THE GALLI GROUP
Engineering Consulting

GEOTECHNICAL DESIGN REPORT
SNYDER HALL RECONSTRUCTION
UMPQUA COMMUNITY COLLEGE
ROSEBURG, OREGON

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1.0 INTRODUCTION

This report presents results of our geotechnical investigation of the site for the Snyder Hall Reconstruction in Roseburg, Oregon. The purpose of the site investigation was to evaluate the site surface and subsurface conditions across the building site with a series of borings and backhoe test pits in order to provide geotechnical design recommendations for the design and construction of the new utilities and the structure. The following sections outline 1) our understanding of the proposed site development, 2) our subsurface investigation and evaluation and 3) our geotechnical recommendations for the design and construction of the site improvements and structures.

2.0 PROJECT AND SITE DESCRIPTION

The subject structure will be located at the site of the existing Snyder Hall on the Umpqua Community College Campus. The site is mildly sloped and covered with the existing structure, lawn, concrete walks and scattered trees. See Figure 1 Vicinity map for a more precise project locations.

We understand the project to consist of reconstruction/addition to Snyder Hall. The existing building will be demolished. The new structure will be a single-story (some with partial mechanical mezzanine), wood-framed construction, with a total floor space of 10,000 square feet. Likely foundations will be a combination of isolated spread footings, strip footings for continuous wall loads with some monolithic slab/footing pours. Floors will be slab-on-grade concrete over compacted crushed rock. We anticipate structure loads to be 10 to 40 kips for columns and 1 to 2 kips per lineal foot for strip footings. We understand that no underground structures are planned at this time.

3.0 FIELD EXPLORATION

On March 17 and 23, 2017, our Supervisory Technician, Aaron Reeser, visited the site to conduct the subsurface investigation. Prior to the site investigation, the parcel was "staked" for a underground utility locate. We understand all known utilities had been "located" and marked with marker paint by the local and regional utilities at the time of the subsurface investigation. College personnel also helped locate points of exploration away from private utilities.

Site soils were investigated by drilling four (4) exploratory borings and excavating two (2) test pits at locations selected around the building site. Borings were drilled to depths between 3.0 feet and 11.5 feet with our ATV mounted solid stem auger drill rig. Test pits were excavated to depths of between 6.0 feet to 7.0 feet using a Volvo EC55-B trackhoe. The small to medium-sized trackhoe was outfitted with a 24" bucket and 4 rock teeth. Approximate locations of the exploratory borings and test pits are presented on Figure 2, Site Plan, at the end of this report. At the conclusion of the subsurface investigation, all borings and test pits were backfilled with the soil spoils from the excavation and drilling operations and the ground surface leveled with the blade and scoop.

Our personnel logged the subsurface soil, rock and water conditions encountered and obtained samples for transport to the office and laboratory. Visual classifications of the soils are presented in Appendix A, Boring Logs and Appendix B, Test Pit Logs, at the end of this report. These classifications were utilized by our representative to provide informed engineering recommendations for the proposed site improvements. Please note that in the logs, soil and rock changes are depicted as distinct layers, while in nature they may be more gradual. A more detailed description of the soils encountered can be viewed in Appendix A and Appendix B at the end of this report.

4.0 LABORATORY TESTING

The near surficial layer encountered during the subsurface investigation generally consisted of a brown, clayey Silt to silty Clay. Due to the possibility that this clayey layer is expansive in nature (changes in volume with changes in moisture content), one sample from the silty Clay layer was tested for expansive potential. The test result indicated an Expansion Index (EI) of 240. This test result indicates the brown, clayey Silt to silty Clay layer has high expansion potential. See Appendix C, Laboratory Test Results, at the end of this report for test results.

5.0 SUBSURFACE CONDITIONS

5.1 SUBSURFACE SOIL STRATIGRAPHY

The test pits encountered somewhat uniform subsurface conditions across the site. In general, the site is covered by a thin layer of manmade fill then native expansive Silty Clay. This unit is underlain by gravelly clay and dense silty sand. All Borings and Test Pits terminated in or near the top of highly weathered siltstone/sandstone. The following generalized descriptions represent the units likely to be encountered during lot grading, trench excavation and construction.

The highly weathered Siltstone Sandstone appeared as medium dense to dense Silty Sand with fine gravel, dense sandy Gravels and dense weathered siltstone Sandstone (soft rock). Depths to the highly weathered Siltstone/Sandstone were as follows:

B-1	4.5 ft.	B-4	1.5 ft.
B-2	10.0 ft.	TP-1	2.0 ft.
B-3	5.0 ft.	TP-2	4.0 ft.

Please note that soil descriptions and layer interfaces are interpreted from observations at the site. While the layers are shown as having distinct boundaries in the test pit logs, in nature they may grade slowly from one soil type to another. Soil conditions will also vary across the site in areas not investigated and between test pit locations. For additional detail of the soils conditions encountered at the site, please see the Boring Logs in Appendix A and Test Pit Logs in Appendix B at the end of this report.

5.2 GROUNDWATER

No free groundwater observed during our subsurface investigation. A very minor seep was noted at 2.5 feet in TP-2.

Based on experience in these soils, water will tend to "perch" on the weathered rock in the wetter winter months. The upper silt and clay unit may become soft and somewhat unstable during times of heavy rains. If construction is accomplished during the wetter winter months, it is likely that the silty and clayey units will become disturbed and unworkable and that trenches may become somewhat unstable.

Groundwater levels do change due to seasonal rainfall and other climatic occurrences. Given the site geometry and nature of the soils encountered, it is possible that isolated perched water surfaces could rise to within 3 or 4 feet of the surface.

6.0 GEOLOGIC HAZARDS AND SEISMIC LOADING

6.1 GEOLOGIC HAZARDS

Slope Stability. There are no slopes close to the site. Therefore, there is no possibility of slope failure, rock fall or slide runout damage.

Expansive Soils. The soils encountered are highly expansive. Recommendations in the design portion of the report will mitigate their impacts.

Liquefaction. Loose sand was not found below the water table. Therefore, liquefaction will not be an issue.

Ground Rupture. No Quaternary faults were identified at the project site. Therefore, the risk of damage at the site due to ground rupture is considered very low.

Ground Shaking. The design PGA is 0.11g. See following Seismic Design Table.

Seismic Ground Amplification or Resonance. No hazardous amplification or resonance effects from seismic waves have been associated with the soil subsurface conditions in the project area. The risk of damage at the site from unexpectedly severe shaking due to seismic wave amplification is low.

Tsunami and Seiche. The project site is located over 50 miles inland, and is therefore not subject to inundation from a tsunami. There are no large lakes or reservoirs nearby in the upslope basin whose failure could mitigate the site. Therefore, the risk of damage to the site is very low to zero due to hazard from seiche or seismic-induced flooding.

Conclusions. Therefore, based on our site observations and review of site geology, except for the expansive soils, there are no geologic hazards that will potentially cause significant damage at the site. The project must be designed for the potential for moderate ground shaking during the anticipated seismic events.

6.2 2014 OSSC AND 2012 IBC DESIGN EARTHQUAKE

The design earthquake for the project area is based upon established values and methodologies in the Oregon Structural Specialty Code (OSSC; 2014), International Building Code (IBC; 2012), and ASCE 07-10.

The Maximum Considered Earthquake (MCE_R) and spectral response accelerations were established as set forth in Section 1613 (IBC, 2012) and Section 11.4 (ASCE 7-10), and were obtained from the online USGS Seismic Design Maps (USGS, 2016).

Table 1- DESIGN EARTHQUAKE (OSSC, 2014; IBC, 2012; ASCE 7-10)

Parameter	Value
Project Latitude/ Longitude (Kirtland Road Industrial Park)	Lat. 43° 17' 19.91" Long. -123° 19' 54.23"
Occupancy/Risk Category (Table 1.5-1 ASCE/SEI 7-10)	III III
Site Class - *(Table 20-3-1 ASCE/SEI 7-10)*	**C**
Mapped Spectral Response Acceleration (MCE_R) - Short Period (S_S)	0.837g
Mapped Spectral Response Acceleration (MCE_R) - 1-Second Period (S_1)	0.447g
Short Period Site Coefficient based on Site Class - (F_a)	1.065
1-Second Site Coefficient based on Site Class - (Fv)	1.353
MCE_R Spectral Response Acceleration - (S_{MS})	$S_{MS}= F_a*S_S=$ 0.891g
MCE_R Spectral Response Acceleration for 1-Second - (S_{M1})	$S_{M1}= Fv*S_1=$ 0.605g
Design Spectral Response Acceleration for Short Periods - (S_{DS})	**S_{DS} = 2/3 S_{MS}= 0.594g**
Design Spectral Response Acceleration for 1-Second - (S_{D1})	**S_{D1} = 2/3 S_{M1} = 0.403g**
PGA= MCE_G (Section 11.8.3.2; and Figures 22-7; ASCE/SEI 7-10)	PGA= 0.420g
F_{PGA} (Table 11.8-1 ASCE/SEI 7-10)	F_{PGA} = 1.080
$PGA_M= F_{pga}$*PGA (EQ 11.8-1; ASCE/SEI 7-10)	**PGA_M = 0.459g**
Design PGA (PGAm*2/3)	**PGA_D= 0.303g**
Seismic Design Category (Section 11.6 and Table 11.6-1 and Table 11.6-2; ASCE/SEI 7-10)	**D**

7.0 CONCLUSIONS

In our professional opinion, based on our field investigation and office review, the soil conditions of the site are suitable for the proposed new structure, provided the geotechnical recommendations contained in this report are followed during design and construction of the project.

