November 26, 2018

ENTECH
ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
FAX (719) 531-5238

Larry and Barbara Cohn
10950 Yoemans Park Drive
Colorado Springs, CO 80908

Re: Subsurface Soil Investigation
12710 Sylvan Meadows Drive
Lot 27, Sylvan Meadows Filing No. 2
Colorado Springs, Colorado

Dear Mr. and Mrs. Cohn:

Personnel of Entech Engineering, Inc. have drilled two shallow test borings at the site referenced above. Specific findings for the site are presented in this letter.

Soil Classification:

Soil types observed in the test boring and test pit on this site were found to consist of a thin layer of silty sand overlying silty sandstone and sandy claystone.

Allowable Bearing Capacity:

An allowable bearing pressure of 3500 psf is recommended for the undisturbed very dense sandstone, 2400 psf is recommended for structural fill, if overexcavation is required. An equivalent hydrostatic fluid pressure (in the active state) of 45 pcf is recommended for the native granular soils and imported structural fill.

Soil Moisture Conditions:

Moist. Groundwater was encountered subsequent to drilling in Test Boring No. 1 at a depth of 19 feet. It is anticipated that the proposed shallow foundation will not be impacted by shallow water. However, it should be noted that fluctuations in groundwater conditions may occur due to variations in rainfall or other factors not readily apparent at this time. Isolated sand layers within the soil profile can carry water in the subsurface. Water may also flow on top of less permeable clay lenses or bedrock.

Expansion Potential:

Highly expansive claystone is commonly found interbedded within the sandstone in this area. Claystone was encountered in Test Boring No. 1 at a depth of 17 feet.

Fill:

None.

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Subsurface Soil Investigation
12710 Sylvan Meadows Drive
Lot 27, Sylvan Meadows Filing No. 2
Colorado Springs, Colorado

Special Considerations:

Areas of seasonal shallow groundwater have been mapped on the site (Figure 1). It is anticipated there is sufficient room on the lot to avoid these areas. The foundation should be kept as high as possible to avoid impacts of water. Drains will be necessary for below grade areas.

If expansive soils are encountered at or near foundation grade overexcavation will be required.Excavation of site sand materials is anticipated to be moderate with a rubber-tired equipment. Excavation of the dense sandstone will likely require track mounted equipment. Site granular materials are suitable for use as structural fill pending approval by Entech Engineering, Inc.

Foundation Type:

A spread footing (16")/stemwall foundation system, is anticipated for this site. Point load bearing pads should be sized for the allowable bearing capacity given. **This does not constitute a foundation design.** Qualified personnel should verify that building loads do not exceed the bearing value given in this letter. The bottoms of exterior foundations should be located at least 30 inches below finished grade for frost protection.

Foundation Configuration Remarks:

The configuration of the foundation system is critical to its performance. The position of foundation windows, jogs, steps and the relative elevation of adjacent and opposite walls determine foundation performance. Improper placement of the above can result in differential and lateral foundation movement. In addition, foundation walls over 4 feet in height should not span over 30 feet in length without specific design.

Reinforcing:

Reinforcing should be designed to permit foundation walls to span a minimum of 10 feet under the design load. Foundation walls retaining over 4 feet of soil should be designed to resist an equivalent fluid pressure (in the active state) of 45 pcf. Expansive soils should not be used as backfill material.

Floor Slabs:

Floor slabs on grade, if any should be separated from structural portions of the building and allowed to float freely. Interior partitions must be constructed in such a manner that they do not transmit floor slab movement to the roof or overlying floor. Backfill placed below floor slabs should be compacted to a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D- 1557.

Drainage and Grading:

The ground surface must be sloped away from the building to provide positive drainage away from the foundation. We recommend an equivalent slope of 6 inches in the first 10 feet (5%) surrounding the structure, where possible, or as required to quickly remove surface water. Where a 5% slope cannot be achieved practically, such as around patios, at inside foundation corners, and between a house and nearby sidewalk, we believe it is desirable to establish as much slope as possible and to avoid irrigation in the area. Roof downspouts should discharge beyond the limits of backfill. We recommend providing splash blocks and downspout extensions to discharge runoff beyond the limits of backfill.

