTM D698 (standard Proctor). Moisture conditioning of the subgrade surface may involve wetting or drying of the soil to help facilitate compaction. Please refer to the in-situ moisture content laboratory test results for an estimation of existing soil-moisture conditions (at the time of exploration).

In the event the exposed subgrade becomes unstable, yielding, or unable to be compacted due to high moisture conditions or construction traffic, the materials should be removed to a sufficient depth to develop stable subgrade soils that can be compacted to the minimum recommended levels. The severity of construction problems will be dependent, in part, on the precautions that are taken by the contractor to protect the subgrade soils.

Pavement and exterior slab subgrades should be sloped to promote runoff and reduce the potential for ponding of water on the subgrade surface. Proper grading of pavement subgrades is critical to their long-term performance. Any areas of soft or saturated subgrade soils which exhibit pumping or significant deflection should be over-excavated to firm, non-yielding soil and replaced with import granular structural fill placed and compacted as described in the *Fill Placement & Compaction* section.

Weather conditions should be given careful attention during subgrade preparation to prevent excess moisture from collecting on or penetrating and possibly saturating the subgrade before and after compaction. It is recommended that the subgrade be temporarily sloped to provide drainage to a low area of the excavation and any excess water pumped from the excavation. Such collection and discharge must be in compliance with the Contractor’s site-specific storm water pollution prevention plan (SWPPP). Should portions of the subgrade become excessively saturated, those areas should be sufficiently excavated, replaced with moisture conditioned soil, and properly compacted.

8.1.4 Materials

8.1.4.1 On-site Soil

The fine-grained soils present near surface throughout the project site are not suitable for re-use as structural fill beneath foundations or slabs but may be used for backfill of exterior foundation walls, trench backfill in utility trenches, and general site grading fill provided deleterious materials are removed, and the material is placed in accordance with the recommendations outlined in the *Fill Placement and Compaction* section.

Gravel of varying silt and sand content was observed throughout the property. If a significant volume of gravel is generated from excavation, it is suitable for re-use as structural fill beneath foundations and slabs, provided material greater than 3-inches in size (i.e., cobbles and boulders) and deleterious materials are removed, and the material is placed in accordance with the recommendations outlined in the *Fill Placement and Compaction* section. In addition, on-site soils used for such purposes should be thoroughly mixed prior to placement to achieve a uniform texture.

8.1.4.2 Import Soil

Import soil, where required should be free of organics, debris, and other deleterious material and meet the recommendations in the following table. Import materials should approved by the Geotechnical Engineer prior to delivery to the site.

Fill Type	Recommendations	
	Sieve	***Percent Passing***
Import Granular Structural Fill[1,2]	3-inch	100
	¾-inch	70 – 100
	No. 4	25 – 50
	No. 40	10 – 20
	No. 200	0 – 15

[1] Soils with more than 30% retained on the ¾-inch sieve are considered 'oversized' and may require method-based compaction methods.
[2] Material should be non-plastic.

8.1.4.3 Fill Placement and Compaction

Fill should be placed in lift thicknesses appropriate for the compaction equipment used. Typically, six to eight-inch loose lifts are appropriate for typical rubber tire and steel drum compaction equipment. Lift thicknesses should be reduced to a maximum of four inches for hand operated compaction equipment. Fill should be moisture conditioned to within two percentage points of the optimum moisture content prior to placement to facilitate compaction.

Fill placed for on-site improvements and in structural areas should be compacted to the following percentages of the maximum dry density as determined by ASTM D698 (standard Proctor).

Fill Area	Compaction (%) ASTM D698
Subgrade	95
Site Grading	95
Foundations / Slabs / Wall Backfill	98
Utility Trench Backfill	95
Base Course	95

8.1.5 Wet Weather Construction

Due to the climatic effects in this region during late fall, winter, and spring (generally wet conditions), it is recommended that construction (especially site grading) take place during the summer and early fall season, if possible. If construction occurs during or immediately after excessive precipitation, it may be necessary to over-excavate and replace wet subgrade soil which might otherwise be suitable.

If construction is undertaken in wet periods of the year, it will be important to slope the ground surface to provide drainage away from construction. In addition, groundwater levels will likely be higher during wet periods of the year.

8.1.6 Cold Weather Construction

Foundations should be embedded adequately to protect against frost action as recommended in the *Foundation Recommendations* section of this report. Removal of frost susceptible soil within the frost-depth zone (approximately 42 inches) below concrete flatwork (walkways, entryway pads, etc.) is recommended to help reduce the potential detrimental effects of frost heave. The near surface silt soils are considered frost susceptible.

If site grading and construction are anticipated during cold weather, proper winter construction practices should be observed. Snow and ice should be removed from excavated and fill areas prior to additional earthwork or construction. Structural portions of the construction should not be placed on frozen ground; nor should the supporting soils for buildings be permitted to freeze during or after construction. Frozen soils should not be used as fill.

8.2 STORMWATER AND DRAINAGE

The grading plan should include slopes such that stormwater run-off is directed away from the building and pavement areas to a stormwater management system. The ground surface adjacent to foundations should be sloped a minimum of five percent within 10 feet of the building. If the adjoining ground surface consists of hardscapes, it may be sloped a minimum of two percent in the first 10 feet. Water should not be allowed to infiltrate or pond adjacent to foundations.

Landscaping which requires watering is discouraged adjacent to structures due to the potential to introduce water into the subgrade soils by the irrigation system. Such introduction of water could result in greater movement of foundations and slabs than those discussed herein.

8.3 PAVEMENT

Based on the subsurface conditions observed in the test pits, it is anticipated that pavement subgrades will mostly consist of silt with varying sand content. CBR testing was performed on a representative sample of the silt subgrade soil and determined a CBR value of 4.6 percent and was used for pavement design purposes.

Recommended pavement sections for the project are based on the following assumptions.

Criteria	Assumed Value
Pavement Life	20 years
Subgrade California Bearing Ratio (CBR)	4.6%
Reliability	85%
Initial Serviceability	4.2
Terminal Serviceability	2.0

8.3.1 Roadways

Roadway loading for the proposed residential street sections for this project is estimated based on the assumption that traffic loading conditions totaling 50,000 and 100,000 equivalent single-axle loads (ESALs) or less will be required for local asphalt streets and minor collector streets, respectively, for the assumed pavement design life (20 years).

The pavement sections presented in the following table are recommended for the proposed roadway sections for this project based on assumed ESAL values.

Roadway Type	Section Type	AC[1] (in)	CBC[2] (in)	Total (in)
Local Asphalt Street	Unreinforced	2.5	8	10.5
Minor Collector Steet	Unreinforced	2.5	10	11.5

[1]AC = Asphalt Concrete
[2]CBC = Crushed Base Course

Crushed base course meeting the requirements of MPWSS section 02235 gradation for crushed base course should be specified for use. It is recommended the asphaltic concrete surface be compacted per MPWSS requirements.