Geotechnical issues which should be addressed during design and construction of the project are likely to include the following:

1) Degree of difficulty in excavating soils and/or rock along the utility alignments or deep foundations and basements.
2) Maintaining safe trench excavations.
3) Proper compaction of structural fill.
4) Over-excavation to remove expansive soils, subgrade preparation and structural fill placement for "support" of building foundations founded above the dense soils/weathered rock.

Engineering design parameters are provided in the following report which addresses these issues. Prudent design, field control and proper construction techniques should adequately mitigate potentially adverse affects from these site challenges. The following sections provide geotechnical recommendations for the design and construction of the planned improvements.

8.0 GEOTECHNICAL RECOMMENDATIONS

8.1 SITE PREPARATION AND GRADING

8.1.1 Clearing, Grubbing and Stripping

All areas proposed for the structure and associated patios and walkways or structural fill beneath these items should be cleared and grubbed of all grass, weeds, trees, stumps, and other debris and/or deleterious materials. The site should then be stripped and cleared of all vegetation, sod and organic topsoil. It appears that a stripping depth of approximately 4 to 6 inches will be required in some areas to remove the existing grass and rootzone layer. Additional stripping depths may be required in certain areas to remove the rootballs. All debris and old foundations and utility lines greater than 2" shall be removed to at least 3 feet outside the proposed footing footprint. The stripped organic materials and old demolition debris should be hauled from the site or stockpiled for use in landscape areas only. This material should not be used in structure backfill, trench backfill or abutment backfill on this project.

Abandoned utility lines (72"), storm drains, underground tanks or other items which provide void space beneath the surface, should be removed or effectively plugged. Movement of surface and/or groundwater through these old conduits can create the potential for piping of soils (the removal of soil fines by water seeping into the void spaces or through conduits), resulting in subsidence of the surface or settlement of structures and paved areas.

Holes or depressions resulting from the removal of underground obstructions and old excavations that extend below the finish subgrade (including test pits) and will be beneath the

structure shall be cleared of all loose material and dished to provide access for compaction equipment. These areas shall then be backfilled and compacted to grade with structural fill, as described later in this report.

It is recommended that stripping of the site and backfill and compaction of depressions below finish subgrade, be observed by the geotechnical engineer or his representative.

8.1.2 Subgrade Preparation

The exposed subgrade throughout the site, which will support structural fill, foundations, walkways and building structures, should exhibit a smooth, firm and unyielding subgrade after stripping and backfill under the observation of a representative of The Galli Group. All subgrade areas should be proofrolled with a loaded (to unloaded) truck (when practical) to verify all areas are dense and stable.

Where soils are disturbed or do not demonstrate a firm, unyielding condition when proofrolled, the soil should be removed and replaced with imported granular fill. The imported granular fill should be compacted to a minimum of 98 percent of their maximum dry, as determined by ASTM Test Method D-698 (Standard Proctor). All soft and/or unstable areas should be over-excavated and backfilled with granular structural fill.

CAUTION

Where site subgrades consist of clayey Silt to silty Clay soils, we recommend keeping the surface moist until structural fill is placed. This will minimize shrinkage of any expansive soils within the unit and formation of shrinkage cracks. Possible methods for protecting the exposed clayey Silt soils include sprinkling, periodic sprinkling with a water truck, covering with plastic sheeting, or delaying stripping until immediately before placing backfill materials. If dry clay soils are covered and not rewetted, swell related problems could develop.

We recommend our firm observe the excavated subgrade after excavations are complete and prior to placement of structural fill and/or concrete.

8.1.3 Utility and Site Excavations

We anticipate that excavations will be performed for new utility lines and foundation excavations for new structure. At this time, we do not anticipate excavations deeper than 5 feet. Dense weathered rock units were first encountered during our investigation at depths ranging from 1.5 to 10.0 feet below the existing ground surface. In some cases, a medium-sized trackhoe almost encountered "practical refusal" in the underlying dense weathered rock. Based on our experience in this area, larger excavators with narrow buckets should be able to excavate this unit to depths deeper than required.

Except in areas where seepage is present, the trench excavations should remain open when cut. However, some raveling and falling rock pieces could necessitate backsloping or trench

box protection of all workmen in the trench. Temporary cut slopes during dry weather and through the native clays and silts should be cut at no steeper than 1H:1V. During wet weather, we recommend the contractor provide shoring or backslope these temporary cut slopes to flatter inclinations as needed. Care must be taken to protect workmen at all times.

Dewatering may be necessary in some locations if construction is undertaken during wetter months of the year, when perched water will likely be present on top of the dense gravels. Pumping from open sumps should handle all water in the trenches and excavations. Care should be taken to not discharge muddy water into local streams.

The surficial soils are highly susceptible to disturbance during the wet winter months. If construction is accomplished during the wet winter months, the surficial, clayey or sandy Silt unit will most likely become severely disturbed and unworkable. Care must be taken during construction to ensure that standing water is not left in excavations and allowed to soften the subgrade soils.

Please note, that while we have commented on the anticipated stability of the soil units in trenches, we are not responsible for jobsite safety. The contractor is at all times responsible for jobsite safety, including excavation safety. We recommend all local, state and federal safety regulations be adhered to.

8.2 STRUCTURAL FILL PLACEMENT AND COMPACTION

8.2.1 Beneath Structures

Structural fill is defined as any fill placed and compacted to specified densities and used in areas that will be under structures, pavements, sidewalks and other load-bearing areas. Structural fill will most likely be required to backfill against walls, and beneath footings and slabs.

Structural Fill Materials. Ideally, and particularly for wet weather construction, structural fill should consist of a free-draining granular material (non-expansive) with a maximum particle size of six inches. The material should be reasonably well-graded with less than 5 percent fines (silt and clay size passing the No. 200 mesh sieve). During dry weather, any organic-free, non-expansive, compactable granular material, meeting the maximum size criteria, is acceptable for this purpose. See Section 8.9 for structural fill specifications.

The onsite topsoil and clayey Silts and silty Clays should not be used for structural fill under structures. During dry weather, the onsite Gravels & Cobbles and dense sand encountered in the test pits should work reasonably well as structural fill. It will, however, be messy to trench through, with much rock fall. During wet weather, the fine-grained portions of the rounded Gravel and Cobble unit will tend to "control" its properties and characteristics. Therefore, during wet weather it is generally recommended to "cap" these materials with at least 6 inches of compacted crushed rock to "protect" the surface from construction traffic disturbance (heavy construction traffic requires at least 12 inches of crushed rock).

Locally available crushed rock and clean, jaw-run or crushed "shale" Granite have also performed adequately for most applications of structural fill (see Section 8.9).

Structural Fill Placement. Structural fill should be placed in horizontal lifts not exceeding 8 inches loose thickness (less, if necessary to obtain proper compaction) for heavy compaction equipment and four inches or less for light and hand-operated equipment. Each lift should be compacted to a minimum of 98 percent of the maximum dry density, as determined by ASTM Test Method D-698 (Standard Proctor). Compaction shall be by mechanical means, "jetting" will not be allowed.

To facilitate the earthwork and compaction process, the earthwork contractor should place and compact fill materials at or slightly above their optimum moisture content. If fill soils are on the wet side of optimum, they can be dried by continuous windrowing and aeration or by intermixing lime or Portland Cement to absorb excess moisture and improve soil properties. If soils become dry during the summer months, a water truck should be available to help keep the moisture content at or near optimum during compaction operations.

CAUTION
Note: If the clayey soils are left beneath any areas (not allowed under footings) these soils shall be kept at 2% to 3% above optimum for compaction. These should be compacted to between 93% and 95% of ASTM D-698. *Dry, hard packed clayey soils can result in swell related problems and must be avoided.*

Fill Placement Observation and Testing Methods. The required construction monitoring of the structural fill utilizing standard nuclear density gauge testing and standard laboratory compaction curves (ASTM D-698 specified) is not applicable to larger jaw run shale (2" or above) or larger crushed rock. The high percentage of rock particles greater than ¾'s of an inch in these materials causes laboratory and field density test results to be erratic and does not provide an adequate representation of the density achieved. Therefore, construction specifications for this type of material typically specify method of placement and compaction coupled with visual observation during the placement and compaction operations.