Homebuyers should maintain the surface grading and drainage installed by the builder to assure water is not directed toward the foundations and does not pond near the house. Landscaping should be carefully designed to minimize irrigation adjacent to the foundation. We do not recommend use of impervious plastic membranes below landscaped areas near foundations; geotextile fabrics can control weed growth while allowing evaporation. Plants used close to foundation walls should be limited to those with low moisture requirements; irrigated grass should not be located within 5 feet of the foundation. Sprinklers should not discharge water within 5 feet of foundations. Irrigation should be limited to the minimum amount sufficient to maintain vegetation. Application of more water will increase the potential for slab and foundation movements.

Subdrain:

A subsurface perimeter drain should be placed around useable space below grade and is recommended around the entire structure in the foundation excavation. A typical drain detail is attached.

Backfill:

Backfill should be compacted to 95% of its maximum Modified Proctor Dry Density, ASTM D-1557. Backfill must be compacted by mechanical means. No water flooding techniques of any type should be used in the compaction of backfill on this site. Expansive soils are not to be used as foundation backfill.

Concrete:

Type II cement is recommended for all concrete on this site. Concrete should not be placed on frozen or wet ground. Care should be taken to prevent the accumulation and ponding of water in the footing excavation prior to the placement of concrete. If standing water is present in the excavation, it should be removed by the installing sumps and pumping the water away from the building area. If concrete is placed during periods of cold temperatures, the concrete must be

kept from freezing. This may require covering the concrete with insulated blankets and heating to prohibit freezing.

Open Foundation Excavation Observation:

The open foundation excavation should be observed prior to construction of the foundation in order to verify that no anomalies are present, that materials at the proper design bearing capacity have been encountered, and that no soft spots or debris are present in the foundation area.

Remarks:

The recommendations provided in this letter are based upon the observed soil parameters, anticipated foundation loads, and accepted engineering procedures. The recommendations are intended to minimize differential movement resulting from the heaving of expansive soils or resulting from settlement induced by the application of building loads. It must be recognized that the foundation may undergo movement. In addition, concrete floor slabs may experience movement; therefore, adherence to those recommendations which would isolate floor slabs from columns, walls, partitions or other structural components is extremely important, if damage to the superstructure is to be minimized. Any subsequent owners should be apprised of the soil conditions and advised to maintain good practice in the future with regard to surface and subsurface drainage, framing of partitions above floor slabs, drywall and finish work above floor slabs, etc.

We trust this has provided you with the information you required. If you have any questions or need additional information, please do not hesitate to contact us.

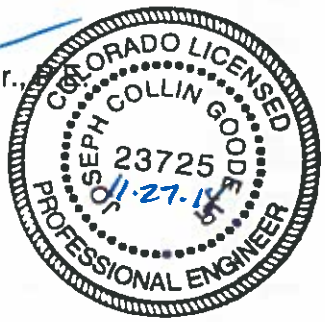
Respectfully Submitted,

ENTECH ENGINEERING, INC.