Crack maintenance on asphalt pavement should be performed at a minimum of every three years, or immediately when cracking is evident. Crack sealing will help reduce surface water infiltration into the underlying clay soils. A shortened pavement life will result from an improper or inadequate maintenance program.

8.4 OWNER OPERATION AND MAINTENANCE RESPONSIBILITIES

Property owners must accept the responsibility for maintaining the site grading, drainage, monitoring utility connections, and have a defined schedule for verifying and making necessary repairs as necessary to maintain the overall as designed positive site grading to ensure long term performance of the foundations as defined herein. The property owner shall not make modifications to site grading that compromises the as-designed positive surface drainage. In addition, landscaping and irrigation must be designed, installed, and maintained so as to not impact the overall site grading and/or become a source of water to the site soils which could result in movement of the support structures, pavement, or slabs.

9.0 ADDITIONAL RECOMMENDED SERVICES

ALLWEST should be retained to provide construction materials testing and observation to verify the soil and geologic conditions and the report recommendations are incorporated into the actual construction. The design engineer-of-record should determine applicable testing and special inspection requirements in accordance with the governing code documents. If ALLWEST is not retained to provide required construction observation and materials testing services, ALLWEST cannot be responsible for soil engineering related construction errors or omissions.

10.0 EVALUATION LIMITATIONS

This report has been prepared to assist the planning and design for the proposed Miramonte Mary Jane South project located North of O'Leary Street in Missoula, Montana. The evaluation was provided based on preliminary plans that were made available at the time of exploration. The geotechnical engineer must be informed of significant changes to the building layout and/or loading criteria that differ from the assumptions stated in this report. Reliance by any other party is prohibited without the written authorization of ALLWEST. Services consist of professional opinions and conclusions made in accordance with generally accepted geotechnical engineering principles and practices in the local area at the time this report was prepared. This acknowledgement is in lieu of all warranties, express or implied.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:
- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:
- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

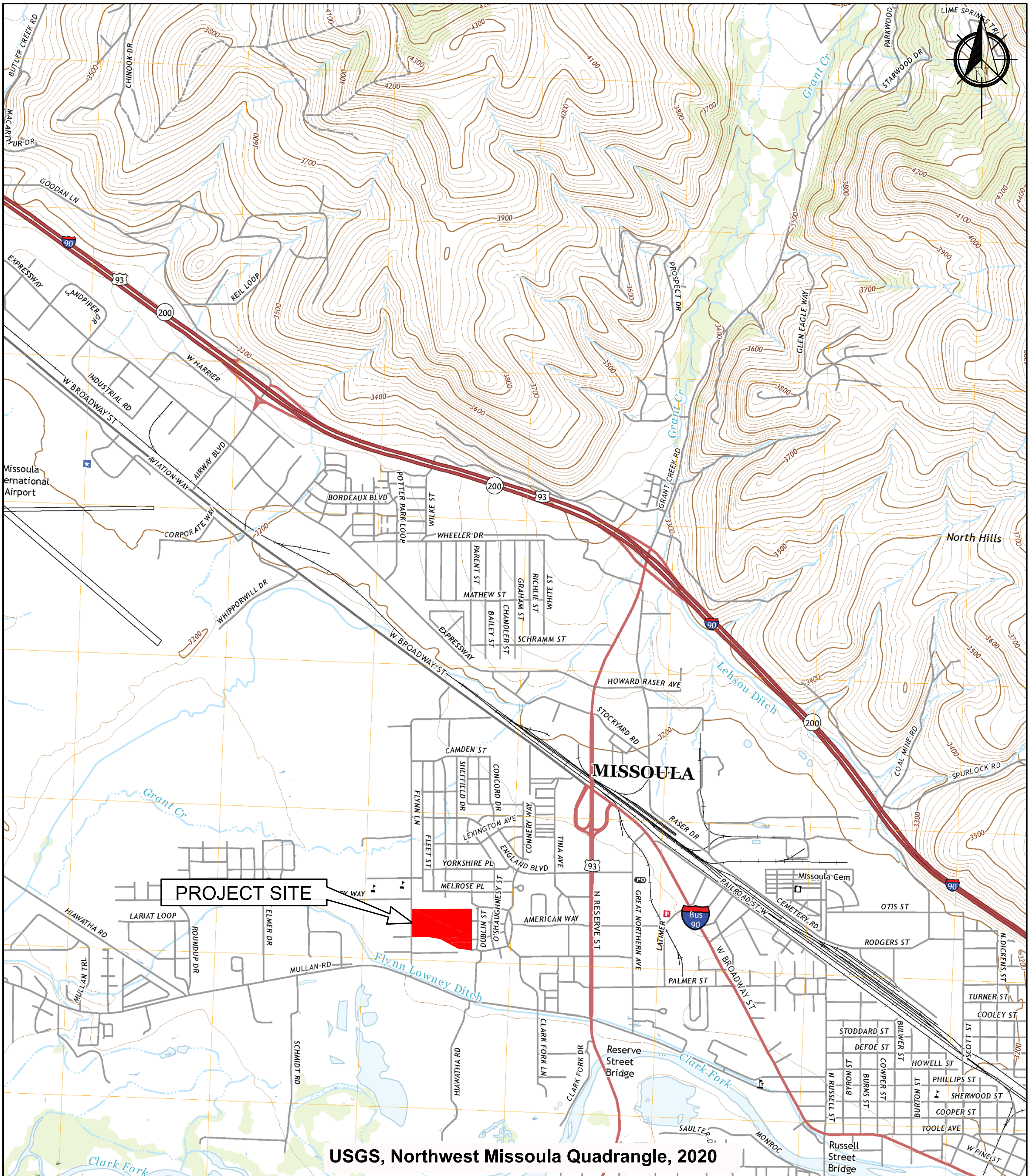
While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

Appendix A

Vicinity Map (Figure A-1)
Test Pit Location Map (Figure A-2)



ALLWEST

2720 Palmer St Unit A
Missoula, Montana 59808
(406) 206-5911
www.allwesttesting.com

FIGURE A-1: VICINITY MAP	
PROJECT:	723-010G - Miramonte Mary Jane South
LOCATION:	Missoula, Montana
CLIENT NAME:	IMEG Corp.
DATE:	April 2023

ALLWEST
2720 Palmer St Unit A
Missoula, Montana 59808
(406) 206-5911
www.allwesttesting.com

FIGURE A-2: TEST PIT LOCATION MAP

PROJECT:	723-010G - Miramonte Mary Jane South
LOCATION:	Missoula, Montana
CLIENT NAME:	IMEG Corp.
DATE:	April 2023

