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and Environmental Scientists

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GEOTECHNICAL ENGINEERING STUDY
PARKER TOWN HALL EXPANSION
20120 MAINSTREET
PARKER, COLORADO

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20120 East Mainstreet
Parker, Colorado 80134

Project No: 22-2-222

January 17, 2023

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SUMMARY

1. Eleven exploratory borings were drilled at the site of the proposed development to explore the subsurface conditions. Below a thin layer of topsoil or asphalt pavement, a discontinuous layer of existing fill was encountered to depths of up to about 5 feet. Native granular soils were encountered below these materials, and extended to the maximum explored depths of 5 to 25 feet in all of the borings except Boring 4, where a layer of clay was encountered at a depth of about 20½ feet. No bedrock was encountered within the borings.

2. The existing fill consisted of clayey sand, silty clayey sand, and silty sand, and will be suitable for reuse at this site if it is properly processed and moisture conditioned. Details can be found in the "Site Grading and Earthwork" section of this report.

3. During drilling, groundwater depths ranged from 13 to 17 feet and were measured at depths of 14.4 to 14.9 feet seven days later. Although water was encountered in all five of the structure borings initially, it was only measured in two borings during our follow-up visit. This is likely due to the granular soils sloughing and caving off at a slightly higher level than the groundwater. Cave depths ranged from 12.5 to 14.9 feet when measured seven days after drilling. The groundwater elevation is expected to fluctuate over time due to seasonal, climatic, and other factors.

4. Considering the data obtained from the field and laboratory studies and the nature of the proposed construction, it is our opinion that shallow footing foundations bearing on undisturbed native soils will be suitable for this site. Due to the presence of undocumented fill, we recommend it's removal and replacement below movement-sensitive structures such as foundations unless documentation can be provided indicating it has been suitably placed. Based on the fill depths encountered during our exploration, we anticipate fill depths up to about 3 feet across this site, but actual fill may be deeper in areas. Foundations bearing on suitable materials may be designed for a maximum allowable bearing pressure of 3,000 psf.

5. Based on the estimated traffic volumes presented in the "Pavement Design" section of this report, we recommend the following pavement sections for this project.

Traffic	Pavement Section Thickness (in.)	
	Composite Asphalt over Base Course	Portland Cement Concrete over Base Course
Parking Lots and Drive Areas	5 over 6	7 over 4
Pikes Peak Avenue	6 over 8	7 over 4

Portland Concrete Pavement (PCC) should be used in areas where concentrated truck turning moments are anticipated such as at trash enclosures.

PURPOSE AND SCOPE OF STUDY

This report presents the results of a geotechnical engineering study for the proposed expansion of the new town hall in Parker, Colorado. The project site is shown on Fig. 1. The study was conducted in general accordance with the scope of work in our Proposal No. C22-296, dated October 24, 2022, for the purpose of providing recommendations for site grading, foundations, and pavements.

This report has been prepared to summarize the data obtained during this study and to present our conclusions and recommendations based on the proposed construction and the subsurface conditions encountered. Design parameters and a discussion of geotechnical engineering considerations related to the proposed construction are included in the report.

PROPOSED CONSTRUCTION

The existing new town hall facility will be expanded, and will include a two-story addition to the east, and a one-story addition to the west. The two-story expansion will have a plan area of about 32,000 square feet, and the single story addition will be about 1,800 square feet. No below grade interior space will be constructed as a part of this project. The existing parking areas will be reconfigured, and a new parking lot will be constructed to the east of Pikes Peak Avenue. The midsection of Pikes Peak Avenue will be realigned to accommodate these changes. The layout provided to us for this project was conceptual, but we understand that it generally reflects the final site layout.

The buildings and paved areas will be constructed at or near the existing grade with minimal cuts and fills occurring across the site. If construction, locations, or conditions are significantly different from those described above or depicted in this report, we should be notified to reevaluate the recommendations contained herein.

SITE CONDITIONS

The site is located at 20120 Mainstreet in Parker, Colorado. The project site is at the location of the currently operating new town hall, which includes a mixed 1 and 2-story building with a footprint of roughly ½ acre, and about 1½ acres of paved space. An irrigated grass lawn is located at the east side of the building, and field grass areas are located along the north side of the site, and in the area of the proposed new parking lot to the east of Pikes Peak Avenue. Small to medium trees and shrubs are located throughout the site, but are more concentrated within

irrigated areas, and along the perimeter of pavements. Sulphur Gulch is located just south of the site, and is about 5 to 10 feet lower than the surrounding areas.

SUBSURFACE CONDITIONS

Information on the subsurface conditions was obtained by drilling eleven exploratory borings at the approximate locations shown on Fig. 1. The borings were drilled on November 18, 2022 with a 4-inch diameter, continuous flight auger. Graphic logs of the borings and the corresponding legend and notes are presented on Figs. 2 and 3. The results of laboratory testing performed on selected soil samples from the borings are presented on Figs. 4 through 11, and are summarized on Table I. The laboratory testing was conducted in general accordance with applicable ASTM standards.

Below a thin layer of topsoil or asphalt pavement, a discontinuous layer of existing fill was encountered to depths of up to about 3 feet within the proposed building footprint, but extended to about 5 feet deep elsewhere. Native granular soils were encountered below these materials, and extended to the maximum explored depths of 5 to 25 feet in all of the borings except Boring 4, where a layer of clay was encountered at a depth of about 20½ feet. No bedrock was encountered within the borings. A brief discussion of each major soil type encountered is presented below. Additional details including the depths at which each soil was encountered can be found on the attached Figs. 2 and 3.

Asphalt pavement was encountered in Borings 3, 5, 6, and 7 drilled within the existing parking area. The pavement ranged in thickness from about 5 to 6 inches, and averaged 5½ inches. The pavement has numerous randomly oriented cracks, but is over 20 years old. It appears to be in relatively good condition considering its age.

The fill encountered consisted of clayey sand, silty clayey sand, and silty sand. These soils were generally fine to coarse grained, moist, and mottled brown. The lateral and vertical extents of the existing fill were not determined as a part of this study.

The native soils included poorly to well graded sand with silt and silty sand. These soils were fine to coarse grained, loose to medium dense, moist to wet, and light brown to brown. The sample of silty sand tested was non-expansive, and underwent a slight amount of additional compression upon wetting upon a surcharge pressure of 200 psf.

Lean clay with sand was found at depth in Boring 4. The clay included a fine to medium grained sand fraction, was stiff, very moist, and brown.

During drilling, groundwater depths ranged from 13 to 17 feet and were measured at depths of 14.4 to 14.9 feet seven days later. Although water was encountered in all five of the structure borings initially, it was only measured in two borings during our follow-up visit. This is likely due to the granular soils sloughing and caving of at a slightly higher level than the groundwater. Cave depths ranged from 12.5 to 14.9 feet when measured seven days after drilling. The groundwater elevation is expected to fluctuate over time due to seasonal, climatic, and other factors, but is unlikely to be a consideration at the anticipated excavation depths for this project.

FOUNDATION CONSIDERATIONS

Considering the data obtained from the field and laboratory studies and the nature of the proposed construction, it is our opinion that a conventional footing foundations will be suitable for this site, but that all existing fill should be removed and replaced with well compacted, moisture conditioned soil. Scarification and recompaction of the native soils at the base of the footings should also be performed to provide adequate bearing conditions. Recommendations for shallow footings are presented below.

Footing Foundations: The design and construction criteria presented below should be observed for a footing foundation system. The construction details should be considered when preparing project documents.

1. All existing fill should be removed from below the proposed footings. The base of the foundation excavation should be scarified and recompacted to a depth of about 12 inches below the base of the footing. Footings constructed on suitable soils should be designed for an allowable soil bearing pressure of 3,000 psf.

2. For foundations bearing on suitable soil, we estimate total settlement for footings designed and constructed as discussed in this section will be less than about 1 inch. Differential settlements across each building footprint are estimated to be approximately ½ to ¾ of the total settlement. This settlement will be differential with respect to the existing building. Design details should account for this potential differential movement.

3. Shallow foundations should have a minimum width of 16 inches for continuous footings and 24 inches for isolated pads.

4. Exterior footings and footings beneath unheated areas should be provided with adequate soil cover above their bearing elevation for frost protection. Placement of foundations at least 36 inches below the exterior grade is typically used in this area.

5. The lateral resistance of a footing placed on properly suitable compacted fill material will be a combination of the sliding resistance of the foundation on the foundation bearing materials and passive earth pressure against the side of the footing. Resistance to sliding at the bottoms of the footings may be calculated based on an allowable coefficient of friction of 0.35. Passive pressure against the sides of the foundation may be calculated using an allowable equivalent fluid unit weight of 190 pcf.

6. Continuous foundation walls should be reinforced top and bottom to span an unsupported length of at least 10 feet.

7. Granular foundation soils should be moistened, and densified with a smooth vibratory compactor prior to placement of concrete.

8. Areas of soft, loose, or otherwise deleterious material encountered within the foundation excavation should be removed and replaced with properly compacted structural fill.

9. A representative of the geotechnical engineer should observe all footing excavations prior to fill and concrete placement.

FLOOR SLABS

The existing native granular soils, exclusive of topsoil, are suitable to support lightly to moderately loaded floor slabs. As with the foundations, all existing fill should be removed where it is encountered below the slab. To reduce the effects of some differential movement, the following measures should be taken.

1. The soils below the proposed slab should be scarified and moisture conditioned to a depth of about 12 inches prior to the placement of concrete.

2. Floor slabs should be separated from all bearing walls and columns with expansion joints which allow unrestrained vertical movement.

3. Floor slabs should not extend beneath exterior doors or over foundation stem walls, unless saw cut at the beam after construction.