For these larger rock materials, we recommend the 8-inch lift be compacted by a minimum of 3 passes with a heavy vibratory roller. One "pass" is defined as the roller moving across an area once in both directions. The placement and compaction should be observed by our representative. After compaction, as specified above, is completed the entire area should be proofrolled with a loaded dump truck to verify density has been achieved. All areas which exhibit movement or compression of the rock material under proofrolling should be reworked or removed and replaced as specified above. A successful proofroll is when there is less than ¼" deflection below the tires of a loaded truck.

Field density testing by "nuclear" methods would be adequate for verifying compaction of 2-inch to ¾-inch minus crushed base rock, Decomposed Granite and other materials 2 inches or smaller in size. Therefore, typical specifications would suffice.

8.2.2 Utility Trench Backfill

Utility lines of various types may be buried across the proposed building sites. These need to be adequately supported and the trenches need to be backfilled and compacted properly to prevent subsidence of the surface or damage to the utility lines.

Pipe Bedding. The bottom of the trench must be shaped out of acceptable bedding materials (refer to manufacturer's recommendations) to "fit" the pipe base prior to placement of the pipe. It is critical to the long-term performance of the pipe that the bottom and haunches be fully supported by a dense bedding layer which decreases pipe distortion from load. The onsite silty Clay material is not acceptable for pipe bedding due to the difficulty to compact this material in trench areas and likelihood it will not provide a firm base. The Gravel and Cobbles should also not be used as pipe bedding due to the larger rock pieces which could damage the pipe.

Pipe bedding should be compacted to at least 95% of ASTM D-698 (Standard Proctor) or to that specified by the pipeline designer. Cement-treated pea gravel or sand/cement slurry will solidify and would typically not require compaction after placement.

Pipe Zone Material. All of the lines should be backfilled around and to approximately 12-inches above the pipe with an acceptable pipe zone material. This may consist of finer crushed rock, cement-treated pea gravel, coarse sand with fine gravel or other material acceptable to the pipeline designers. The onsite silty Clay should not be utilized since it will be difficult to compact within the confines of the trenches and will not provide the desired level of support for the pipe. The larger pieces of the gravel and cobble units also would not work well for pipe zone material. The pipe zone material should be well compacted beneath the haunches and on each side of the pipe. Mechanical means will be required to densify these materials to the required densities (unless a cement-treated material is used).

Density requirements for "pipe zone" backfill should be per the manufacturer's specifications for the type of pipe being used (generally between 95% and 98% of ASTM D-698). Care should be taken when compacting close to and immediately above the pipe so as to not damage the pipe.

General Trench Backfill. We strongly recommend that all utility trench backfill be placed and compacted in the same manner as described for structural fill above. This may consist of on site gravels and cobbles and imported crushed rock and shale.

Trench backfill beneath structures should be placed and compacted in accordance with the section on Structural Fill, earlier in this report. Trench backfill beneath asphalt pavements but not under structures should be compacted to at least 98 percent of the maximum dry density, as determined by ASTM Test Method D-698 (Standard Proctor) for the upper 48 inches. Below 48 inches the trench backfill should be compacted to at least 95 percent of the maximum dry density.

8.2.3 Non-Structural Fill

Any waste soil, organic strippings or other deleterious soil would be considered non-structural fill. These materials may make excellent landscape soils and lawn topsoil material. This material may be placed in landscape areas and waste soil areas. It should not be placed as part of a structural fill slope. It is recommended that when these soils are used they be given a moderate level of compaction (probably about 90 to 93 percent) to help seal them from surface water. When utilized in berms less than 10 feet in height we recommend side slopes no greater than 3H:1V.

8.3 BUILDING SUPPORT

8.3.1 General Building Support

The following paragraphs are intended to provide recommendations for support of the structure.

8.3.2 Building Pad Construction

Due to the expansive clay and silt soils, if the structure will have a slab floor, constructing a building pad for the entire structure is recommended. Full removal of the clay down to the dense Sand or Gravels and Cobble unit is recommended. Then construct a structural fill building pad to at least 3 feet beyond the outside edges of all footings. This could be constructed as follows:

1. Remove all Clay and silty Clay down to the dense Gravels and medium dense to dense Sand (2 to 5 feet).
2. Proofroll the subgrade and redensify all loose areas.
3. Place and compact imported crushed rock or shale fill for the building pad as structural fill compacted to 98% of D-698.

This building pad could be used for footing support, utilizing the support method with crushed rock over the medium dense sand and/or dense gravels as described below.

8.3.3 Footing Design

Footings supported on the medium dense sand or rounded Gravels & Cobbles. We recommend the following for footings supported on 12 inches of crushed rock structural fill which is founded on the underlying sand gravels and cobbles.

1. Excavate down into the top of the sand and gravel zone. If excavations are deeper than footing subgrade elevation they must be extended on all sides of the footing a distance equal to at least ½ the depth of the structural fill to be placed beneath the footing.

2. Place at least 12 inches of compacted ¾-inch to 4-inch minus crushed rock, compacted to at least 98% of ASTM D-698. **NOTE:** If looser areas are encountered 18" or 24" of crushed rock may be required.
3. Footings constructed in this manner may be designed for an allowable bearing pressure of 2,500 psf with a one-third increase for short-term wind and seismic loads.
4. The base of spread footings shall be buried a minimum of 16 inches below finish grade in order to provide lateral support and frost protection.
5. We recommend minimum lateral dimensions of 18 inches for continuous load bearing footings and 24 inches for isolated piers constructed in this manner.

Subgrade Soils. Care should be taken when over-excavating beneath the structure so as not to disturb the native subgrade soils. This is particularly important during wet weather. Disturbed subgrade soils beneath structural fill can increase settlement of the footings significantly. Therefore, all loose, disturbed, soft or saturated soils must be removed and replaced prior to placing structural fill or lean mix. Due to the high likelihood of winter or springtime construction, we recommend covering the subgrade with crushed rock as soon as possible after excavation.

Anticipated Settlements. The foundations, when designed as described above, are anticipated to undergo maximum total and differential settlements of up to 7/8" and 1/2" respectively.

Seismic Considerations. The foundations may be subjected to loads from moderately severe ground shaking in a seismic event. This would increase the overall loading on the subgrade soils. For the soils anticipated, this additional loading should not cause any significant adverse affects due to bearing capacity failure as long as footings are designed and constructed per this report.

Footing Drains. All exterior footings shall have a footing drain as described in Section 8.7 and shown on Figures 3 and 4.

8.4 CONCRETE SLABS-ON-GRADE

General. Properly prepared structural fill over the native soils would be adequate for support of concrete slabs-on-grade. In order to "protect" the subgrade during construction, we recommend placing a crushed rock structural fill layer of at least 12 inches beneath the floor slab in areas where the native clayey Silt soils remain stable beneath the floor.

CAUTION
Keep all clayey subgrade soils in a moist and fully swelled condition (exterior slabs).

For best performance we recommend all expansive silty clay be removed from beneath interior slab areas. The subgrade soils should be cleaned of organics, debris, uncontrolled fill and loose material prior to placement of structural fill and underslab drain rock. The

subgrade soils should be proofrolled with a loaded dump truck or other heavily loaded rubber-tired vehicle. If proofrolling appears to begin "pumping" on the subgrade a lighter vehicle should be used. The loose and/or unstable areas revealed during proofrolling should be removed and replaced with structural fill or lean concrete.

Slab Support. The following recommendations are provided for slabs constructed on crushed rock over properly prepared subgrade soils consisting of the native sand soils or the dense gravels (over dense gravels, 6 inches of crushed rock is adequate).

1. Build up the area with compacted crushed rock Structural Fill to the drainage layer subgrade elevation.
2. Place six-inch layer of clean (less than 2% passing the No. 200 sieve and less than 5% pass the No. 10 sieve) crushed rock (½" to ¾" clean crushed rock works well) over the structural fill to provide a positive capillary moisture break and uniform slab support. The capillary break is especially helpful in office and display areas and other areas with floors that will not "breathe" (such as tile or linoleum).
3. Place impermeable membrane, such as Stego Industries 15-mil vapor barrier, or an equivalent product, over the "clean" rock layer to further retard upward migration of moisture vapor into and through the concrete slab.

Slab Subdrains. Where the underslab drainage section will be below exterior grades, we recommend the floor slab be provided with a series of subdrains as described in Section 8.7 and shown in Figure 5.

8.5 EXTERIOR FLATWORK

Areas that will have concrete walks and slabs adjacent to the structure will be subjected to the potential shrinks/swell cycles of the expansive soils. These perform better if placed over 10 to 12 inches of non-expansive fill. Keep the clayey subgrade moist and fully swelled prior to the fill placement.