Appendix B

Test Pit Logs
Unified Soil Classification System

ALLWEST
MISSOULA, MONTANA
GEOTECHNICAL SECTION

TEST PIT LOG

DATE STARTED: 2/27/2023
DATE FINISHED: 2/27/2023
OPERATOR: Pat Malone
COMPANY: MFCII406, LLC
LOGGER: Andrew Warren
WEATHER: Cold, Sunny

TEST PIT TP-01

EXCAVATOR: Sany SY 5OU
EXCAVATION METHOD: 30" soil excavation bucket

PROJECT: 723-010G - Miramonte Mary Jane South

NOTES:

LATITUDE (DEGREES): N 46°53'27.8736" (46.891076°)
LONGITUDE (DEGREES): W -114°3'15.2712" (-114.054242°)

TOTAL DEPTH: 9'

DEPTH (ft)	USCS	DESCRIPTION	GRAPHIC LOG	SAMPLE #	NOTES
0	TOPSOIL	TOPSOIL; Sandy SILT (ML), brown, slightly moist, low plasticity. Frozen to approximately 4".			
	ML	SILT with sand (ML), tan, slightly moist, non to low plasticity, medium stiff to stiff. Pinholes visible throughout. Large roots present to approximately 1.5'.			Grab sample: 0.5' - 1.5' Moisture = 8%
3	GP	Poorly graded GRAVEL with sand and cobbles (GP), trace silt, brown, slightly moist, fine- to coarse-grained, subangular to subrounded, medium dense. Frequent cobbles up to approximately 10" nominal size.			Bulk sample: 5' - 7'
9		Test pit terminated at 9.0 feet. 4" PVC installed. Groundwater not observed. Backfilled with excavation spoils.			

	WATER LEVELS
NE	∇ WHILE EXCAVATING
NE	▼ AT COMPLETION
NE	▼ AFTER EXCAVATING

ALLWEST
MISSOULA, MONTANA
GEOTECHNICAL SECTION

TEST PIT LOG

DATE STARTED: 2/27/2023
DATE FINISHED: 2/27/2023
OPERATOR: Pat Malone
COMPANY: MFCII406, LLC
LOGGER: Andrew Warren
WEATHER: Cold, Sunny

TEST PIT TP-02

EXCAVATOR: Sany SY 5OU
EXCAVATION METHOD: 30" soil excavation bucket

PROJECT: 723-010G - Miramonte Mary Jane South

NOTES:

LATITUDE (DEGREES): N 46°53'27.3552" (46.890932°)
LONGITUDE (DEGREES): W -114°3'7.3872" (-114.052052°)

TOTAL DEPTH: 10'

DEPTH (ft)	USCS	DESCRIPTION	GRAPHIC LOG	SAMPLE #	NOTES
0	TOPSOIL	TOPSOIL; Sandy SILT (ML), brown, slightly moist, low plasticity. Frozen to approximately 4".			
0.33–5	ML	SILT with sand (ML), tan to brown, slightly moist, non to low plasticity, medium stiff to stiff. Pinholes visible throughout. Large roots present to approximately 1.5'.			Bulk sample: 1' - 3' Grab sample: 3' - 4' Moisture = 11% Grab sample: 4' - 5' Moisture = 9%
5	SC	Sandy lean CLAY (SC), brown to brown/red, slightly moist, low plasticity, stiff.			
8	SP-SM	Poorly graded SAND with silt (SP-SM), trace fine gravel, brown, slightly moist, medium-grained, subrounded, loose to medium dense.			Grab sample: 8' - 10' Moisture = 5%
10		Test pit terminated at 10.0 feet. 4" PVC installed. Groundwater not observed. Backfilled with excavation spoils.			

Depth scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

	WATER LEVELS
NE	▽ WHILE EXCAVATING
NE	▼ AT COMPLETION
NE	▼ AFTER EXCAVATING

ALLWEST
MISSOULA, MONTANA
GEOTECHNICAL SECTION

TEST PIT LOG

DATE STARTED: 2/27/2023
DATE FINISHED: 2/27/2023
OPERATOR: Pat Malone
COMPANY: MFCII406, LLC
LOGGER: Andrew Warren
WEATHER: Cold, Sunny

TEST PIT TP-03

EXCAVATOR: Sany SY 5OU
EXCAVATION METHOD: 30" soil excavation bucket

PROJECT: 723-010G - Miramonte Mary Jane South

NOTES:

LATITUDE (DEGREES): N 46°53'27.5964" (46.890999°)
LONGITUDE (DEGREES): W -114°3'2.0412" (-114.050567°)

TOTAL DEPTH: 9.5'

DEPTH (ft)	USCS	DESCRIPTION	GRAPHIC LOG	SAMPLE #	NOTES
0	TOPSOIL	TOPSOIL; Sandy SILT (ML), brown, slightly moist, low plasticity. Frozen to approximately 4".			
0.3–7.5	ML	SILT with sand (ML), tan to biege, slightly moist, non to low plasticity, medium stiff to stiff. Pinholes visible throughout. Large roots present to approximately 1.5'.			Grab sample: 1' - 2' Moisture = 8% Grab sample: 4' - 5' Moisture = 7%
7.5–9.5	GP	Poorly graded GRAVEL with sand and cobbles (GP), trace silt, brown, slightly moist, fine- to coarse-grained, subangular to subrounded, medium dense to dense. Regular cobbles up to approximately 8" nominal size.			
9.5		Test pit terminated at 9.5 feet. 4" PVC installed. Groundwater not observed. Backfilled with excavation spoils.			

Depth scale: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

WATER LEVELS
NE ▽ WHILE EXCAVATING
NE ▼ AT COMPLETION
NE ▼ AFTER EXCAVATING

ALLWEST
MISSOULA, MONTANA
GEOTECHNICAL SECTION

TEST PIT LOG

DATE STARTED: 2/27/2023
DATE FINISHED: 2/27/2023
OPERATOR: Pat Malone
COMPANY: MFCII406, LLC
LOGGER: Andrew Warren
WEATHER: Cold, Sunny

TEST PIT TP-04

EXCAVATOR: Sany SY 5OU
EXCAVATION METHOD: 30" soil excavation bucket

PROJECT: 723-010G - Miramonte Mary Jane South

NOTES:

LATITUDE (DEGREES): N 46°53'24.3672" (46.890102°)
LONGITUDE (DEGREES): W -114°3'15.876" (-114.05441°)

TOTAL DEPTH: 9.5'

DEPTH (ft)	USCS	DESCRIPTION	GRAPHIC LOG	SAMPLE #	NOTES
0 - 0.5	TOPSOIL	TOPSOIL; Sandy SILT (ML), brown, slightly moist, low plasticity. Frozen to approximately 6".			
0.5 - 2	ML	Sandy SILT (ML), brown, slightly moist, non to low plasticity, medium stiff to stiff. Pinholes visible throughout. Roots present throughout.			Grab sample: 0.5' - 2'
2 - 9.5	GP	Poorly graded GRAVEL with sand and cobbles (GP), trace silt, brown to multicolored, slightly moist, fine- to coarse-grained, subangular to subrounded, medium dense to dense. Frequent cobbles up to approximately 10" nominal size.			Bulk sample: 3' - 6' Grab sample: 7.5' Moisture = 4%
9.5		Test pit terminated at 9.5 feet. 4" PVC installed. Groundwater not observed. Backfilled with excavation spoils.			