4. Floor slab control joints should be used to reduce damage due to shrinkage cracking. The appropriate joint spacing is dependent on slab thickness, concrete aggregate size and slump, and should be consistent with recognized guidelines such as those of the Portland Cement Association (PCA) or American Concrete Institute (ACI). The joint spacing and any requirements for slab reinforcement should be established by the designer based on experience and the intended slab use.

5. If moisture-sensitive floor coverings will be used, mitigation of moisture penetration into the slabs, such as by use of a vapor barrier, may be required. If an impervious vapor barrier membrane is used, special precautions will be required to reduce potential differential curing problems which could cause the slabs to warp. Section 302.1R of the ACI Manual of Concrete Practice addresses this topic.

6. All plumbing lines should be tested before operation. Where plumbing lines or other protrusions enter through the floor, a positive bond break should be provided. Flexible connections should be provided for slab-bearing mechanical equipment.

The precautions and recommendations itemized above will not prevent the movement of floor slabs but, the precautions should reduce the damage if such movement occurs.

SEISMIC DESIGN CRITERIA

Using estimated shear wave velocities for the subgrade materials encountered based on standard penetration testing, a design Site Class D has been assigned per the International Building Code (IBC). Based on the subsurface profile and site seismicity, liquefaction is not a design consideration.

WATER SOLUBLE SULFATES

The concentration of water soluble sulfates measured in samples obtained from the exploratory borings were 0.01 percent or less. Water soluble sulfate concentrations in this range represent a Class 0 severity of exposure to sulfate attack on concrete exposed to these materials. The degree of attack is based on a range of Class 0 to Class 3 severity of exposure as presented in ACI 201. Based on this information and our experience with similar materials, we believe sulfate resistant cement will not be required for concrete exposed to the onsite soils. We recommend concrete containing Type I/II cement be used for this project due to its ready availability.

SURFACE DRAINAGE

Providing proper surface drainage, both during construction and after the construction has been completed, is very important for acceptable performance of the facility. The following recommendations should be used as guidelines and changes should be made only after consultation with the geotechnical engineer.

1. Excessive wetting or drying of the foundation, slab, and pavement subgrades should be avoided during construction.

2. Care should be taken when compacting around the foundation walls to avoid damage to the structure.

3. The ground surface surrounding the exterior of the building should be sloped to drain away from the foundation in all directions. We recommend a minimum slope of 6 inches in the first 10 feet in unpaved areas. Site drainage beyond the 10-foot zone should be designed to promote runoff and reduce water infiltration. A minimum slope of 3 inches in the first 10 feet is recommended in the paved areas. These slopes may be changed as required for handicap access points in accordance with the Americans with Disabilities Act.

4. Ponding of water should not be allowed on backfill material or within 10 feet of the foundations, whichever is greater.

5. Roof downspouts and drains should discharge well beyond the limits of all backfill.

6. Excessive landscape irrigation should be avoided within 10 feet of the foundation walls.

PAVEMENT DESIGN

A pavement section is a layered system designed to distribute concentrated traffic loads to the subgrade. Performance of the pavement structure is directly related to the physical properties of the subgrade soils and traffic loadings. Site pavements are expected to include new asphalt along Pikes Peak Avenue and the parking areas, and concrete in highly trafficked sections and areas receiving concentrated turning movements such as at trash enclosures.

Subgrade Materials: Based on the American Association of State Highway Transportation Officials (AASHTO) classification system the soils tested near the proposed pavement elevation classified as A-1-a, A-1-b, A-2-4, A-2-6, A-3, and A-6 soil with a maximum group index of 2. An R-value test was conducted on a representative sample of A-2-4 soil, and was found to have an R-value of 16 corresponding to a resilient modulus of 4,334 psi. This value was used for the design of flexible pavements, and a subgrade modulus of 150 pci was used for the design of rigid pavements.

Design Traffic: Traffic loading information was not available at the time of report preparation. Based on our experience, we estimated Equivalent 18-kip Single Axle Loads (ESAL's) of 146,000 and 220,000 for the design of flexible and rigid pavements for parking areas. ESAL values of 365,000 and 550,000 were used for the design of flexible and rigid pavements within Pikes Peak Avenue based on the default values presented in the Town of Parker Roadway Design and Construction Manual for non-residential local roadways. If it is determined that actual traffic is significantly different from that estimated, we should be contacted to reevaluate the pavement thickness design.

Pavement Sections: The recommended sections were determined using the 1993 AASHTO pavement design procedures. Based on the subgrade conditions encountered and the traffic information provided, we recommend the following pavement sections:

Traffic	Pavement Section Thickness (in.)	
	Composite Asphalt over Base Course	Portland Cement Concrete over Base Course
Parking Lots and Drive Areas	5 over 6	7 over 4
Pikes Peak Avenue	6 over 8	7 over 4

Trash pickup areas, and other areas where truck turning movements are concentrated should be paved with a minimum 7 inches of Portland Cement Concrete (PCC) over 4 inches of base coarse material.

Pavement Materials: The asphalt pavement should consist of a bituminous material which meets the requirements of the Town of Parker Specifications. An asphalt binder grade of PG 58-28 and a design gyration value of N_{DES}=50 may be used for local roadways. A ½-inch SX mix should be used for the top mat, and an S mix may be used for the lower lifts. Aggregate base course should meet the requirements of a CDOT Class 6 material.

Concrete pavement should meet the requirements of a Class P Mix, per Section 601 of the CDOT Standard Specifications, and should be based on a mix design established by a qualified engineer. The concrete should contain joints not greater than 12 to 14 feet on centers. Joint spacing should be determined by a qualified engineer. The joints should be hand formed, sawed, or formed by pre-molded filler. The joints should be at least 1/4 of the slab thickness. Expansion joints should be provided at the end of each construction sequence and between the concrete slab and adjacent structures. Expansion joints where required, should be filled with a ½ inch-thick asphalt impregnated fiber. Concrete should be cured by protecting against loss of moisture, rapid temperature changes and mechanical injury for at least three days after placement. The concrete sections presented above are assumed to be unreinforced. Providing tiebars at construction joints and dowels at transverse joints would help reduce the risk of differential movements between panel sections. Providing a grid mat of deformed rebar or welded wire mesh within the concrete pavement section would assist in mitigating corner breaks and differential panel movements. If a rebar mat is installed, we recommend that the bars be placed in the lower half of the pavement section. Also, if reinforcing is used, we have commonly seen No. 4 rebar placed at 24-inch center in each direction, however, we recommend that a structural engineer evaluate the placement and spacing of rebar if needed.

Subgrade Preparation: Immediately prior to paving, we recommend the pavement subgrade be thoroughly scarified and well-mixed to a minimum depth of 12 inches, and adjusted to the moisture and compaction criteria presented in the “Site Grading and Earthwork” section of the report. Before paving, the subgrade should be proof rolled with a heavily loaded, pneumatic-tired vehicle. The vehicle should have a gross weight of at least 50,000 pounds, with a single loaded axle weight of 18,000 pounds, and a tire pressure of 100 psi. Areas that deform excessively under

heavy wheel loads are not stable, and should be removed and replaced with suitable material to achieve a stable subgrade prior to paving.

Drainage: The collection and diversion of surface drainage away from paved areas is extremely important to the satisfactory performance of the pavement. Drainage design should provide for the removal of water from paved areas and prevent the wetting of the subgrade soils.

EXCAVATION CONSIDERATIONS

In our opinion the overburden soils encountered in the exploratory borings drilled for this study can be excavated with conventional construction equipment. All excavations should be in accordance with OSHA, state and local requirements. The contractor should follow appropriate safety precautions. In accordance with OSHA guidelines, the native overburden soils and existing fill soils will likely classify as a Type C material. If materials different from those indicated in this report are encountered, the OSHA soil type may vary and need to be adjusted. A contractor's competent person should make decisions regarding cut slopes. A qualified geotechnical engineer should observe any questionable slopes or conditions. Per OSHA criteria, unless excavations are shored, temporary excavations in Type C materials should have slopes no steeper than 1½:1 (H:V). Shoring will be required where excavated slopes cannot be accommodated.

Groundwater was encountered during our investigation, but is not anticipated at the proposed excavation depths. However, if groundwater exists above the depth of excavation, flatter slopes will be required. It is assumed site dewatering would occur in advance of the excavation and be maintained the entire duration that the excavation is open. Surface drainage should be diverted away from all temporary cut slopes in order to reduce the potential for slope erosion and instability. OSHA regulations require that excavations greater than 20 feet in depth and excavations that extend below the ground water level be designed by a professional engineer.

SITE GRADING AND EARTHWORK

We recommend the following criteria be used when preparing the site grading plans.

Over-Excavation of Existing Fill: The existing fill is undocumented, and should not be relied upon to support structures or flatwork that will be sensitive to settlement related movement. We recommend the existing fill be completely removed and replaced in these areas. The fill will be

suitable for reuse throughout the site if it is adequately moisture conditioned. Where required, over-excavation should extend out from the perimeter of all foundations at a 1:1 projection.

Fill Material Specifications: The following material specifications are presented for fills on the project site.

1. *Fill Within the Proposed Development*: The on-site granular soils (including existing fill), minus any deleterious materials (e.g. vegetation, brush, sod), will be suitable for reuse throughout the site. Import soils if used, should consist of a non-expansive soil, consisting of a minus 2-inch material that has a maximum 35% passing the No. 200 sieve, and a maximum plasticity index of 15. The geotechnical engineer should evaluate the suitability of all proposed fill materials prior to placement.

2. *Pavement Subgrade Areas:* Same as # 1 above.

3. *Utility Trench Backfill*: Material excavated from the utility trenches may be used for backfill provided it does not contain unsuitable material or particles larger than 2 inches.