Connecting across all construction points and dissimilar pours with deformed rebar will also help limit vertical offsets which can create trip hazards.

8.6 LATERAL LOAD RESISTANCE

Lateral loads exerted upon these structures can be resisted by passive pressure acting on buried portions of the foundation and other buried structures and by friction between the bottom of concrete elements of the foundations and the underlying soil.

We recommend the use of passive equivalent fluid pressures of the following values for portions of the structure and foundations embedded into the native soils.

- Medium Stiff, clayey Silt to silty Clay (Top 18") 250 pcf
- Dense, Sands, Gravels and Cobbles 400 pcf
- Compacted Crushed Rock or Shale 500 pcf

We also recommend that the first 18 inches below the native ground surface (if clay or silt) be ignored when computing the passive resistance. Where granular fill or crushed rock or shale is used, the entire embedment depth may be used. A coefficient of friction of 0.50 or 0.35 can be used for elements poured neat against crushed rock structural fill or native soils, respectively. This should be reduced to 0.2 for areas over a plastic vapor barrier or the clay soils.

8.7 RETAINING WALLS

Lateral earth pressures will be imposed on all below ground and backfilled structures or walls, including foundations which do not have uniform heights of fill on both sides and grade separation retaining walls. The following recommendations are provided for design and construction of conventional reinforced concrete or CMU block retaining walls:

- We recommend walls which are free to rotate at the top (unrestrained) when backfilled, be designed for the following loads.

Native Soil Fill (Sand and Gravels) EFP	45 pcf
Low Grade Angular Rock EFP	35 pcf
Crushed Rock EFP	30 pcf
Seismic (up to 8 feet tall)	0.303g

- Walls that are fixed at the top (restrained) when backfilled should be designed for the following loads.

Native Soils Fill EFP	60 pcf
Low Grade Angular Rock EFP	45 pcf
Crushed Rock EFP	40 pcf
Seismic (up to 8 feet tall)	0.303g

- The walls <u>all</u> must have full drainage as described in section 8.7 and as shown on Figure 6.
- These equivalent fluid pressures are to be used for the soil through which the anticipated failure plane will develop (assume envelope beginning 2 feet behind base of wall and rising up and away from wall at 60 degrees off the horizon).
- A wet soil unit weight of 140 pcf should be used for design of retaining walls which are backfilled with crushed rock or jaw-run "shale". Use 130 pcf for native soil backfill.
- These values are for properly compacted, free draining walls. The onsite organic topsoil or very Silty and clayey soils shall not be used for wall backfill. Imported crushed rock or clean jaw-run "shale" work well for wall backfill materials.

- These design values assume the wall or structure is fully drained, has a flat backfill and has no surcharge loads from traffic or other structures. The structural designer should include surcharge loading from traffic, building loads and/or sloped backfill.
- We recommend designing retaining walls to resist seismic loading. A horizontal acceleration component of at least 0.303g should be applied to the mass of an enlarged active wedge of soil behind the walls and utilized in a pseudo-static analysis. The wedge length back from the wall along the ground surface may be taken to be 0.8H, where H is the height of the wall. This relates to an equivalent uniform load over the entire back of the wall of approximately 17.5 pounds per square foot for each foot of backfill, for walls up to 6 feet tall (i.e. for a 6-foot wall, fully backfilled, uniform seismic load will be on the order of 105 psf over the entire back of the wall).
- The backfill should be placed in lifts at near the optimum moisture content (clayey soils at 2% to 3% above optimum) and compacted to between 93 and 95 percent of the maximum dry density as determined by laboratory procedure ASTM D-698 (Standard Proctor). Loosely placed backfill will exert greater pressures on the wall than the pressures provided above and must be avoided.
- To prevent damage to the wall, backfill and compaction against walls or embedded structures should be accomplished with lighter hand-operated equipment within a distance of 1/2 h to 1/3 h (h being the vertical distance from the level being compacted down to the surface on the opposite side of the wall). Outside this distance, normal compaction equipment may be used.

While proper compaction of wall backfill is critical to the proper performance of the walls, care should be taken to not over-compact the backfill materials. Over-compaction can induce greater lateral loads on the wall or structure than the design pressures given above.

8.8 FOUNDATION AND FLOOR AND WALL DRAINS

All exterior foundations and embedded structures and some floors should have proper drainage.

Footing Drains. Drainage should consist of a rigid, smooth interior perforated drain pipe (capable of being cleaned by a roto-rooter type apparatus), typically resting adjacent to the footing near the base of the footing, provided this level is at least 6 inches below the drain rock layer under any floor slabs. The perforated pipe should be surrounded above and on the sides by a minimum of 8 inches of clean drain rock or pea gravel. The drain rock envelope should be wrapped in a non-woven geotextile designed as a filter fabric (AMOCO 4546 or equivalent). We recommend the fabric be covered with a 2-inch layer of sand, to protect it against damage during backfilling operations and potential partial plugging from soil fines, prior to backfilling. Please see Figures 3 and 4 for a typical footing drain detail.

Floor Subdrains. Where the drain rock layer below slabs will be lower than the adjacent exterior grades, water will tend to accumulate in this low area. One method to drain this water is to include a series of subdrains at the bottom of the drain rock layer beneath the slab.

The drain rock section should be thickened to at least 10-inches for such areas. The subdrain lines typically consist of 3-inch smooth interior, solid wall, perforated pipe at spacing of 15 feet (or less) across the structure (and around the interior perimeter). The perforated pipe is placed in a deepened zone of the drain layer as shown on Figure 5. The pipes are sloped to drain and collected by a tightline which leads to the stormwater disposal system.

Retaining Wall Drainage. Wall drains should also have a minimum 12-inch wide drainage zone of drain rock wrapped in non-woven filter fabric immediately behind the wall extending up from the drainage section to within 12 to 18 inches of the surface. A preformed, fabric-wrapped, polymer sheet drain, such as Amerdrain, Linq Drain or Enkamat must be placed against the wall. Exterior wall drains, which will not be sealed on top by asphalt or concrete, should have the upper 12 inches backfilled with compacted onsite silt soils to minimize intrusion of surface waters into the wall drain system. Please see Figure 6.

Walls that should not pass water vapor must be fully sealed (with a bitumen-based sealer that will not harden or crack) before the sheet drain is attached. Wall seal such as MasterBlend HLM5000 or equivalent, should be used and applied per the manufacturer's recommendations.

All drains should be tightlined and positively sloped to an approved stormwater disposal location into the public storm drain system. **Note:** In no case shall water be collected and/or directed or discharged close to the foundations. Such improper water discharge can cause added water related problems.

All drains and subdrains should be connected to a tightline that discharges at an approved stormwater disposal location. *We strongly recommend against connecting roof downspouts or surface area drains to foundation, wall or floor subdrain systems.* We recommend cleanouts be placed periodically by the designer to facilitate cleaning and maintenance of all drainage systems.

8.9 MATERIALS SPECIFICATIONS

The following materials specifications shall apply to the materials as used on this project.

Aggregate Base Rock (Acceptable for Structural Fill)

- Angular Crushed Rock (¾ or 1" Minus); R=85 or greater; Well Graded (No Gaps and at least 60% retained on the No. 4 sieve)
- Exceeds the fracture, durability and sand equivalent requirements outlined in Section 00641 of the Oregon Standard Specifications for Construction
- Maximum passing the No. 200 sieve ≤ 5%
- Compacted to 98% of the maximum dry density as determined by ASTM D698 or AASHTO T-99

Aggregate Subbase Rock (Acceptable for Structural Fill)

- Angular Clean Crushed (jaw run) hard "Shale" (4" Minus Jaw-Run) or Crushed Rock (2" to 4" Minus); R=50 or greater; Angular and Reasonably Well Graded
- At Least 60% retained on the No. 4 Sieve.
- Exceeds the fracture, durability and sand equivalent requirements outlined in Section 00641 of the Oregon Standard Specifications for Construction
- Maximum passing the No. 200 sieve ≤ 10% Total; ≤ 3% Clay Size
- <u>During wet weather; passing No. 200 sieve ≤ 5%.</u>
- Compacted to 95% of the maximum dry density as determined by ASTM D698 or AASHTO T-99; initial lift may not attain 95% due to soft subgrade; Engineer to decide in the field.
- Care must be taken to avoid very silty subbase that will not support construction loads, especially when wet (will not meet specifications).

Embankment Fill (Acceptable for Structural Fill During <u>Dry</u> Weather)

- Reasonably well graded (not open work)
- Has at least 60% retained on the No. 4 sieve.
- Has no more than 30% passing No. 200 sieve.
- Passing No. 200 sieve must have less than 20% clay size.

On-Site Soil Fill (Acceptable as Specified in Report)

- Dense Sand, Gravels & Cobbles free of organics and waste materials.
- Place when weather allows proper compaction

Clean Sand

- Clean washed sand or sand and gravel, less than 1% passing No. 200.
- Gravel to be rounded or subrounded (no fracture faces), 1" or less.
- Must have less than 30% gravel by weight.