	WATER LEVELS
NE	WHILE EXCAVATING
NE	AT COMPLETION
NE	AFTER EXCAVATING

Sheet 1 of 1

ALLWEST MISSOULA, MONTANA GEOTECHNICAL SECTION TEST PIT LOG	DATE STARTED: 2/27/2023 DATE FINISHED: 2/27/2023 OPERATOR: Pat Malone COMPANY: MFCII406, LLC LOGGER: Andrew Warren WEATHER: Cold, Sunny	TEST PIT TP-05 EXCAVATOR: Sany SY 5OU EXCAVATION METHOD: 30" soil excavation bucket
PROJECT: 723-010G - Miramonte Mary Jane South	NOTES:	

LATITUDE (DEGREES): N 46°53'24.0972" (46.890027°)
LONGITUDE (DEGREES): W -114°3'8.28" (-114.0523°)

TOTAL DEPTH: 9'

DEPTH (ft)	USCS	DESCRIPTION	GRAPHIC LOG	SAMPLE #	NOTES
0	TOPSOIL	TOPSOIL; Sandy SILT (ML), brown, slightly moist, low plasticity. Frozen to approximately 4".			
1–3	ML	SILT with sand (ML), brown to tan, slightly moist, non to low plasticity, stiff. Pinholes visible throughout. Large roots present to approximately 1.5'.			Grab sample: 2' - 3' Moisture = 9%
3–9	GP	Poorly graded GRAVEL with sand and cobbles (GP), trace silt, brown/gray to multicolored, slightly moist, fine- to coarse-grained, subangular to subrounded, medium dense to dense. Regular cobbles up to approximately 10" nominal size.			Bulk sample: 5' - 6'
9		Test pit terminated at 9.0 feet. 4" PVC installed. Groundwater not observed. Backfilled with excavation spoils.			

Depth scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

	WATER LEVELS
NE	▽ WHILE EXCAVATING
NE	▼ AT COMPLETION
NE	▼ AFTER EXCAVATING

ALLWEST
MISSOULA, MONTANA
GEOTECHNICAL SECTION

TEST PIT LOG

DATE STARTED: 2/27/2023
DATE FINISHED: 2/27/2023
OPERATOR: Pat Malone
COMPANY: MFCII406, LLC
LOGGER: Andrew Warren
WEATHER: Cold, Sunny

TEST PIT TP-06

EXCAVATOR: Sany SY 5OU
EXCAVATION METHOD: 30" soil excavation bucket

PROJECT: 723-010G - Miramonte Mary Jane South
NOTES:

LATITUDE (DEGREES): N 46°53'23.4888" (46.889858°)
LONGITUDE (DEGREES): W -114°3'1.6236" (-114.050451°)

TOTAL DEPTH: 9'

DEPTH (ft)	USCS	DESCRIPTION	GRAPHIC LOG	SAMPLE #	NOTES
0	TOPSOIL	TOPSOIL; Sandy SILT (ML), brown, slightly moist, low plasticity. Frozen to approximately 4".			
0.3 – 6	ML	Sandy SILT (ML), brown to tan, slightly moist, non to low plasticity, stiff. Pinholes visible throughout. Large roots present to approximately 1.5'.			Bulk sample: 1' - 2' Grab sample: 5' - 6' Moisture = 7%
6 – 9	GP	Poorly graded GRAVEL with sand and cobbles (GP), trace silt, brown/gray to multicolored, slightly moist, fine- to coarse-grained, subangular to subrounded, medium dense to dense. Regular cobbles up to approximately 10" nominal size.			
9		Test pit terminated at 9.0 feet. 4" PVC installed. Groundwater not observed. Backfilled with excavation spoils.			