4. *Subgrade Preparation*: The ground surface shall be stripped of vegetation/organics, loose soils, or any other unsuitable materials prior to fill placement. The resulting ground surface should be scarified to a depth of 12 inches; moisture conditioned as necessary, and compacted in a manner specified below for the subsequent layers of fill. Loose or unstable soils shall be removed, where present, in order to provide a stable platform prior to placement of fill.

Compaction Requirements: A representative of the geotechnical engineer should observe fill placement operations on a full-time basis. We recommend the following minimum compaction criteria be used on the project.

Area	Percentage of Modified Proctor Maximum Dry Density (ASTM D 1557)
Building Pad	95%
Pavement Areas/Exterior Flatwork	95%
Foundation Wall Backfill	90%
Landscape and Other Misc. Overlot Fill Areas	90%
Compaction of fill materials should be achieved at a moisture content within +/- 2% of the optimum moisture content. For the placement of particularly clean sands, a lower moisture content still near optimum may be suitable at the direction of the geotechnical engineer.	

DESIGN AND SUPPORT SERVICES

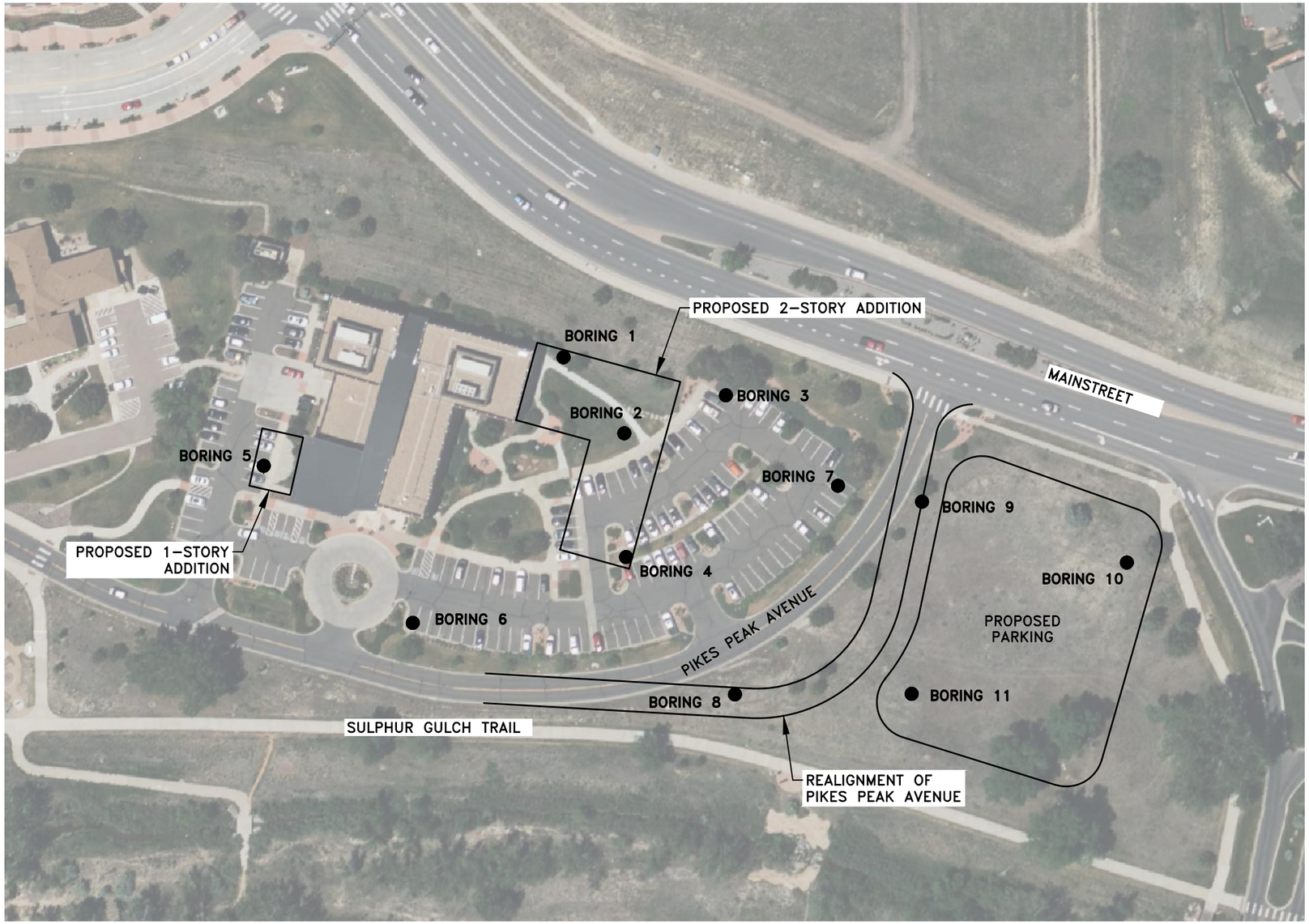
Kumar & Associates, Inc. should be retained to review the project plans and specifications for conformance with the recommendations provided in our report. We are also available to assist the design team in preparing specifications for geotechnical aspects of the project, and performing additional studies if necessary to accommodate possible changes in the proposed construction. We recommend that Kumar & Associates, Inc. be retained to provide observation and testing services to document that the intent of this report and the requirements of the plans and specifications are being followed during construction, and to identify possible variations in subsurface conditions from those encountered in this study so that we can re-evaluate our recommendations, if needed.

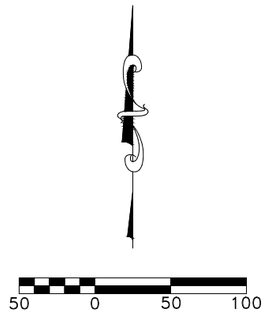
LIMITATIONS

This study has been conducted for exclusive use by the client for geotechnical related design and construction criteria for the project. The conclusions and recommendations submitted in this report are based upon the data obtained from the exploratory borings at the locations indicated on Fig. 1 or as described in the report, and the proposed type of construction. This report may not reflect subsurface variations that occur between the exploratory borings, and the nature and extent of variations across the site may not become evident until site grading and excavations are performed. If during construction, fill, soil, rock or water conditions appear to be different from those described herein, Kumar & Associates, Inc. should be advised at once so that a re-evaluation of the recommendations presented in this report can be made. Kumar & Associates, Inc. is not responsible for liability associated with interpretation of subsurface data by others.

The scope of services for this project does not include any environmental assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the potential for such contamination, other studies should be undertaken.

AFK/th
Rev: DPC





APPROXIMATE SCALE–FEET

VICINITY MAP
NOT TO SCALE

22–2–222	Kumar & Associates		LOCATION OF EXPLORATORY BORINGS	Fig. 1

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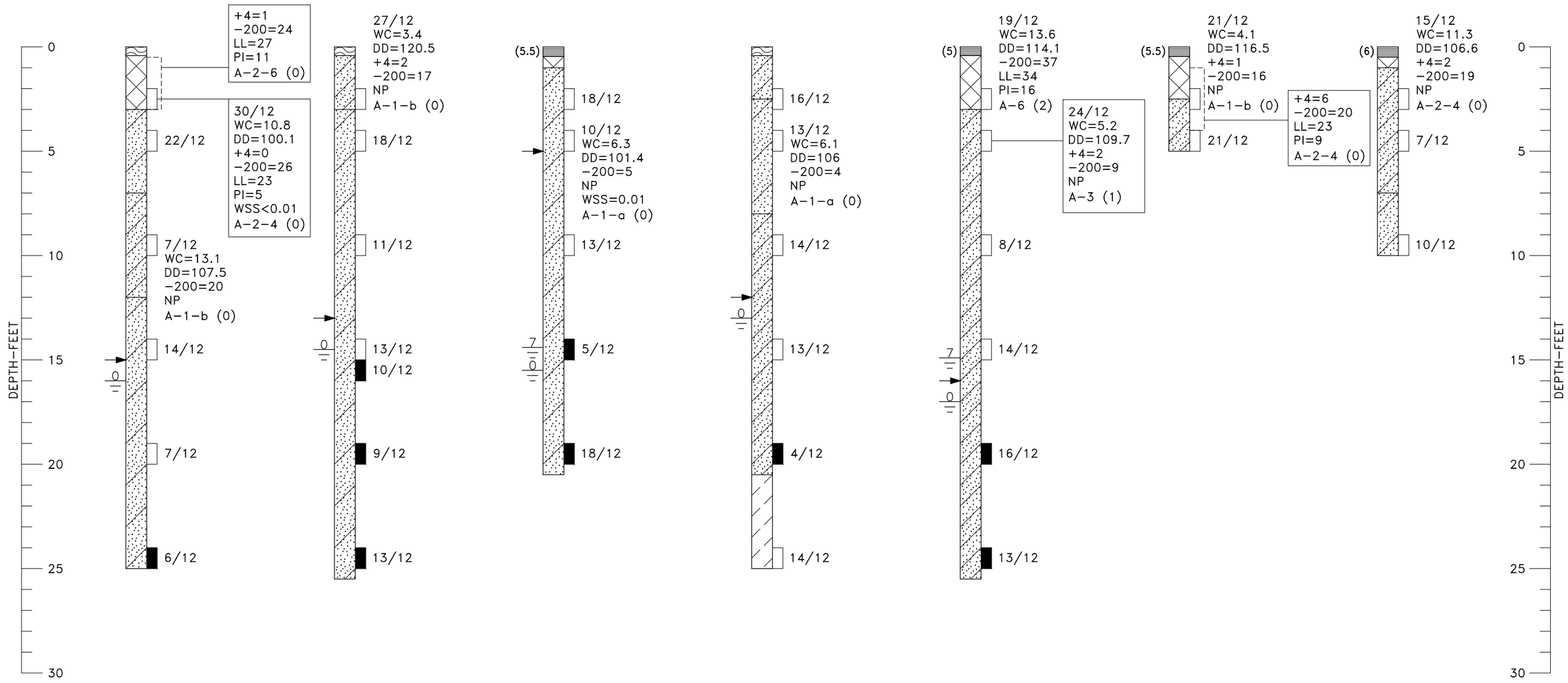
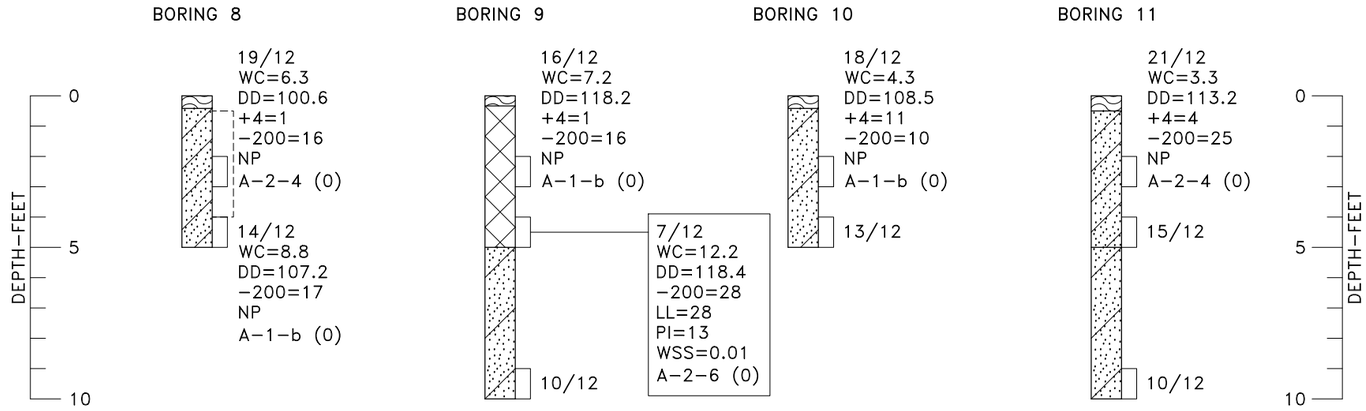