Note: Some fill materials will be difficult to nearly impossible to compact during wet weather. *The contractor <u>must</u> select the type of structural fill that will be able to be placed and compacted to specified conditions during the weather conditions that can take place during the construction schedule.*

Drain Rock (For drainage sections)

- Clean washed rounded or angular openwork drain rock.
- Gradation to be 1/4" and greater, sized to not move into and through perforations in the pipe.
- 1/4" to 3/4" clean crushed, 3/4" to 1" clean rounded rock, 1" to 2" clean angular rock are all acceptable.
- Clean means washed rock with <u>NO</u> coating of silt, clay or sand.

Note: All types may be used in all applications of drain rock that are <u>not</u> beneath Asphaltic Concrete paved areas. In all AC areas <u>angular</u> clean drain rock <u>must</u> be used for AC support.

Note: Drainage layer drain rock that is beneath the floor slab must be the angular clean drain rock.

Geotextile Filter Fabric

- Non-woven geotextile filter fabric for wrapping drainage sections and separation of openwork rock from sands or soils fines.
- Meet specifications as per Mirafi 140N or equivalent.
- Overlap all edges at least 24 inches (12" for drainage section envelope).
- Secure in place such that overlaps will not move during covering operation.

Geotextile Support Fabric

- Woven geotextile support fabric designed for separation of crushed rock and subgrade soil and for rock section support.
- Meet specifications as per ACF180 woven support fabric.
- Overlap edges at least 2 feet and ends at least 5 feet.
- Align roll lengthwise with direction of traffic in all drive lanes.
- Pull tight full length and keep tight during placement of crushed rock above fabric.
- Do not drive on the fabric until it is covered with rock.

Perforated Pipe

- 3", 4" or 6" rigid wall, smooth interior perforated pipe.
- Secure all joints with solvent weld glue. DO NOT use only compression push together fittings.
- Slope to drain per specifications in report or on plan sheets.
- Align perforations in the downward direction.
- Must always be placed within filter fabric wrap unless specifically specified otherwise.
- Protect from construction traffic until buried at least 2 times pipe diameter (minimum 8 inches) of angular rock fill.

Wall Sheet Drain

- Polymer sheet drain with filter fabric attached 1 or 2 sides, designed for drainage of vertical embedded foundation or retaining walls.
- For walls up to 10 feet tall. Must meet specifications as for American Wick Drain's AMERDRAIN 200 or 220.
- Install and splice and patch per manufacturer's recommendations.
- Install with fabric side towards the backfill.
- Attach to wall per manufacturer's recommendations.
- Extend down wall all the way to bottom of drainage section around perforated pipe.
- Protect from damage when backfilling with crushed rock larger than 2-inch minus.
- Repair all damaged areas prior to final backfill.

These materials shall be used on this project as specified in this report and on project plans or specifications.

NOTE: DEVIATIONS FROM SPECIFIED MATERIALS MUST BE APPROVED IN WRITING BY THE GEOTECHNICAL ENGINEER, OWNER AND OWNER'S OTHER CONSULTANTS/DESIGN ENGINEERS PRIOR TO USE AT THE SITE.

8.10 SITE DRAINAGE

The site should be graded during construction such that surface water does not pond within the building footprint or beneath pavement areas. Surface runoff should be controlled during construction and with final site grading. All areas adjacent to the structure should slope away from the foundations at an inclination of at least 6 inches in eight feet. This surface water should be channeled into landscape area drains or should be conveyed around the structure and to the public right of way by means of tightline pipes or shale-lined sloped shallow swales. Where items such as landscape areas and sidewalks block the flow of surface water, small area drains or catch basins should be installed to collect and discharge the surface runoff away from the building.

9.0 ADDITIONAL SERVICES AND LIMITATIONS

9.1 ADDITIONAL SERVICES

Additional services by The Galli Group are recommended to help insure that design recommendations are correctly interpreted in final project design and to help verify compliance with project specifications during the construction process. For these projects we anticipate additional services could include the following:

1. Review of final construction plans and specifications for compliance with geotechnical recommendations.
2. Possible project team meetings and/or phone discussions to clarify issues and proceed smoothly into and through the construction process.
3. Observation of site stripping and subgrade proofrolling.
4. Observation and/or testing of over-excavated areas below footings and slabs, embedment depths, structural fill placement and compaction, subgrade proofrolling, pavement subgrade and aggregate base and footing, floor and wall drainage sections.
5. Periodic reports, as requested by the client and/or required by the building department.

We would provide these additional services on a time-and-expense basis in accordance with our Standard Fee Schedule and General Conditions already in-place for this project. We also realize that the owner may have their own personnel carry out such inspections. If that is the case, we cannot be held responsible for decisions made by others.

9.2 LIMITATIONS

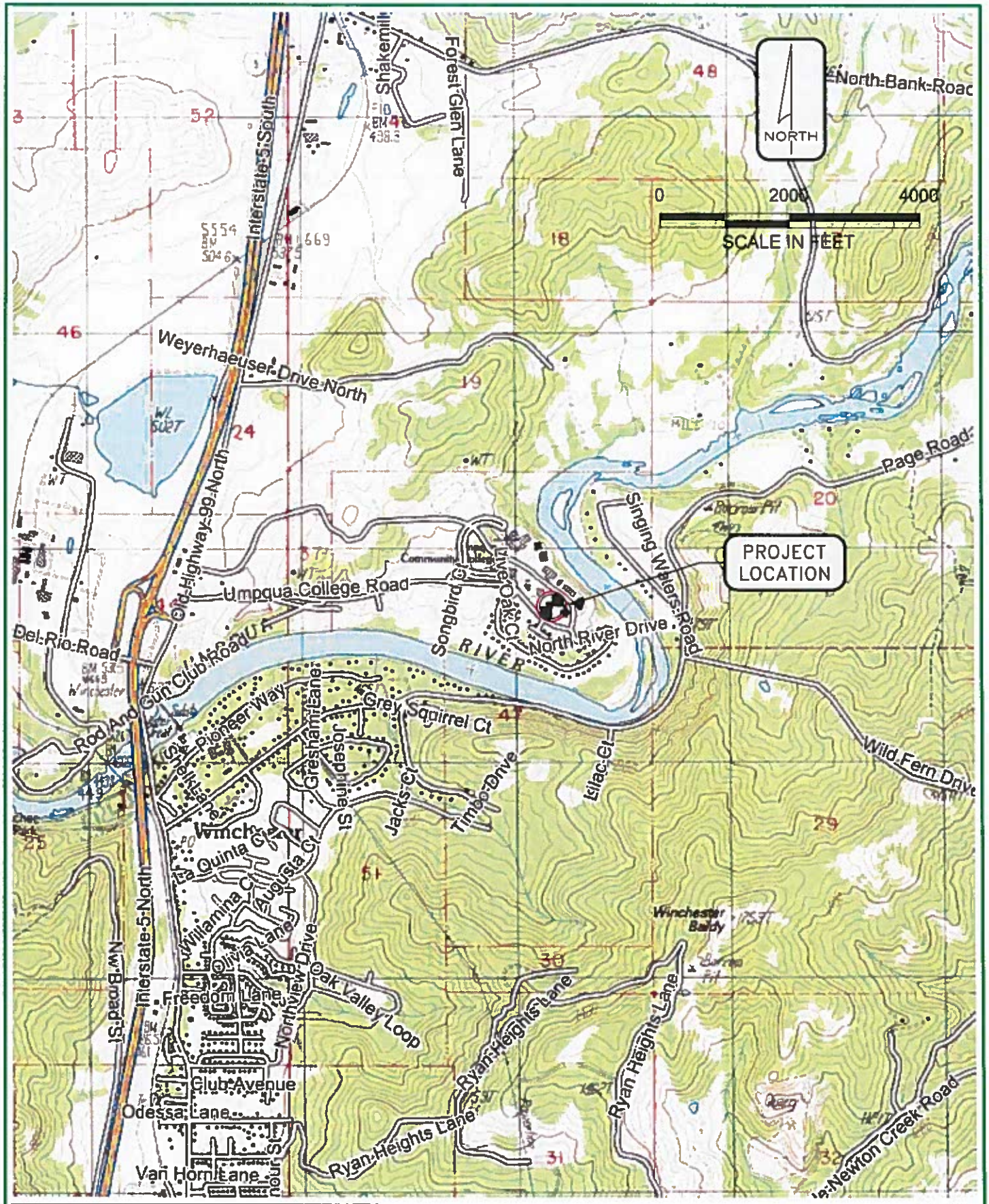
The analyses, conclusions and recommendations contained in this report are based on site conditions and potential development plans as they existed at the time of the study, and assume soils and groundwater conditions exposed and observed at the site and in the borings and test pits are representative of subsurface and groundwater conditions throughout the site. If during construction, subsurface conditions or assumed design information is found to be different, we should be advised at once so that we can review this report and reconsider our recommendations in light of the changed conditions. If there is a significant lapse of time between submission of this report and the start of work at the site, or if conditions have changed due to acts of God or construction at or adjacent to the site, it is recommended that this report be reviewed in light of the changed conditions and/or time lapse.