Depth scale: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

	WATER LEVELS
NE	▽ WHILE EXCAVATING
NE	▼ AT COMPLETION
NE	▼ AFTER EXCAVATING

Unified Soil Classification System

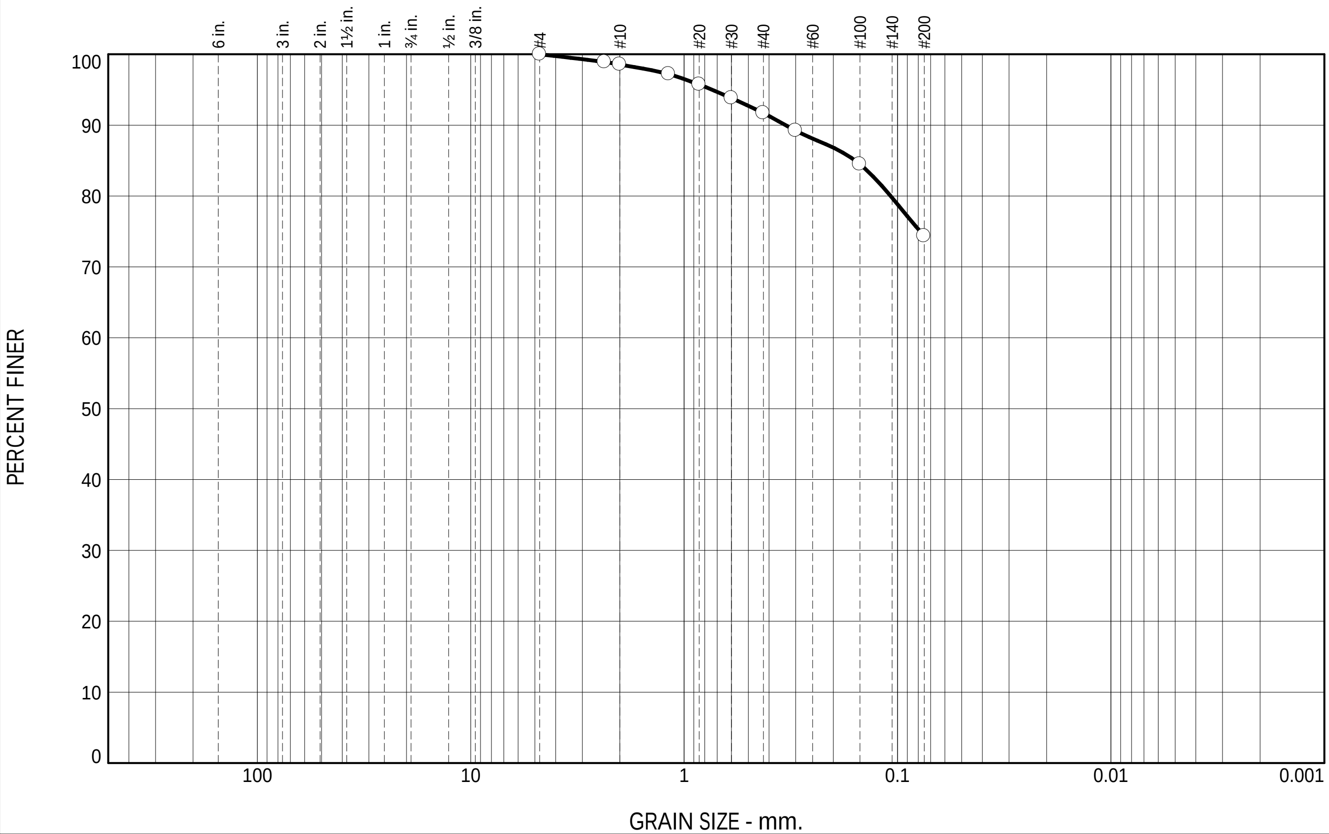
MAJOR DIVISIONS			SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS	GRAVELS	CLEAN GRAVELS	GW	Well-Graded Gravel, Gravel-Sand Mixtures.
			GP	Poorly-Graded Gravel, Gravel-Sand Mixtures.
		GRAVELS WITH FINES	GM	Silty Gravel, Gravel-Sand-Silt Mixtures.
			GC	Clayey Gravel, Gravel-Sand-Clay Mixtures.
	SANDS	CLEAN SANDS	SW	Well-Graded Sand, Gravelly Sand.
			SP	Poorly-Graded Sand, Gravelly Sand.
		SANDS WITH FINES	SM	Silty Sand, Sand-Silt Mixtures.
			SC	Clayey Sand, Sand-Clay Mixtures.
FINE GRAINED SOILS	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50%		ML	Inorganic Silt, Silty or Clayey Fine Sand.
			CL	Inorganic Clay of Low to Medium Plasticity, Sandy or Silty Clay.
			OL	Organic Silt and Clay of Low Plasticity.
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50%		MH	Inorganic Silt, Elastic Silt, Micaceous Silt, Fine Sand or Silt.
			CH	Inorganic Clay of High Plasticity, Fat Clay.
			OH	Organic Clay of Medium to High Plasticity.
Highly Organic Soils			PT	Peat, Muck and Other Highly Organic Soils.

ALLWEST

Appendix C

Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	0	1	7	18	74	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100		
#8	99		
#10	99		
#16	97		
#20	96		
#30	94		
#40	92		
#50	89		
#100	84		
#200	74		

* (no specification provided)

Soil Description

SILT with sand

Atterberg Limits

PL= 28 LL= 38 PI= 10

Coefficients

D_{90}= 0.3344 D_{85}= 0.1577 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(7)

Remarks

Sampled by A. Warren (ALLWEST)
Procedure A (entire sample)

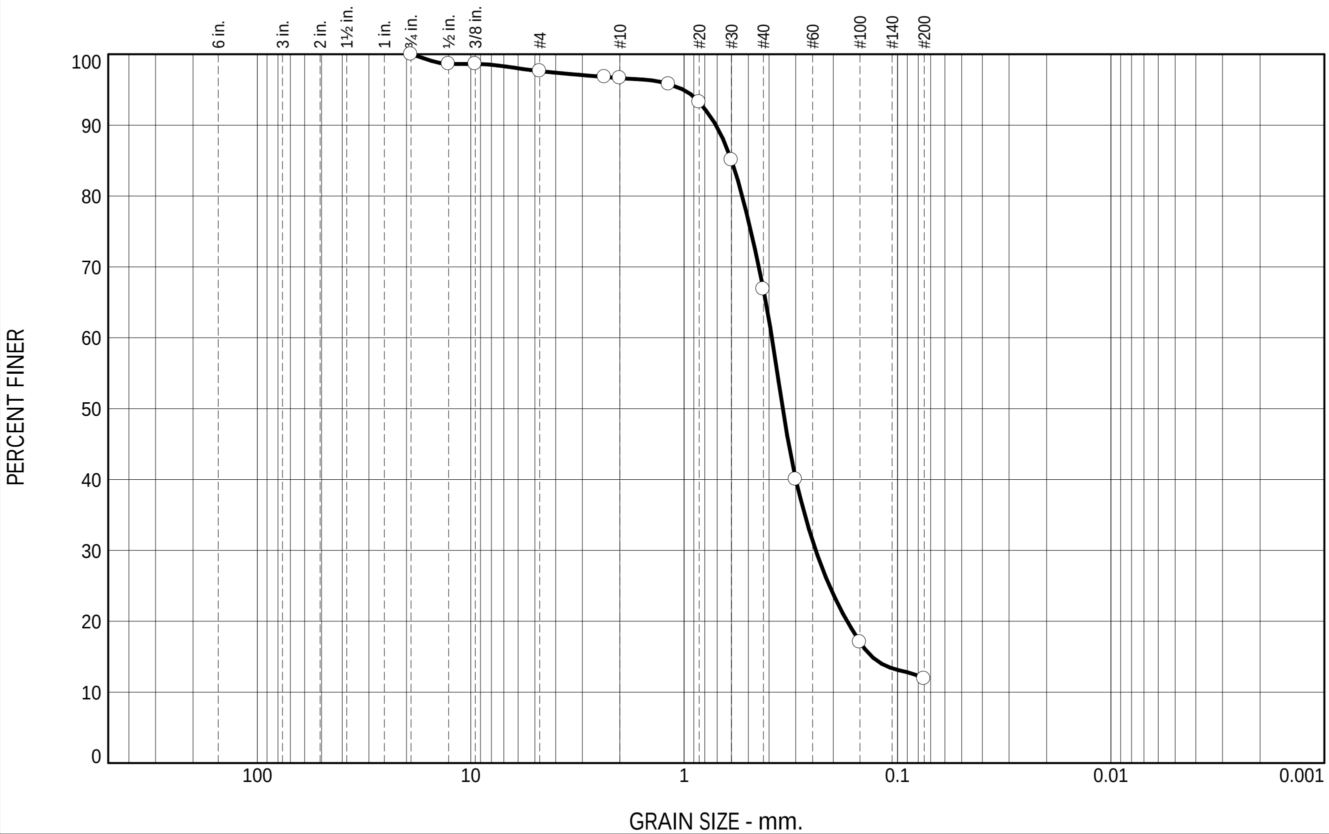
Location: TP-02
Sample Number: S723-0036 Depth: 1' - 3' Date: 3.10.2023