22−2−222	Kumar & Associates		LOGS OF EXPLORATORY BORINGS	Fig. 2



LEGEND

TOPSOIL.

(5.5) ASPHALT, THICKNESS IN INCHES SHOWN IN PARENTHESES TO LEFT OF THE LOG.

FILL: CLAYEY SAND (SC), SILTY CLAYEY SAND (SC–SM), AND SILTY SAND (SM), FINE TO COARSE GRAINED, MOIST, MOTTLED BROWNS.

POORLY TO WELL GRADED SAND WITH SILT (SP–SM TO SW–SM), FINE TO COARSE GRAINED, INCLUDES ZONES OF SILTY SAND, LOOSE TO MEDIUM DENSE, MOIST TO WET, LIGHT BROWN.

SILTY SAND (SM) GENERALLY FINE TO MEDIUM GRAINED, WITH SOME COARSE ZONES, LOOSE TO MEDIUM DENSE, MOIST TO WET, BROWN.

LEAN CLAY WITH SAND (CL), FINE TO MEDIUM GRAINED SAND FRACTION, STIFF, VERY MOIST, BROWN.

DRIVE SAMPLE, 2–INCH I.D. CALIFORNIA LINER SAMPLE.

DRIVE SAMPLE, 1 3/8–INCH I.D. SPLIT SPOON STANDARD PENETRATION TEST.

DISTURBED BULK SAMPLE.

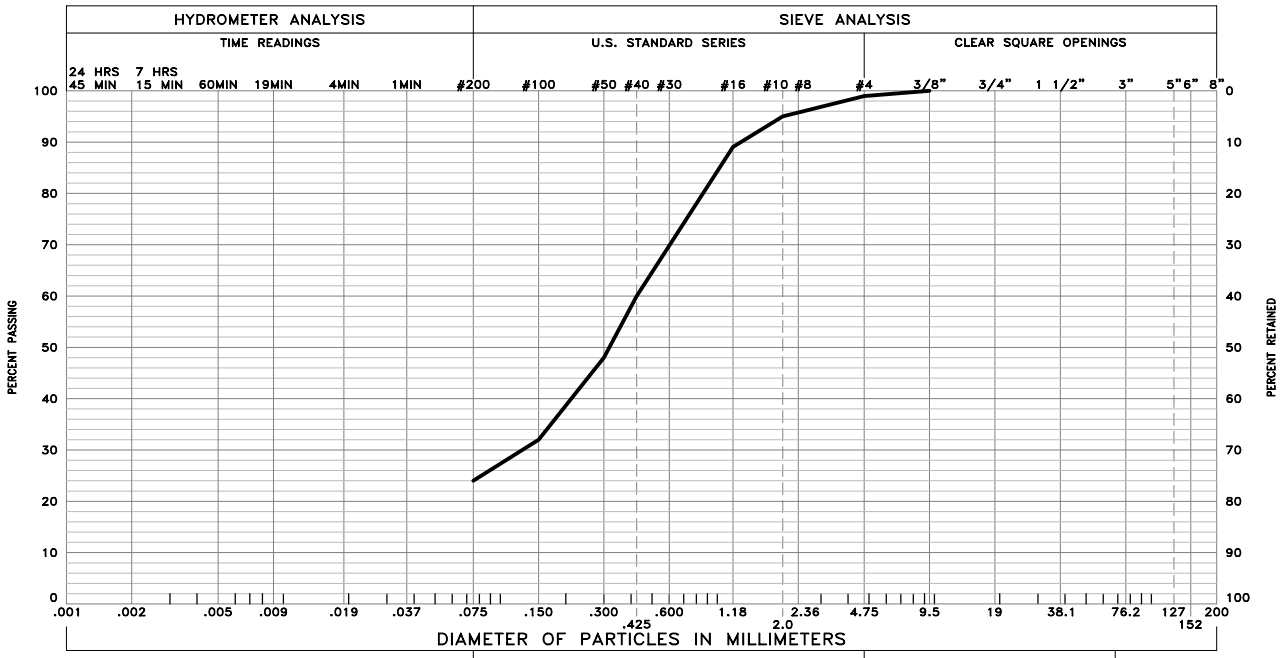
30/12 DRIVE SAMPLE BLOW COUNT. INDICATES THAT 30 BLOWS OF A 140–POUND HAMMER FALLING 30 INCHES WERE REQUIRED TO DRIVE THE SAMPLER 12 INCHES.

0,7 DEPTH TO WATER LEVEL AND NUMBER OF DAYS AFTER DRILLING MEASUREMENT WAS MADE.

DEPTH AT WHICH BORING CAVED.

NOTES

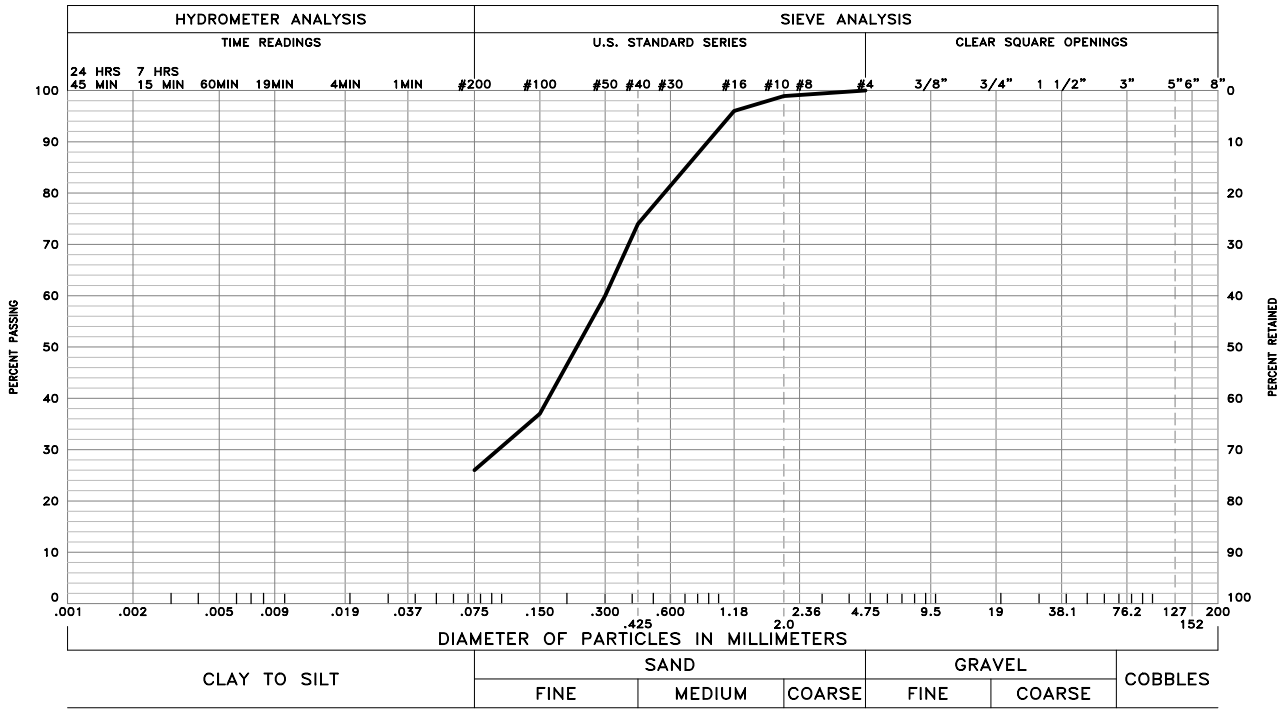
1. THE EXPLORATORY BORINGS WERE DRILLED ON NOVEMBER 18, 2022 WITH A 4–INCH–DIAMETER CONTINUOUS–FLIGHT POWER AUGER.
2. THE LOCATIONS OF THE EXPLORATORY BORINGS WERE MEASURED APPROXIMATELY BY HANDHELD GPS DEVICE.
3. THE ELEVATIONS OF THE EXPLORATORY BORINGS WERE NOT MEASURED AND THE LOGS OF THE EXPLORATORY BORINGS ARE PLOTTED TO DEPTH.
4. THE LINES BETWEEN MATERIALS SHOWN ON THE EXPLORATORY BORING LOGS REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN MATERIAL TYPES AND THE TRANSITIONS MAY BE GRADUAL.
5. GROUNDWATER LEVELS SHOWN ON THE LOGS WERE MEASURED AT THE TIME AND UNDER CONDITIONS INDICATED. FLUCTUATIONS IN THE WATER LEVEL MAY OCCUR WITH TIME.
6. LABORATORY TEST RESULTS:
   WC = WATER CONTENT (%) (ASTM D2216);
   DD = DRY DENSITY (pcf) (ASTM D2216);
   +4 = PERCENTAGE RETAINED ON NO. 4 SIEVE (ASTM D6913);
   –200= PERCENTAGE PASSING NO. 200 SIEVE (ASTM D1140);
   LL = LIQUID LIMIT (ASTM D4318);
   PI = PLASTICITY INDEX (ASTM D4318);
   NP = NON–PLASTIC (ASTM D4318);
   WSS = WATER SOLUBLE SULFATES (%) (CP–L 2103);
   A–2–6 (0) = AASHTO CLASSIFICATION (GROUP INDEX) (AASHTO M 145).