This report was prepared for the use of Umpqua Community College and their design and construction team in the design and construction of the subject project. It should be made available to others for information and factual data only. This report should not be used for contractual purposes as a warranty of site subsurface conditions. It should also not be used at other sites or for projects other than the one intended.

We have performed these services in accordance with generally accepted geotechnical engineering practices in Oregon, at the time the study was accomplished. No other warranties, either expressed or implied, are provided.

THE GALLI GROUP
GEOTECHNICAL CONSULTING

William F. Galli, P.E., G.E.
Senior Principal Engineer



THE GALLI GROUP GEOTECHNICAL CONSULTING 612 NW 3rd Street Grants Pass, OR 97526	VICINITY MAP SNYDER HALL AT U.C.C. ROSEBURG, OREGON	DATE: MARCH 2016 JOB NO: 02-5300-01 REV: 3/29/2017 2:00 PM PREPARED BY: MG3 5300 Snyder Hall UCC - 01 - Vicin.dwg	FIGURE: 1

LEGEND

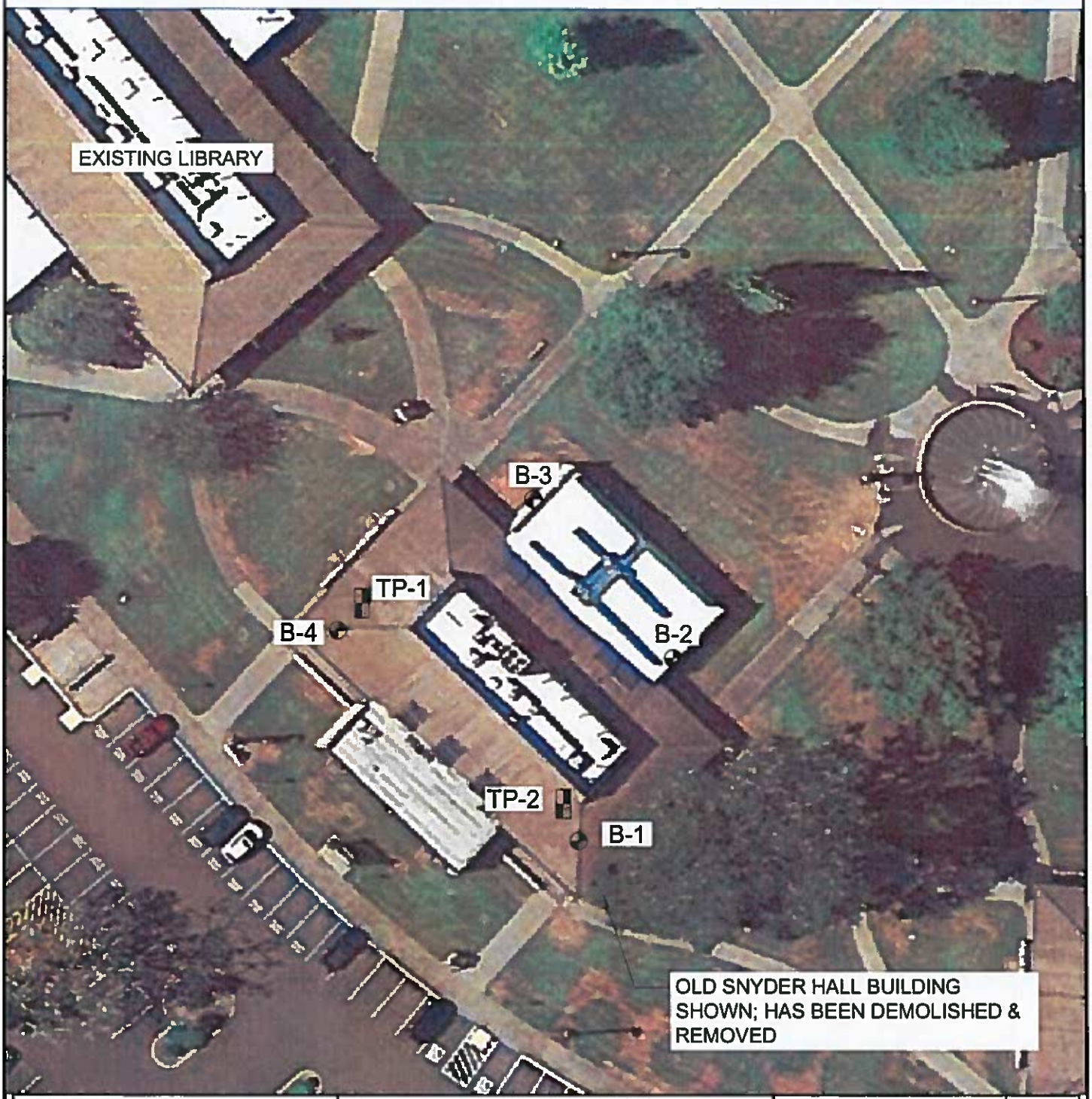
B-1	BORING NUMBER AND APPROXIMATE LOCATION
TP-1	TEST PIT NUMBER AND APPROXIMATE LOCATION

APPROX NORTH

0 40 80

SCALE IN FEET

AERIAL PROVIDED BY GOOGLE EARTH



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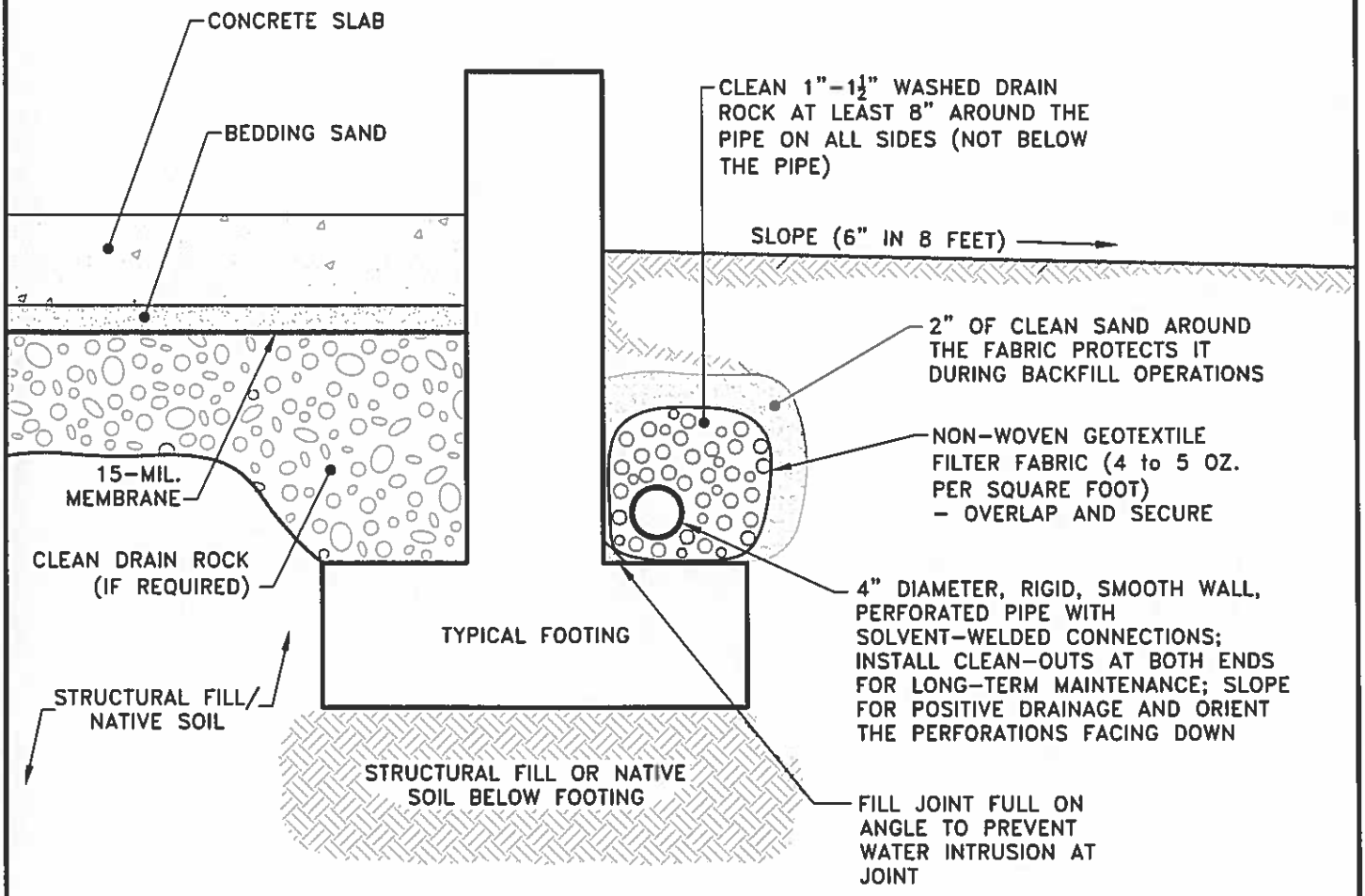
Grants Pass, OR 97526