ALLWEST

Client: IMEG Corporation
Project: Miramonte Mary Jane South
Project No: 723-010G Figure C-1

Tested By: K. Himmelreich Checked By: A. Warren, PE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	2	1	30	55	12	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100		
1/2"	99		
3/8"	99		
#4	98		
#8	97		
#10	97		
#16	96		
#20	93		
#30	85		
#40	67		
#50	40		
#100	17		
#200	12		

* (no specification provided)

Soil Description

Poorly graded SAND with silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.7096 D_{85}= 0.5990 D_{60}= 0.3877
D_{50}= 0.3446 D_{30}= 0.2416 D_{15}= 0.1318
D_{10}= C_u= C_c=

Classification

USCS= SP-SM AASHTO= A-2-4(0)

Remarks

Sampled by A. Warren (ALLWEST)
Procedure A (entire sample)

Location: TP-02
Sample Number: S723-0036 Depth: 8' - 10' Date: 3.10.2023

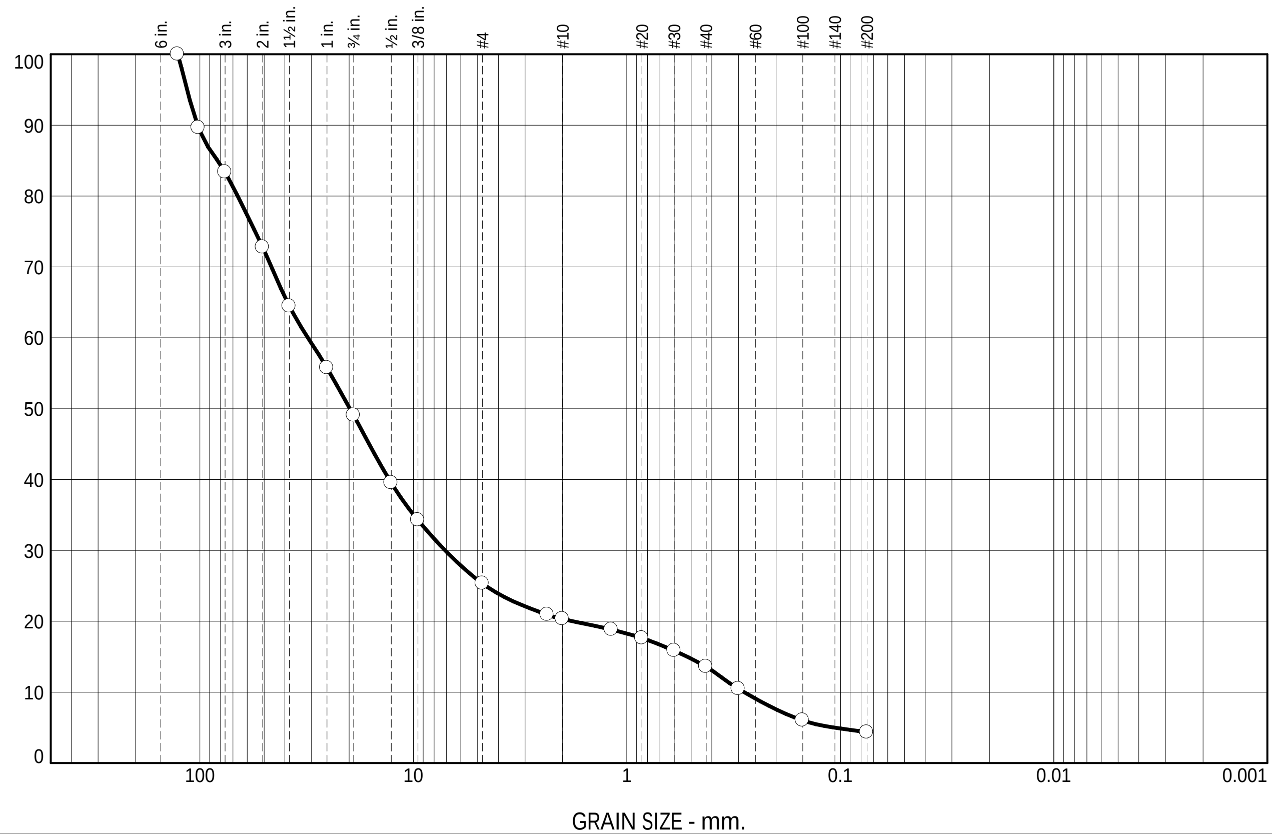
ALLWEST

Client: IMEG Corporation
Project: Miramonte Mary Jane South

Project No: 723-010G Figure C-2

Tested By: H. Love Checked By: A. Warren, PE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
17	34	24	5	6	10	4	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
5"	100		
4"	90		
3"	83		
2"	73		
1 1/2"	64		
1"	56		
3/4"	49		
1/2"	40		
3/8"	34		
#4	25		
#8	21		
#10	20		
#16	19		
#20	18		
#30	16		
#40	14		
#50	10		
#100	6		
#200	4.3		

* (no specification provided)

Soil Description

Poorly graded GRAVEL with sand and cobbles

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 102.6388 D_{85}= 82.5245 D_{60}= 31.1824
D_{50}= 19.8440 D_{30}= 7.1006 D_{15}= 0.5219
D_{10}= 0.2824 C_u= 110.43 C_c= 5.73

Classification

USCS= GP-GM AASHTO= A-1-a

Remarks

Sampled by A. Warren (ALLWEST)
Procedure A (-#4 only)