GRAVEL 1 % SAND 75 % SILT AND CLAY 24 %

LIQUID LIMIT 27 PLASTICITY INDEX 11

SAMPLE OF: Fill: Clayey Sand (SC) FROM: Boring 1 @ 6"–3'

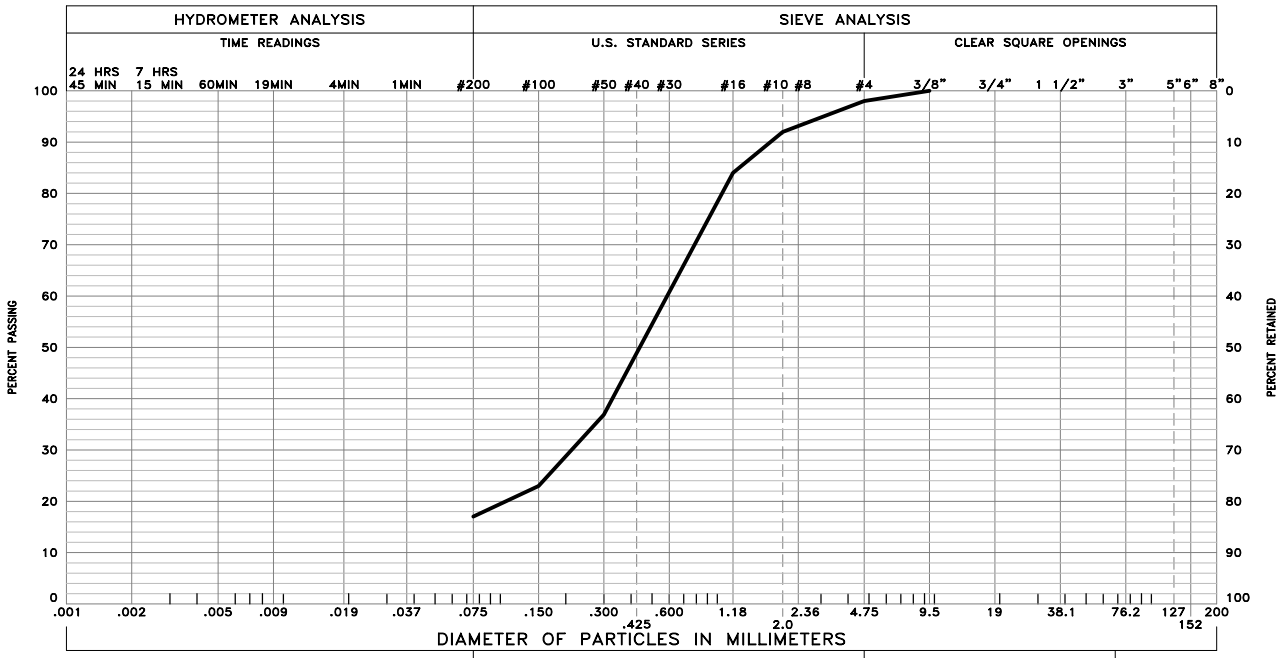


GRAVEL 0 % SAND 74 % SILT AND CLAY 26 %

LIQUID LIMIT 23 PLASTICITY INDEX 5

SAMPLE OF: Fill: Silty Clayey Sand (SC–SM) FROM: Boring 1 @ 2'

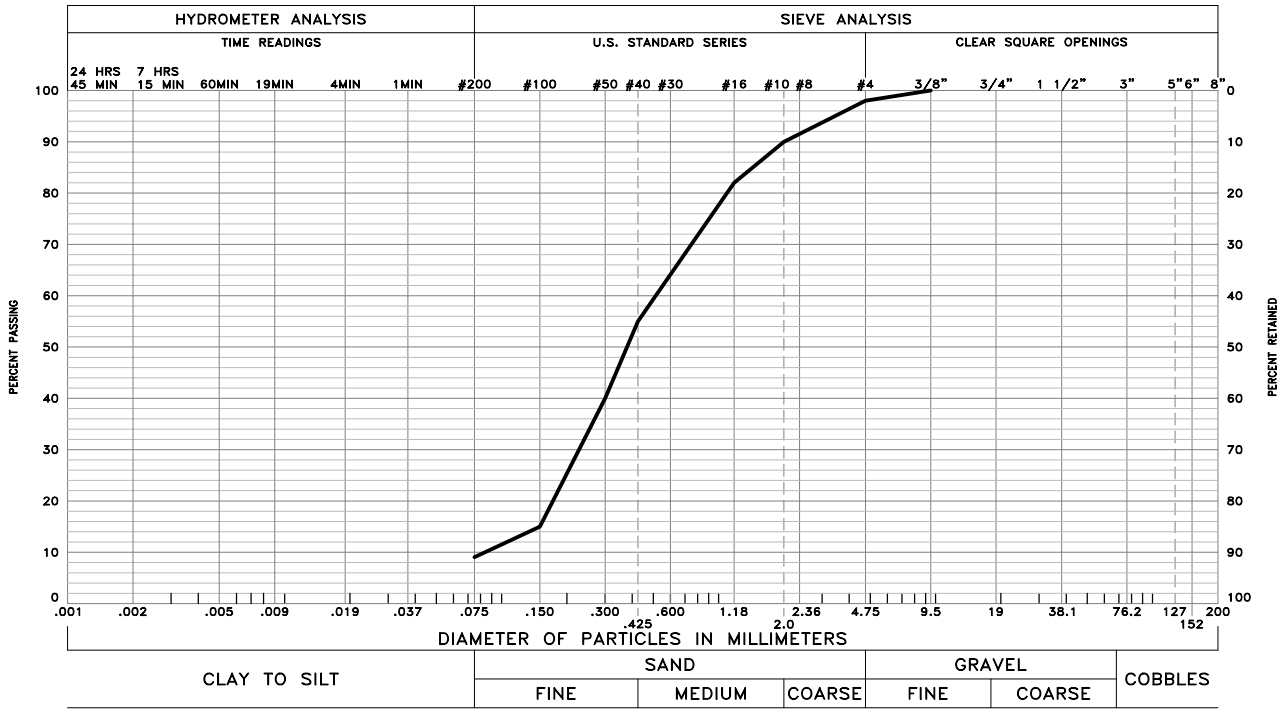
22-2-222	Kumar & Associates	GRADATION TEST RESULTS	Fig. 5



GRAVEL 2 % SAND 81 % SILT AND CLAY 17 %

LIQUID LIMIT – PLASTICITY INDEX NP

SAMPLE OF: Silty Sand (SM) FROM: Boring 2 @ 2'