Logan L. Langford
Geologist

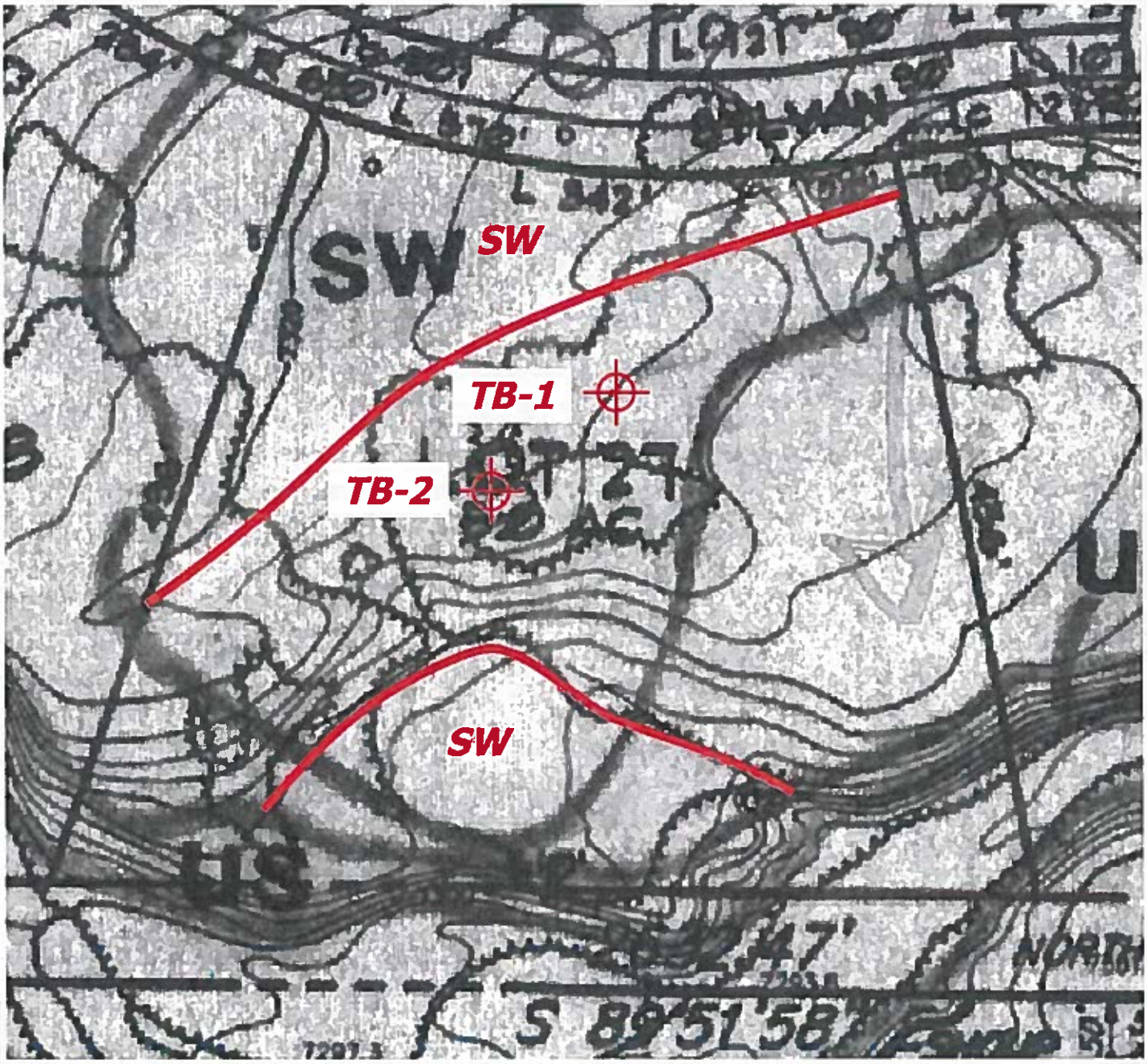
Reviewed by:

Joseph C. Goode, Jr., P.E.
President



LLL/slf

Entech Job No. 181683
AAprojects/2018/181683 ssi



TB- APPROXIMATE TEST BORING LOCATION AND NUMBER

SW- SEASONALLY HIGH GROUNDWATER AREAS

N

ENTECH ENGINEERING, INC.
595 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

SITE PLAN/TEST BORING LOCATION MAP
12710 SYLVAN MEADOWS DRIVE
LOT 27, SYLVAN MEADOWS FILING NO. 2
COLORADO SPRINGS, COLORADO
FOR: LARRY AND BARBARA COHN

DRAWN:	DATE:	CHECKED:	DATE:
LLL	11/20/18		

JOB NO.: 181683

FIG NO.: 1

TEST BORING NO. 1
DATE DRILLED 11/10/2018
Job # 181683

REMARKS

WATER AT 19', 11/19/18

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			50/6"	8.6	
5			50/4"	7.1	
10			50/6"	10.7	
15			50/6"	9.5	
20			*	8.1	

SAND, SILTY, BROWN
SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

CLAYSTONE, SANDY, GRAY BROWN, MOIST

* - BULK SAMPLE TAKEN

TEST BORING NO. 2
DATE DRILLED 11/10/2018
CLIENT LARRY & BARBARA COHN
LOCATION 12710 SYLVAN MEADOWS DR.