Location: TP-04
Sample Number: S723-0038 Depth: 3' - 6' Date: 3.3.2023

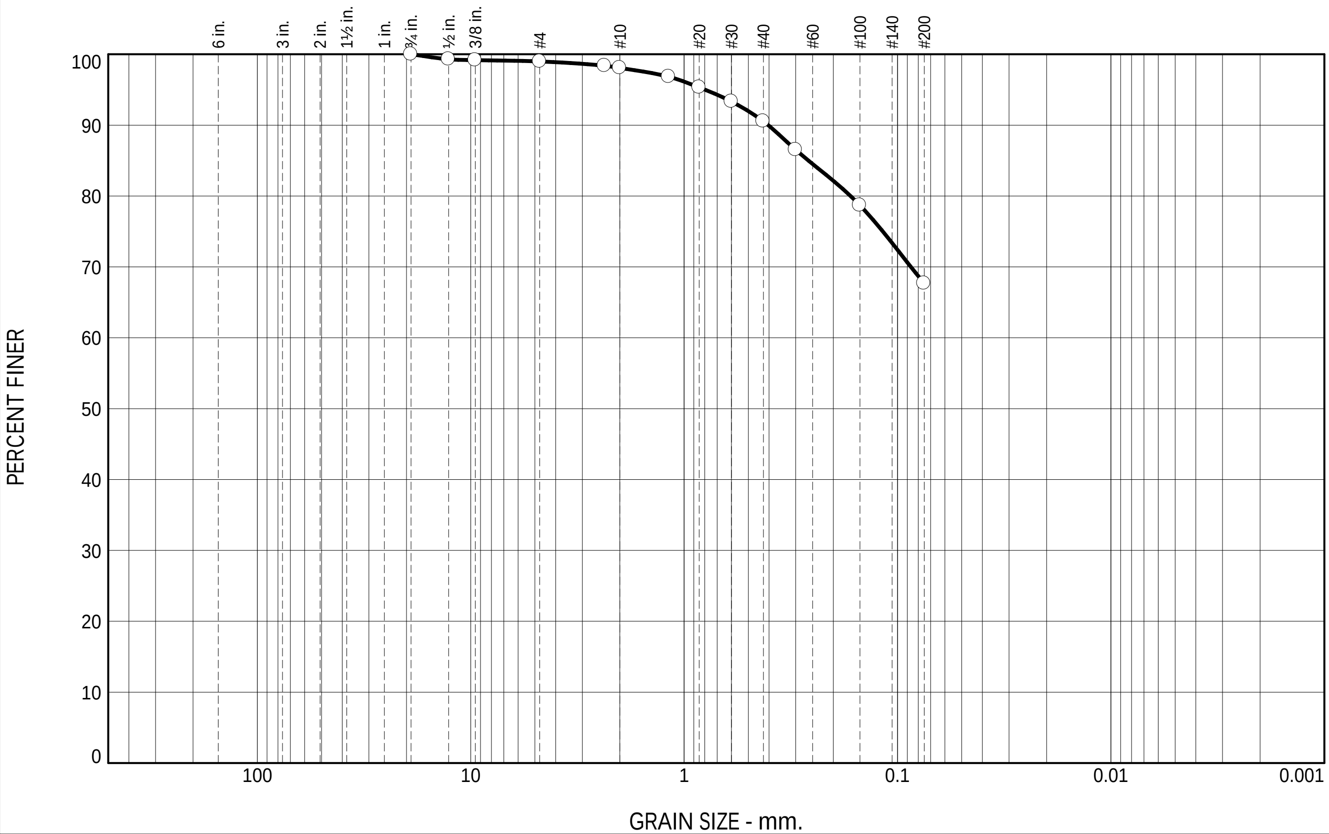
ALLWEST

Client: IMEG Corporation
Project: Miramonte Mary Jane South

Project No: 723-010G Figure C-3

Tested By: H. Love Checked By: A. Warren, PE

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0	0	1	1	7	23	68	

SIEVE SIZE OR DIAMETER	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100		
1/2"	99		
3/8"	99		
#4	99		
#8	98		
#10	98		
#16	97		
#20	95		
#30	93		
#40	91		
#50	87		
#100	79		
#200	68		

* (no specification provided)

Soil Description

Sandy SILT

Atterberg Limits

PL= 26 LL= 37 PI= 11

Coefficients

D_{90}= 0.4033 D_{85}= 0.2615 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-6(7)

Remarks

Sampled by A. Warren (ALLWEST)
Procedure A (entire sample)

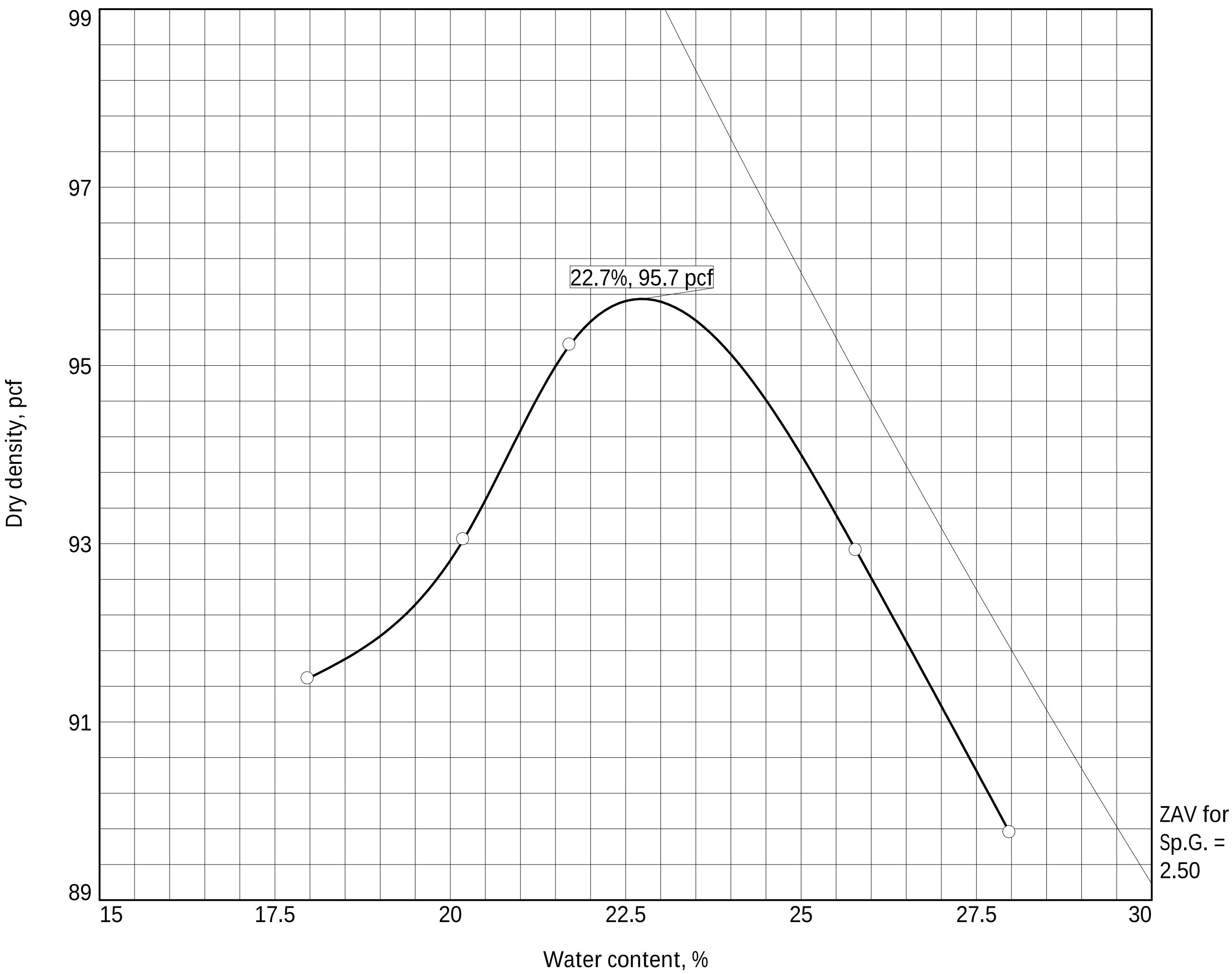
Location: TP-06
Sample Number: S723-0040 Depth: 1' - 3' Date: 3.14.2023