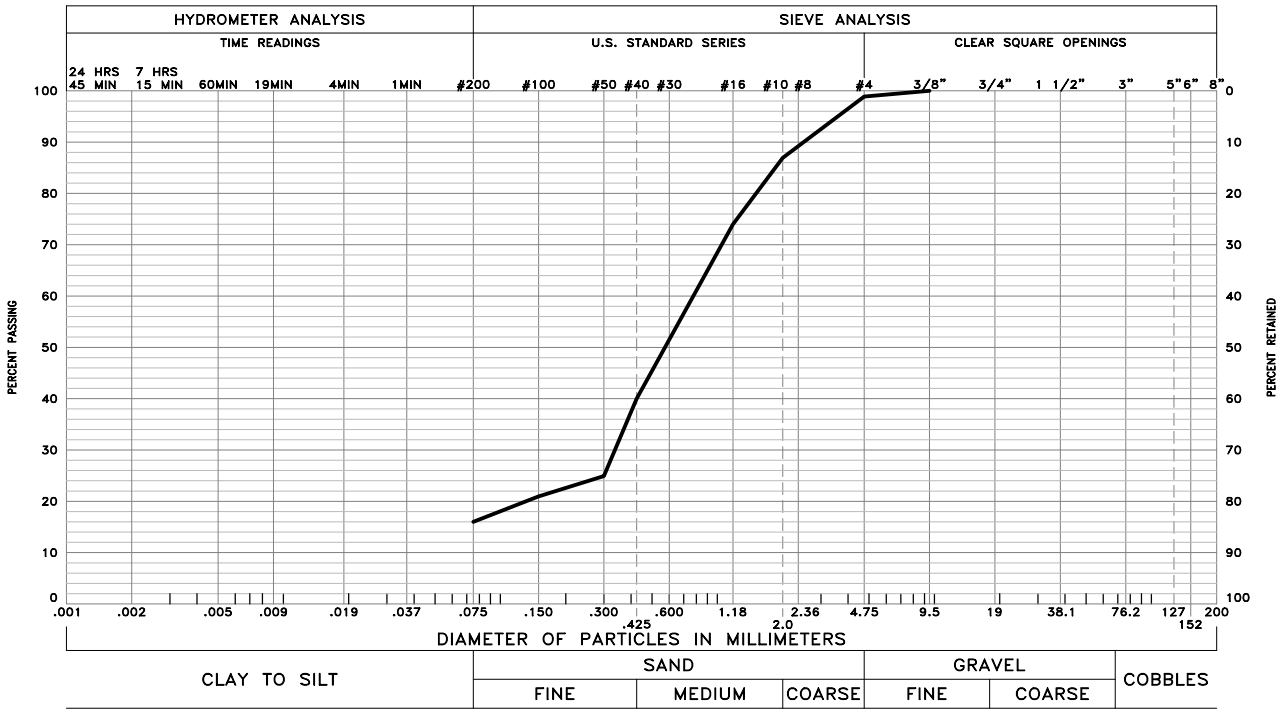


GRAVEL 2 % SAND 89 % SILT AND CLAY 9 %

LIQUID LIMIT – PLASTICITY INDEX NP

SAMPLE OF: Well Graded Sand with Silt (SW-SM) FROM: Boring 5 @ 4'

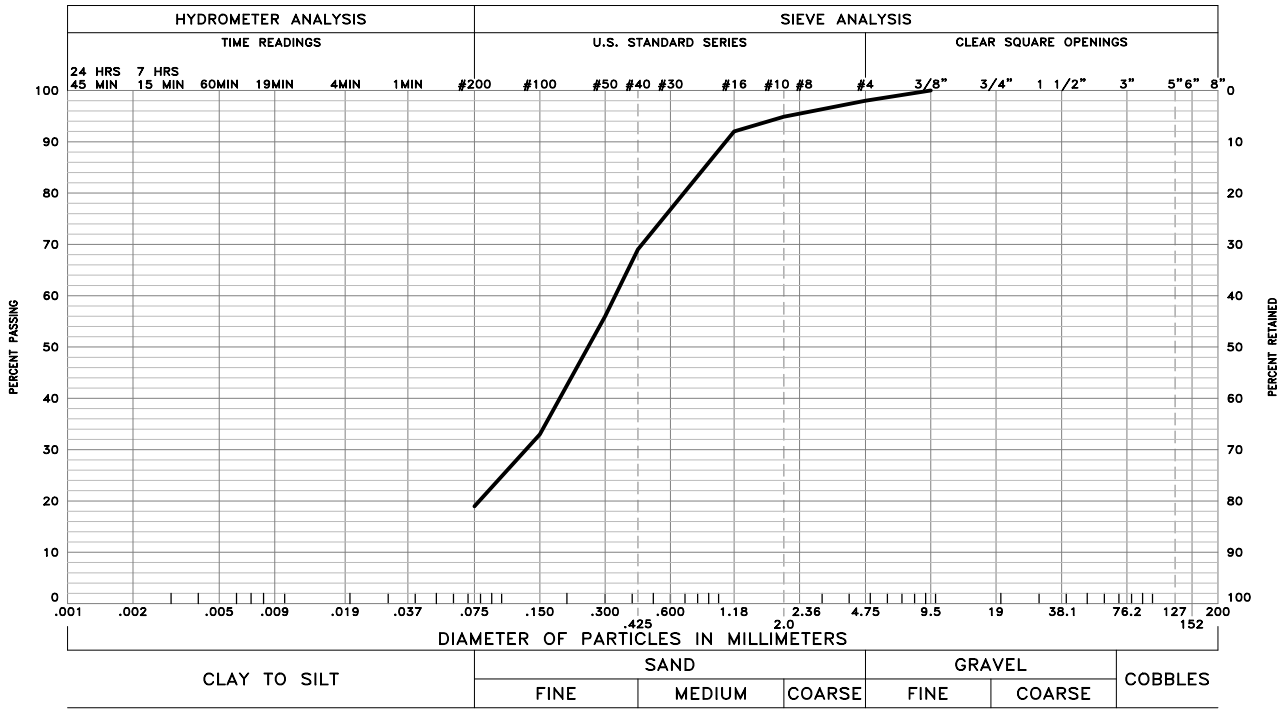
22-2-222	Kumar & Associates	GRADATION TEST RESULTS	Fig. 6



GRAVEL 1 % SAND 83 % SILT AND CLAY 16 %

LIQUID LIMIT – PLASTICITY INDEX NP

SAMPLE OF: Silty Sand (SM) FROM: Boring 6 @ 2'

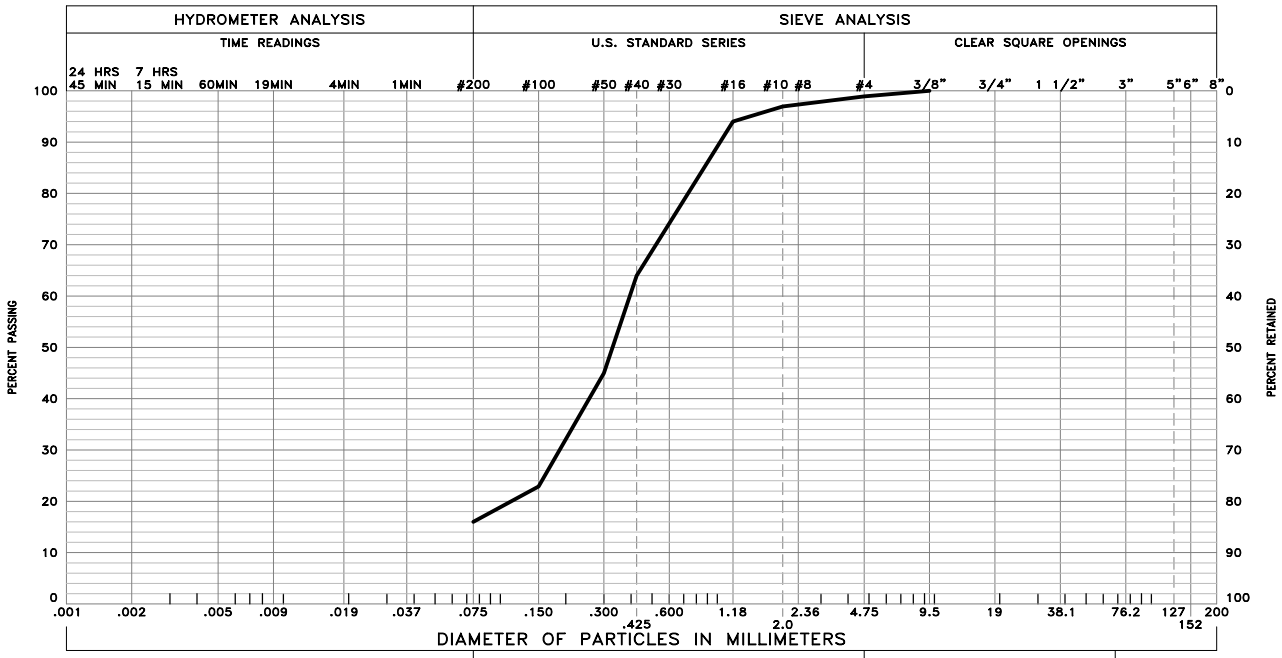


GRAVEL 2 % SAND 79 % SILT AND CLAY 19 %

LIQUID LIMIT – PLASTICITY INDEX NP

SAMPLE OF: Silty Sand (SM) FROM: Boring 7 @ 2'