REMARKS

DRY TO 15', 11/19/18

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			45	6.6	
5			50/6"	10.4	
10			50/4"	16.1	
15			50/4"	20.3	
20					

SAND, SILTY, BROWN
SANDSTONE, SILTY, FINE TO COARSE GRAINED, TAN, VERY DENSE, MOIST

CLAYEY LENSES

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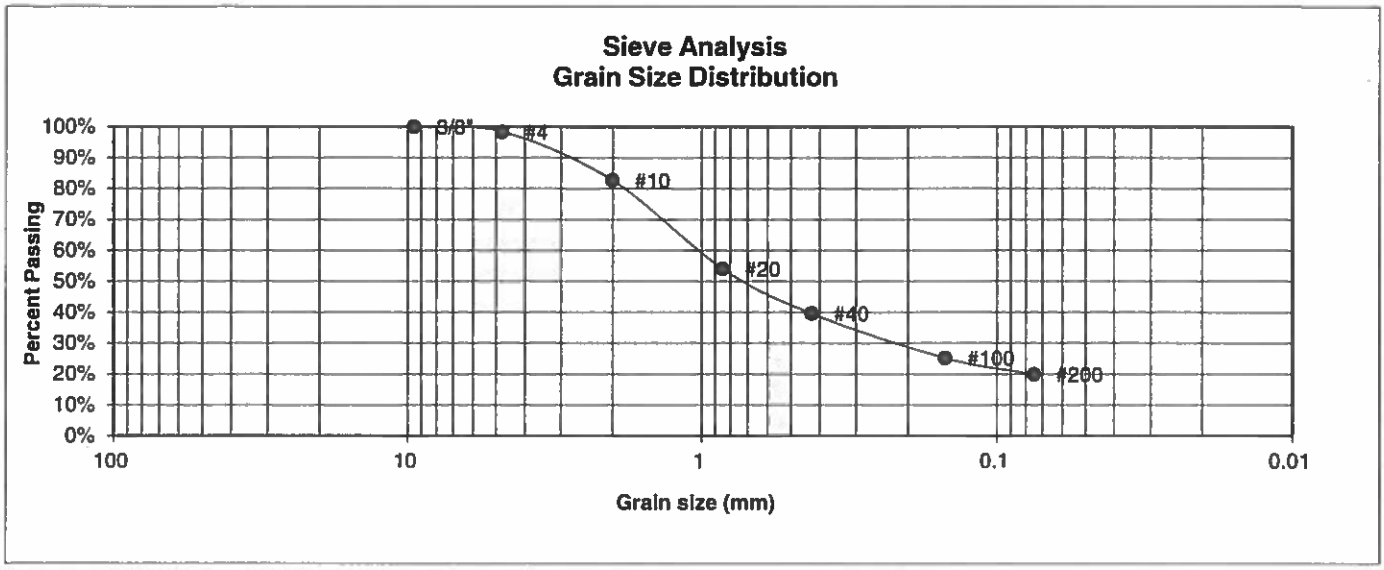
505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		LLL	11/20/18