SITE PLAN WITH TEST PIT LOCATIONS

SNYDER HALL AT U.C.C.
ROSEBURG, OREGON

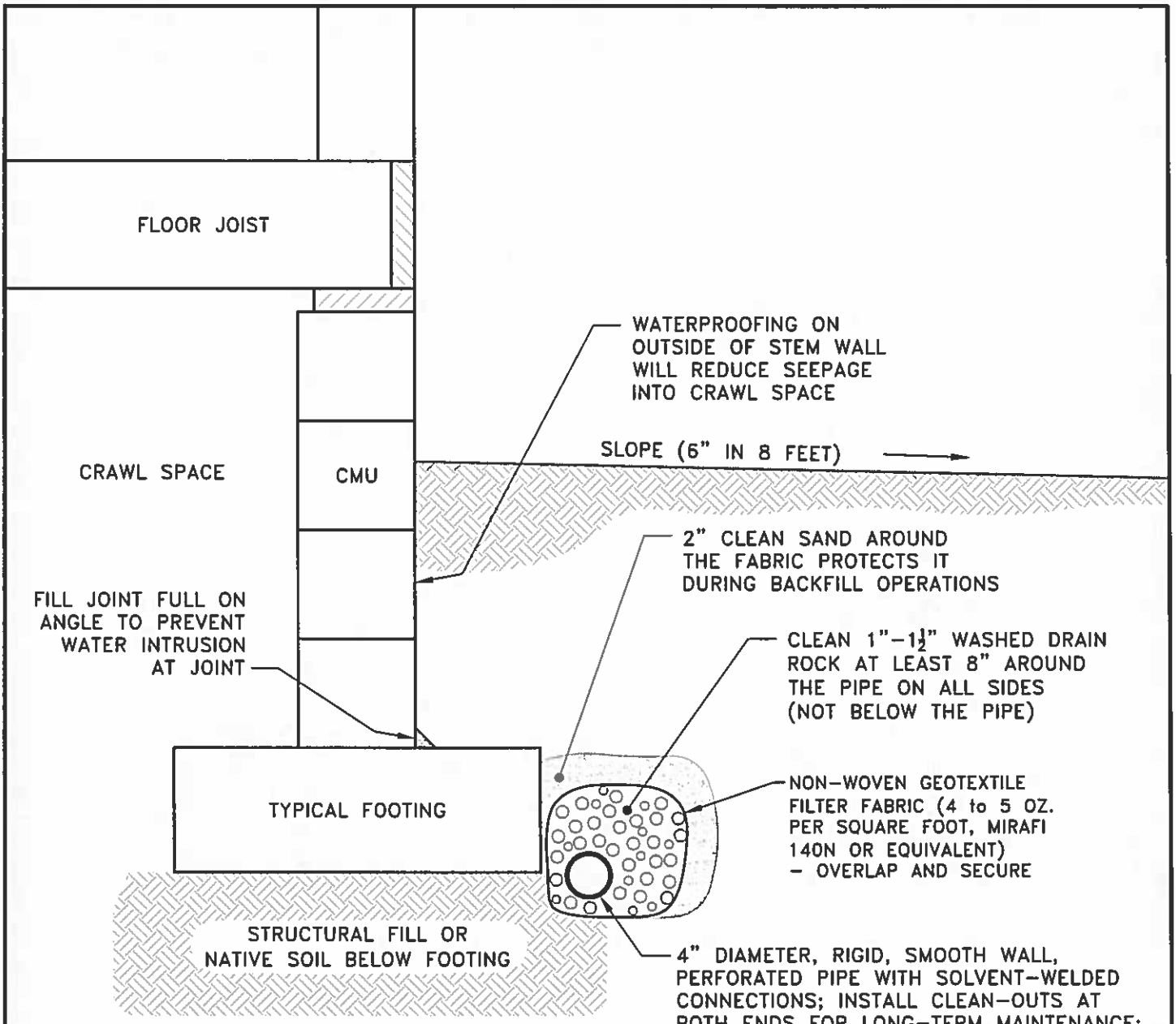
DATE:	MARCH 2016
JOB NO:	02-5300-01
REV:	3/29/2017 3:03 PM
PREPARED BY:	MG3
5300 Snyder Hall UCC - 02 - Site Plan.dwg	

FIGURE: 2



FOR ILLUSTRATION PURPOSES ONLY
NOT TO SCALE

THE GALLI GROUP GEOTECHNICAL CONSULTING 612 NW 3rd Street Grants Pass, OR 97526	TYPICAL FOUNDATION DRAIN SLAB ON GRADE FLOOR SNYDER HALL AT U.C.C. ROSEBURG, OREGON	DATE: MARCH 2016 JOB NO: 02-5300-01 REV: 3/29/2017 2:21 PM PREPARED BY: MG3 5300 Snyder Hall UCC - 03 - found drain-slab dwg	FIGURE: 3



NOTES:

(1) VAPOR BARRIER TO BE STEGO INDUSTRIES 15mil STEGO WRAP OR EQUIVALENT. OWNER MY CHOOSE TO USE 6mil VISQUENE, UNDERSTANDING IT WILL NOT WORK AS WELL.

(2) CAPILLARY BREAK ROCK BELOW VAPOR BARRIER TO BE 1/4" TO 3/4" CLEAN CRUSHED ROCK OR EQUIVALENT.

FOR ILLUSTRATION PURPOSES ONLY – NOT FOR CONSTRUCTION
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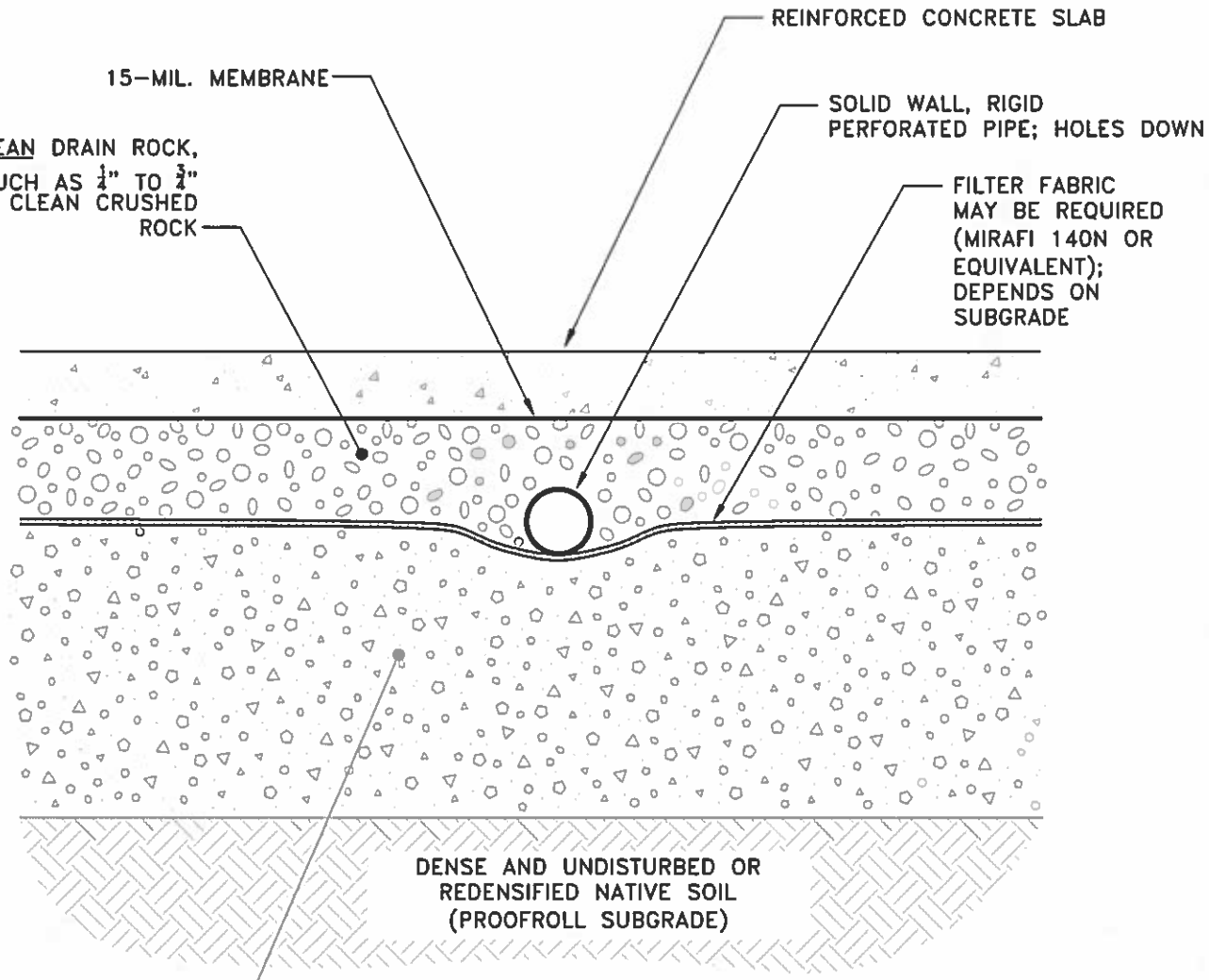
Grants Pass, OR 97526