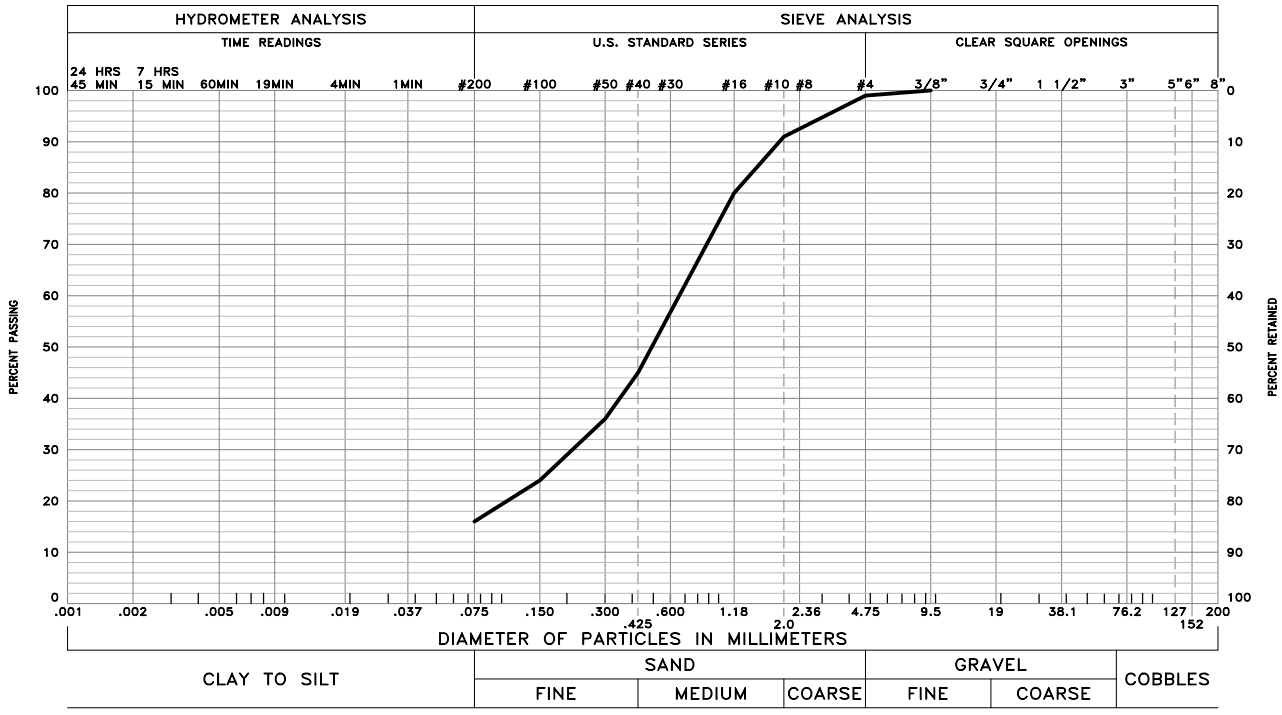
22-2-222	Kumar & Associates	GRADATION TEST RESULTS	Fig. 7



GRAVEL 1 % SAND 83 % SILT AND CLAY 16 %

LIQUID LIMIT – PLASTICITY INDEX NP

SAMPLE OF: Silty Sand (SM) FROM: Boring 8 @ 2'

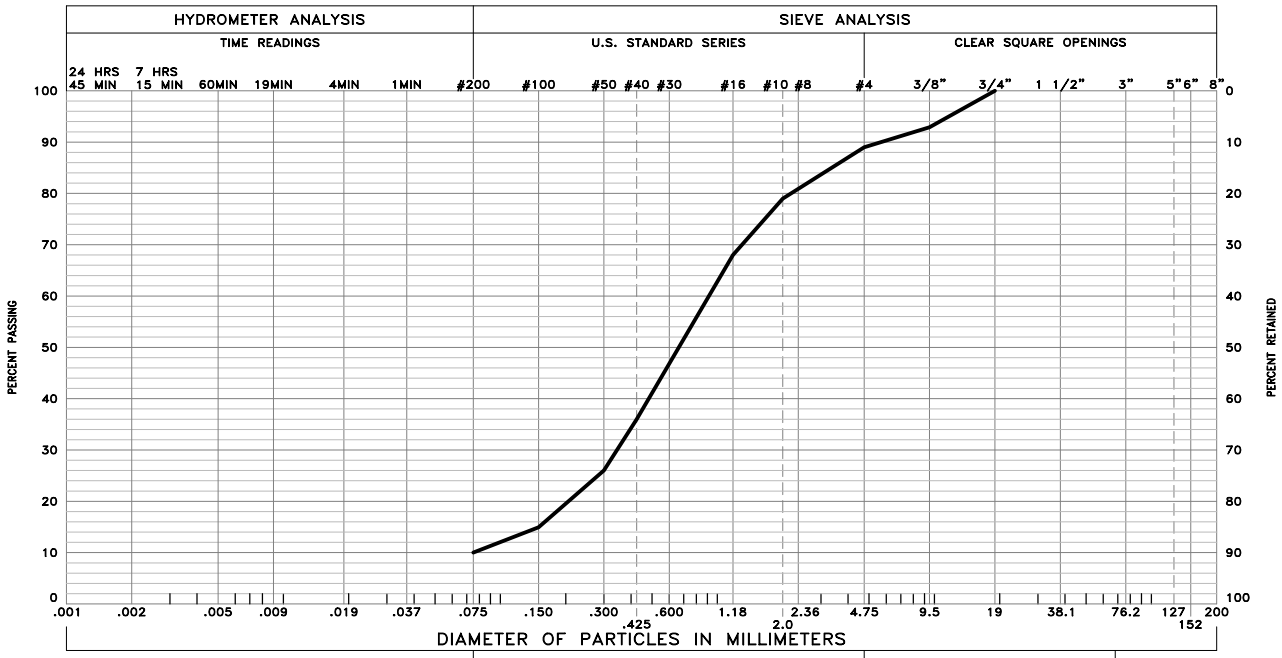


GRAVEL 1 % SAND 83 % SILT AND CLAY 16 %

LIQUID LIMIT – PLASTICITY INDEX NP

SAMPLE OF: Fill: Silty Sand (SM) FROM: Boring 9 @ 2'

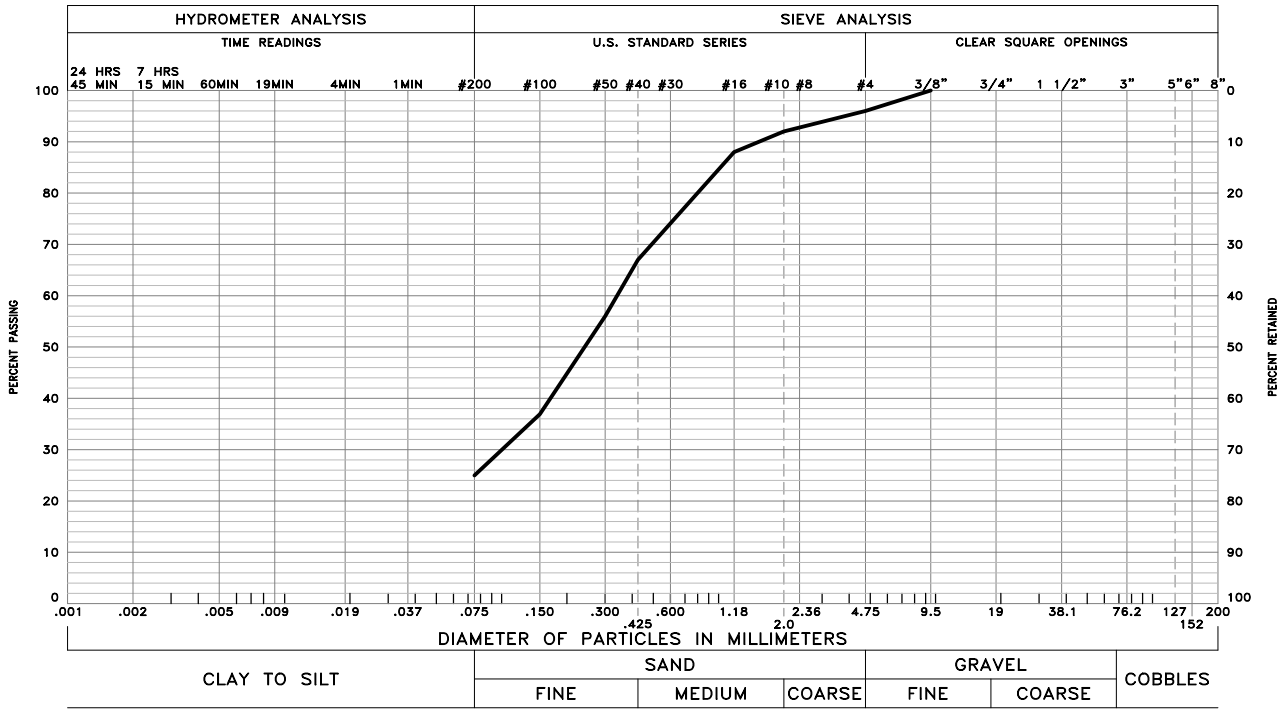
22-2-222	Kumar & Associates	GRADATION TEST RESULTS	Fig. 8



GRAVEL 11 % SAND 79 % SILT AND CLAY 10 %

LIQUID LIMIT – PLASTICITY INDEX NP

SAMPLE OF: Well Graded Sand with Silt (SW–SM) FROM: Boring 10 @ 2'



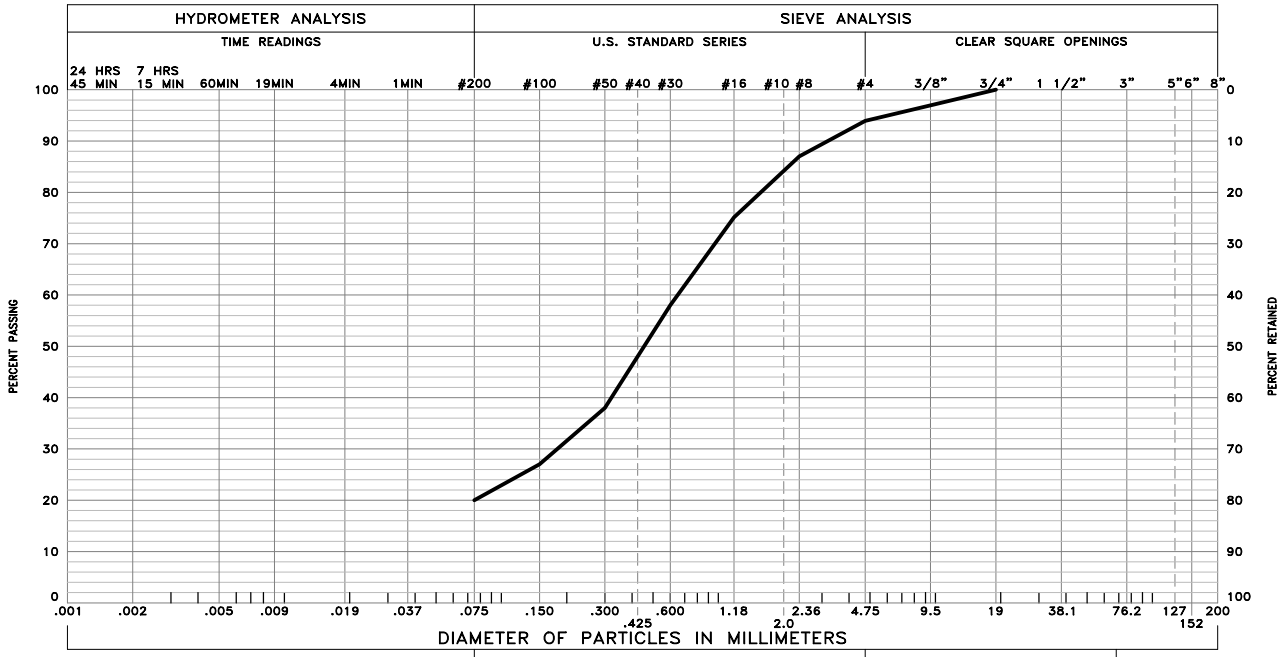
GRAVEL 4 % SAND 71 % SILT AND CLAY 25 %

LIQUID LIMIT – PLASTICITY INDEX NP

SAMPLE OF: Silty Sand (SM) FROM: Boring 11 @ 2'