JOB NO.: 181683
FIG NO.: 2

BORING NO.	1	UNIFIED CLASSIFICATION	SM	TEST BY	BL
DEPTH(ft)	2-3	AASHTO CLASSIFICATION		JOB NO.	181683
CLIENT	LARRY & BARBARA COHN				
PROJECT	12710 SYLVAN MEADOWS DR.				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.4%
10	82.7%
20	54.1%
40	39.6%
100	25.2%
200	19.9%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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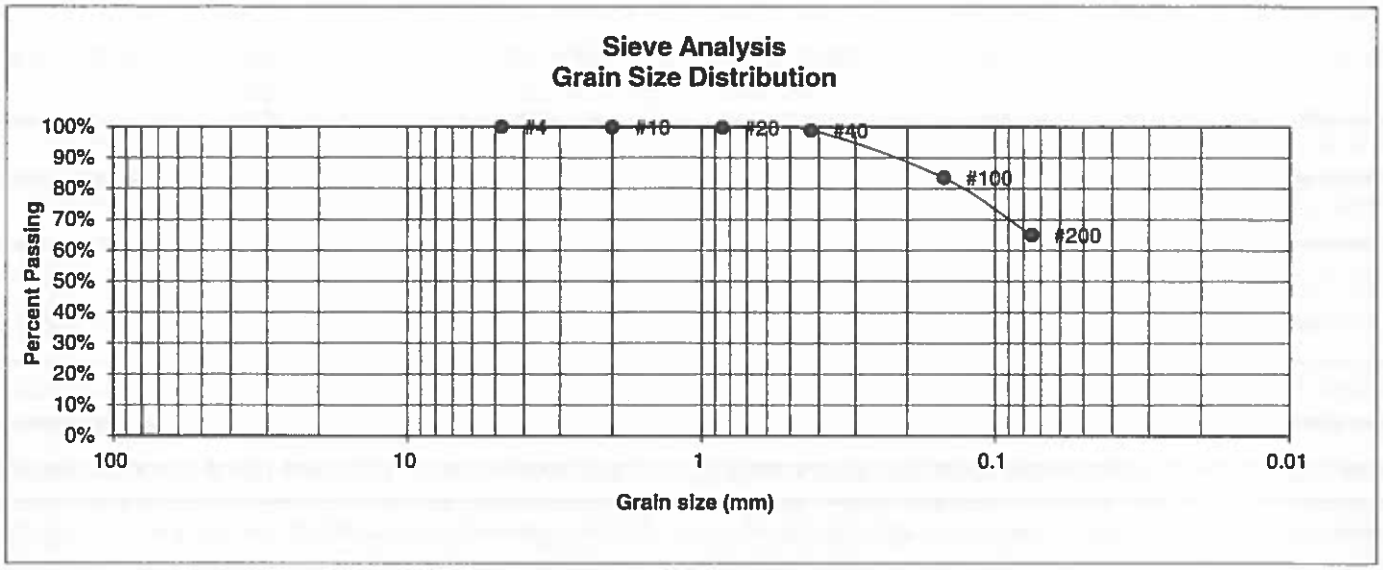
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			11/14/10

JOB NO.: 181683

FIG NO.: 3

BORING NO.	1	UNIFIED CLASSIFICATION	CL	TEST BY	BL
DEPTH(ft)	20	AASHTO CLASSIFICATION		JOB NO.	181683
CLIENT	LARRY & BARBARA COHN				
PROJECT	12710 SYLVAN MEADOWS DR.				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.9%
20	99.7%
40	98.9%
100	83.5%
200	65.1%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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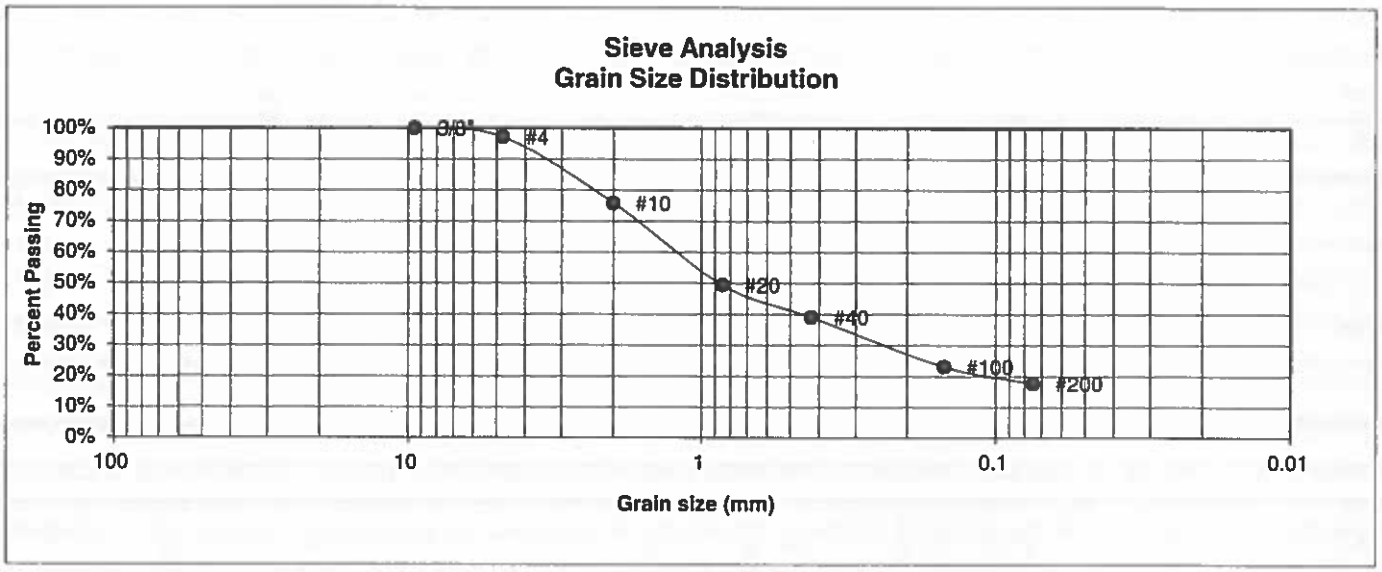
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			1/14/18