Client: IMEG Corporation
Project: Miramonte Mary Jane South

Project No: 723-010G Figure C-4

Tested By: H. Love Checked By: A. Warren, PE

MOISTURE-DENSITY RELATIONSHIP for Curve No. S723-0036



Test specification: ASTM D 698-12 Method A Standard

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
1' - 3'	ML	A-4(7)	NT	NT	38	10	0	74

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 95.7 pcf Optimum moisture = 22.7 %	SILT with sand

Project No. 723-010G Client: IMEG Corporation

Project: Miramonte Mary Jane South

Date: 3.3.2023

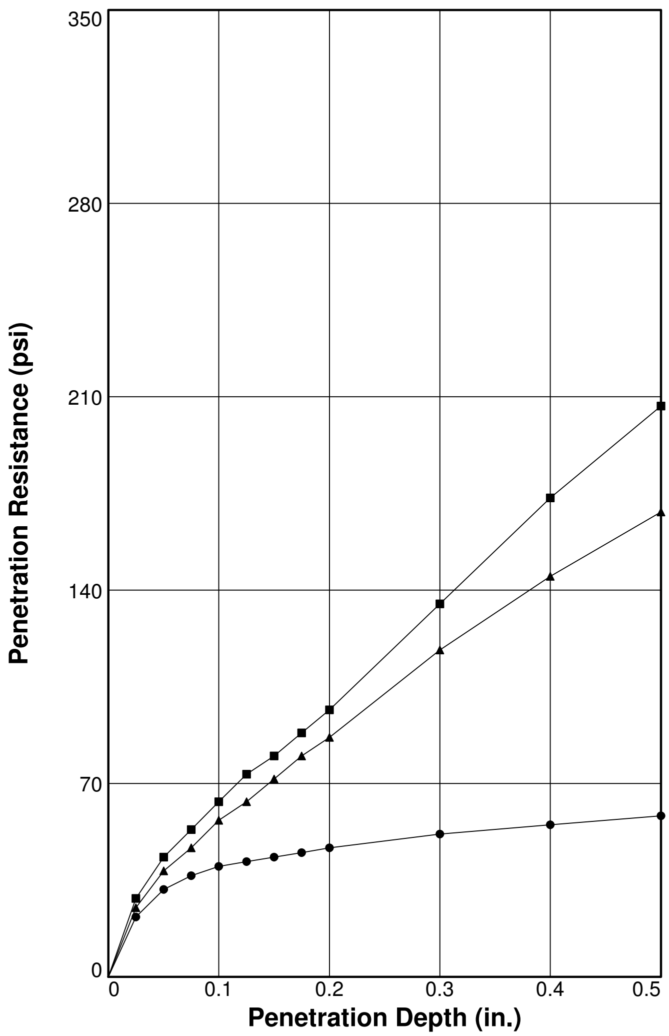
Location: TP-02 Sample Number: S723-0036

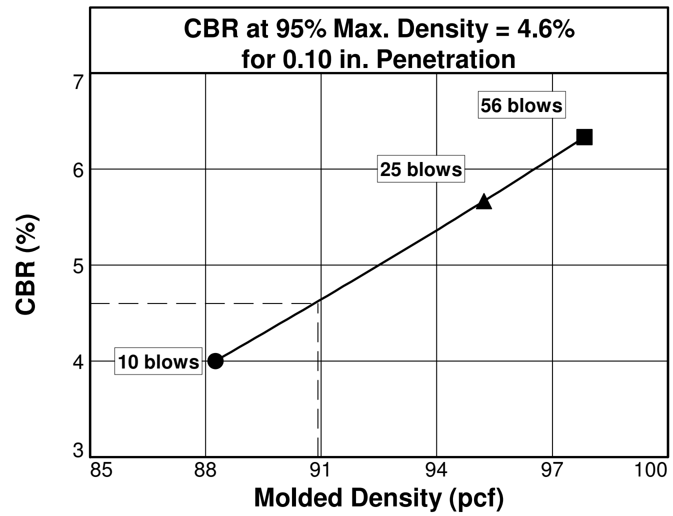
ALLWEST

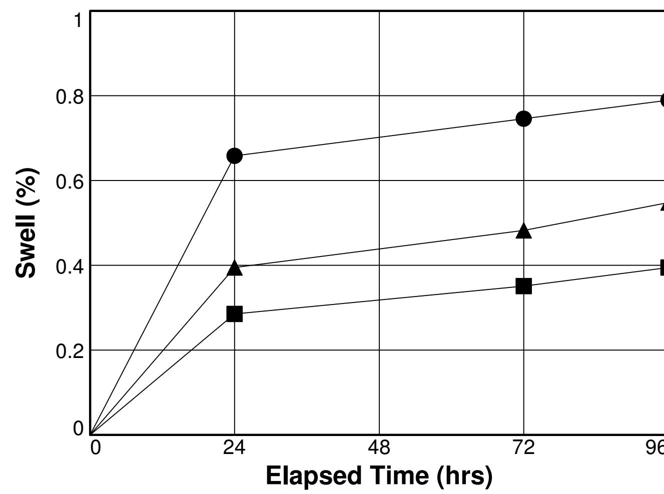
Remarks:

Figure C-5

BEARING RATIO TEST REPORT
ASTM D1883-16







	Molded			Soaked			CBR (%)		Linearity Correction (in.)	Surcharge (lbs.)	Max. Swell (%)
	Density (pcf)	Percent of Max. Dens.	Moisture (%)	Density (pcf)	Percent of Max. Dens.	Moisture (%)	0.10 in.	0.20 in.			
1 ○	88.3	92.3	23.2	87.6	91.5	30.5	4.0	3.1	0.000	10	0.8
2 △	95.2	99.5	23.2	94.7	99	27.9	5.7	5.8	0.000	10	0.5
3 □	97.8	102.2	23.2	97.5	101.8	26.5	6.3	6.4	0.000	10	0.4

Material Description	USCS	Max. Dens. (pcf)	Optimum Moisture (%)	LL	PI
Silt with sand	ML	95.7	22.7	NP	NP

Project No: 723-010G

Project: Miramonte Mary Jane South

Location: TP-2

Sample Number: S723-0036 **Depth:** 1-3'

Date: 3/15/23

ALLWEST

Test Description/Remarks:

A. Warren sampled 2/28/23

Figure C-6