These test results apply only to the samples which were tested. The testing report shall not be reproduced, except in full, without the written approval of Kumar & Associates, Inc. Sieve analysis testing is performed in

22-2-222	Kumar & Associates	GRADATION TEST RESULTS	Fig. 9



GRAVEL 6 % SAND 74 % SILT AND CLAY 20 %

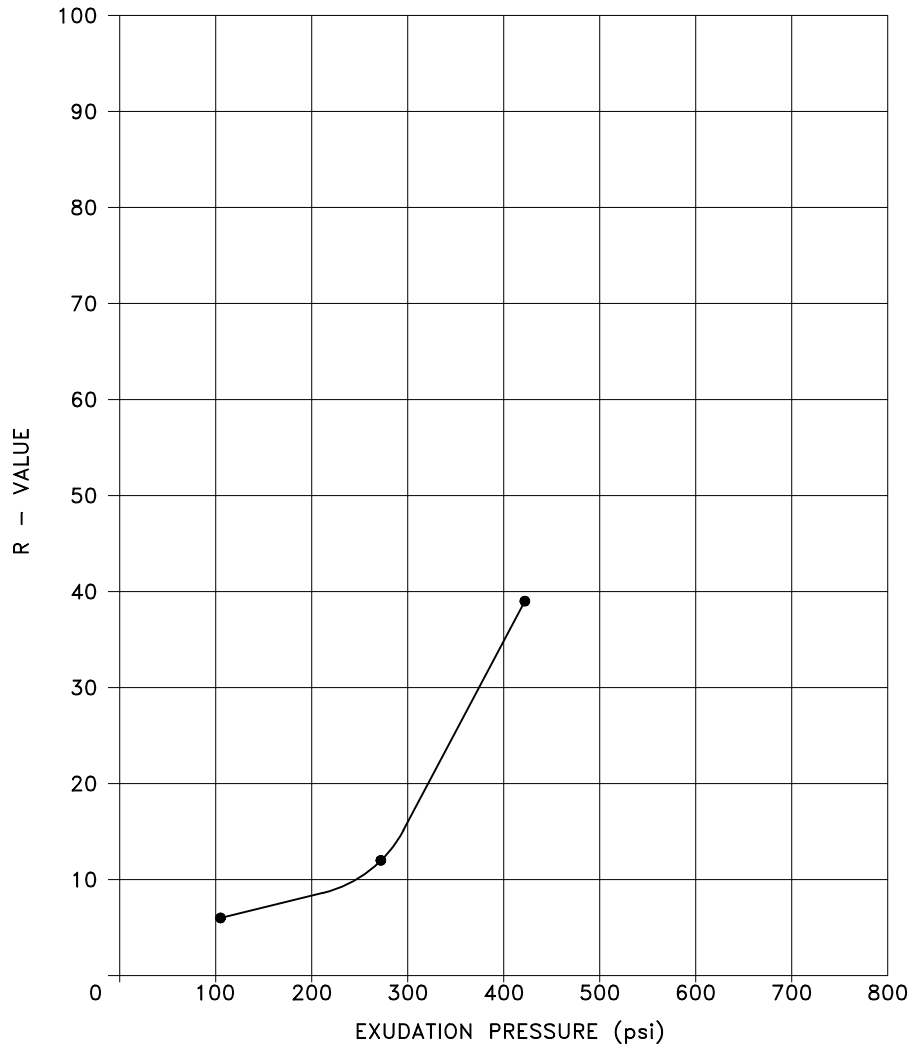
LIQUID LIMIT 23 PLASTICITY INDEX 9

SAMPLE OF: Fill: Clayey Sand FROM: Boring 6 @ 1'–4'

These test results apply only to the samples which were tested. The testing report shall not be reproduced, except in full, without the written approval of Kumar & Associates, Inc. Sieve analysis testing is performed in accordance with ASTM D6913, ASTM D7928, ASTM C136 and/or ASTM D1140.

22–2–222	Kumar & Associates	GRADATION TEST RESULTS	Fig. 10

TEST SPECIMEN	1	2	3	4	R –VALUE (300 psi)
MOISTURE CONTENT (%)	10.2	11.0	11.8		
DENSITY (pcf)	126.2	126.7	123.8		
EXPANSION PRESSURE (psi)	0.000	0.000	0.000		
EXUDATION PRESSURE (psi)	422	272	105		
R VALUE	39	12	6		16



SOIL TYPE: Clayey Sand (SC)

LOCATION: Boring 6 @ 1'–4'

DATE SAMPLED: 12–12–2022 DATE RECEIVED: 12–12–2022 DATE TESTED: 12–19–2022

GRAVEL: 6 % SAND: 74 % SILT AND CLAY: 20 %

LIQUID LIMIT: 23 PLASTICITY INDEX: 9

22–2–222	Kumar & Associates	HVEEM STABILOMETER TEST RESULTS	Fig. 11

Kumar and Associates, Inc.

TABLE I

SUMMARY OF LABORATORY TEST RESULTS

Project No.: 22-2-222
Project Name: Parker Town Hall
Date Sampled: 11/18/22
Date Received: 11/29/22

SAMPLE LOCATION		DATE TESTED	NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (pcf)	GRADATION		PERCENT PASSING NO. 200 SIEVE	ATTERBERG LIMITS		WATER SOLUBLE SULFATES (%)	AASHTO CLASSIFICATION (Group Index)	SOIL OR BEDROCK TYPE (Unified Soil Classification)
BORING	DEPTH (ft)				GRAVEL (%)	SAND (%)		LIQUID LIMIT	PLASTICITY INDEX			
1	6"-3'	12/14/22			1	75	24	27	11		A-2-6 (0)	Fill: Clayey Sand (SC)
1	2	12/14/22	10.8	100.1	0	74	26	23	5	<0.01	A-2-4 (0)	Fill: Silty Clayey Sand (SC-SM)
1	9	12/14/22	13.1	107.5			20		NP		A-1-b (0)	Silty Sand (SM)
2	2	12/14/22	3.4	120.5	2	81	17		NP		A-1-b (0)	Silty Sand (SM)
3	4	12/14/22	6.3	101.4			5		NP	0.01	A-1-a (0)	Poorly Graded Sand with Silt (SP-SM)
4	4	12/14/22	6.1	106.0			4		NP		A-1-a (0)	Poorly Graded Sand with Silt (SP-SM)
5	2	12/14/22	13.6	114.1			37	34	16		A-6 (2)	Clayey Sand (SC)
5	4	12/14/22	5.2	109.7	2	89	9		NP		A-3 (1)	Well Graded Sand with Silt (SW-SM)
6	2	12/14/22	4.1	116.5	1	83	16		NP		A-1-b (0)	Silty Sand (SM)
6	1-4	12/19/22			6	74	20	23	9		A-2-4 (0)	Fill: Clayey Sand (SC)
7	2	12/14/22	11.3	106.6	2	79	19		NP		A-2-4 (0)	Silty Sand (SM)

Kumar and Associates, Inc.

TABLE I

SUMMARY OF LABORATORY TEST RESULTS

Project No.: 22-2-222
Project Name: Parker Town Hall
Date Sampled: 11/18/22
Date Received: 11/29/22

SAMPLE LOCATION		DATE TESTED	NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (pcf)	GRADATION		PERCENT PASSING NO. 200 SIEVE	ATTERBERG LIMITS		WATER SOLUBLE SULFATES (%)	AASHTO CLASSIFICATION (Group Index)	SOIL OR BEDROCK TYPE (Unified Soil Classification)
BORING	DEPTH (ft)				GRAVEL (%)	SAND (%)		LIQUID LIMIT	PLASTICITY INDEX			
8	2	12/14/22	6.3	100.6	1	83	16		NP		A-2-4 (0)	Silty Sand (SM)
8	4	12/14/22	8.8	107.2			17		NP		A-1-b (0)	Silty Sand (SM)
9	2	12/14/22	7.2	118.2	1	83	16		NP		A-1-b (0)	Fill: Silty Sand (SM)
9	4	12/14/22	12.2	118.4			28	28	13	0.01	A-2-6 (0)	Fill: Clayey Sand (SC)
10	2	12/14/22	4.3	108.5	11	79	10		NP		A-1-b (0)	Well Graded Sand with Silt (SW-SM)
11	2	12/14/22	3.3	113.2	4	71	25		NP		A-2-4 (0)	Silty Sand (SM)