JOB NO.: 181683

FIG NO.: 4

BORING NO.	2	UNIFIED CLASSIFICATION	SM	TEST BY	BL
DEPTH(ft)	5	AASHTO CLASSIFICATION		JOB NO.	181683
CLIENT	LARRY & BARBARA COHN				
PROJECT	12710 SYLVAN MEADOWS DR.				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.2%
10	75.9%
20	49.5%
40	39.1%
100	23.2%
200	17.7%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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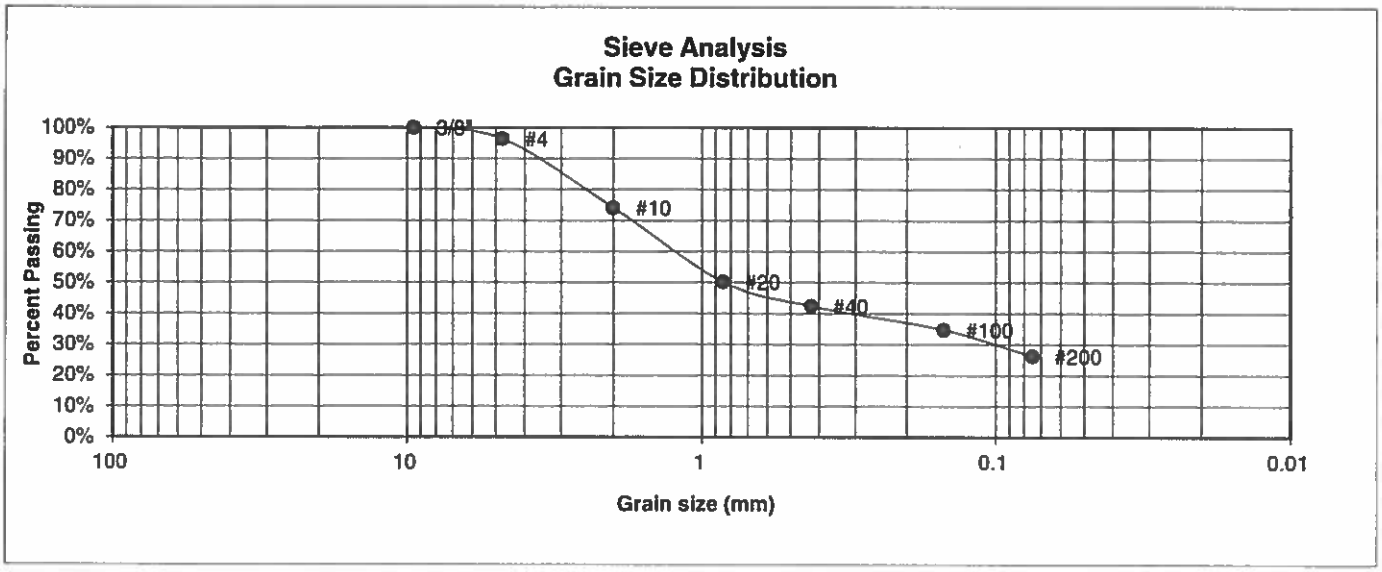
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			11/14/18

JOB NO.: 181683

FIG NO.: 5

BORING NO.	2	UNIFIED CLASSIFICATION	SM	TEST BY	BL
DEPTH(ft)	15	AASHTO CLASSIFICATION		JOB NO.	181683
CLIENT	LARRY & BARBARA COHN				
PROJECT	12710 SYLVAN MEADOWS DR.				



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.4%
10	74.1%
20	50.2%
40	42.4%
100	34.7%
200	26.2%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index

Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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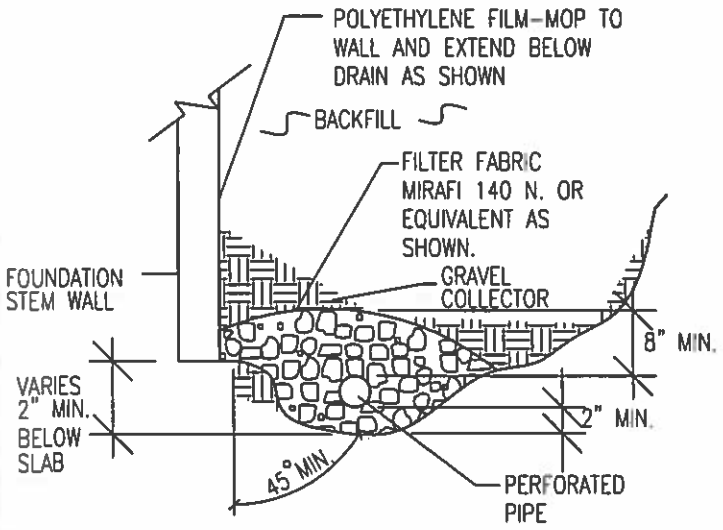
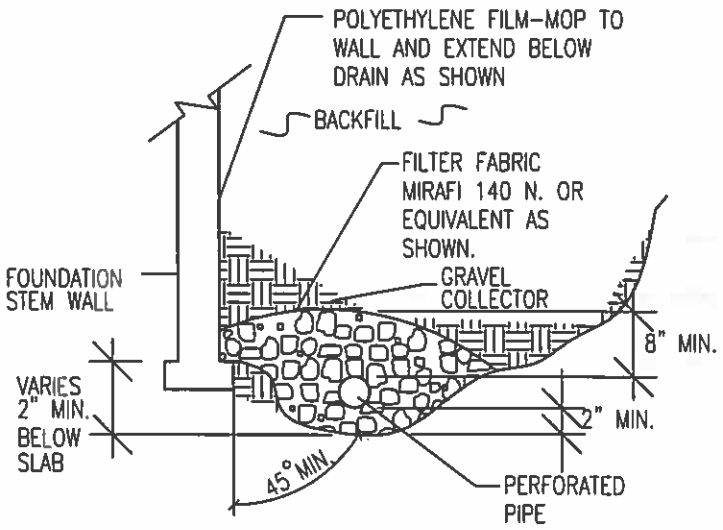
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			11/14/18

JOB NO.: 181683

FIG NO.: 6





NOTES:

-GRAVEL SIZE IS RELATED TO DIAMETER OF PIPE PERFORATIONS–85% GRAVEL GREATER THAN 2x PERFORATION DIAMETER.

-PIPE DIAMETER DEPENDS UPON EXPECTED SEEPAGE. 4–INCH DIAMETER IS MOST OFTEN USED.

-ALL PIPE SHALL BE PERFORATED PLASTIC. THE DISCHARGE PORTION OF THE PIPE SHOULD BE NON–PERFORATED PIPE.

-FLEXIBLE PIPE MAY BE USED UP TO 8 FEET IN DEPTH, IF SUCH PIPE IS DESIGNED TO WITHSTAND THE PRESSURES. RIGID PLASTIC PIPE WOULD OTHERWISE BE REQUIRED.

-MINIMUM GRADE FOR DRAIN PIPE TO BE 1% OR 3 INCHES OF FALL IN 25 FEET.

-DRAIN TO BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. A SUMP AND PUMP MAY BE USED IF GRAVITY OUT FALL IS NOT AVAILABLE.

ENTECH ENGINEERING, INC.
505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

PERIMETER DRAIN DETAIL

DRAWN:	DATE DRAWN:	DESIGNED BY:	CHECKED:
		DS	LLL

JOB NO.: 181683

FIG. NO.: 7