TYPICAL FOUNDATION DRAIN WITH CRAWL SPACE

SNYDER HALL AT U.C.C.
ROSEBURG, OREGON

DATE:	MARCH 2016
JOB NO:	02-5300-01
REV:	3/29/2017 2:22 PM
PREPARED BY:	MG3
	5300 Snyder Hall UCC - 04 -found drain-crawl 03.dwg

FIGURE: 4



NOTES:

(1) MAXIMUM SPACING IS 10 TO 15 FEET.

(2) ORIENT PIPE PERFORATIONS TO BOTTOM.

(3) ASSEMBLE PIPE USING SOLVENT-WELDED CONNECTIONS.

(4) DO NOT DRIVE OVER DRAIN LINES.

(5) DRAIN ROCK AND STRUCTURAL FILL TO MEET SPECS. IN REPORT BODY – SLOPE PIPE TO DRAIN.

(6) MAY REQUIRE FILTER FABRIC ON NATIVE SUBGRADE OR IF STRUCTURAL FILL IS VERY SILTY OR SANDY.

(7) BEST VAPOR BARRIER IS STEGO INDUSTRIES 15mil STEGO WRAP (OR EQUIVALENT). OWNER MAY CHOOSE TO USE 6mil VISQUENE WITH THE UNDERSTANDING IT DOES NOT PERFORM NEARLY AS WELL.

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Grants Pass, OR 97526

FLOOR SUBDRAIN DETAIL

SNYDER HALL AT U.C.C.
ROSEBURG, OREGON

DATE: MARCH 2016
JOB NO: 02-5300-01
REV: 3/29/2017 2:22 PM
PREPARED BY: MG3
5300 Snyder Hall UCC - 05- subdrain sog 03.dwg

FIGURE: 5

TYPICAL RETAINING WALL CROSS-SECTION

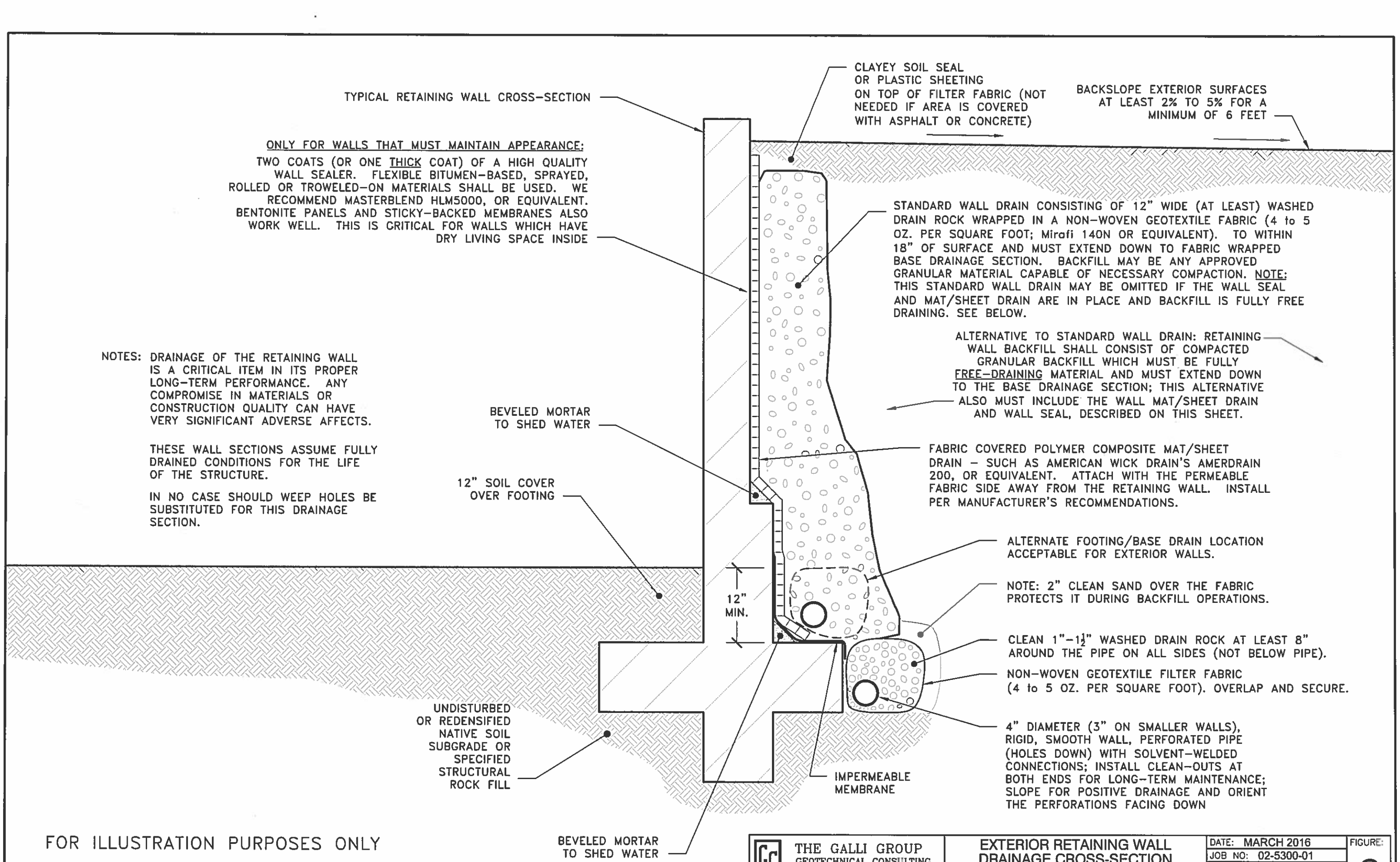
ONLY FOR WALLS THAT MUST MAINTAIN APPEARANCE:

TWO COATS (OR ONE THICK COAT) OF A HIGH QUALITY WALL SEALER. FLEXIBLE BITUMEN-BASED, SPRAYED, ROLLED OR TROWELED-ON MATERIALS SHALL BE USED. WE RECOMMEND MASTERBLEND HLM5000, OR EQUIVALENT. BENTONITE PANELS AND STICKY-BACKED MEMBRANES ALSO WORK WELL. THIS IS CRITICAL FOR WALLS WHICH HAVE DRY LIVING SPACE INSIDE

NOTES: DRAINAGE OF THE RETAINING WALL IS A CRITICAL ITEM IN ITS PROPER LONG-TERM PERFORMANCE. ANY COMPROMISE IN MATERIALS OR CONSTRUCTION QUALITY CAN HAVE VERY SIGNIFICANT ADVERSE AFFECTS.

THESE WALL SECTIONS ASSUME FULLY DRAINED CONDITIONS FOR THE LIFE OF THE STRUCTURE.

IN NO CASE SHOULD WEEP HOLES BE SUBSTITUTED FOR THIS DRAINAGE SECTION.



FOR ILLUSTRATION PURPOSES ONLY

NOT TO SCALE

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Grants Pass, OR 97526

EXTERIOR RETAINING WALL DRAINAGE CROSS-SECTION

SNYDER HALL AT U.C.C.
ROSEBURG, OREGON

DATE: MARCH 2016
JOB NO: 02-5300-01
REV: 3/29/2017 2:23 PM
PREPARED BY: MG3
5300 Snyder Hall UCC - 06 - retwall dm ext.dwg

FIGURE: 6

APPENDIX A

BORING LOGS

USC	DEPTH IN FEET	MATERIAL DESCRIPTION SURFACE ELEV. (FT.)	SAMPLES NO.	SAMPLES S.P.T.	GROUND WATER DEPTH IN FEET	STANDARD PENETRATION TEST ▲ BLOWS PER FOOT 0 10 20 30 40
		(FILL) Loose, light brown, sandy Gravels & Cobbles; well graded, rounded to subrounded gravels and cobbles, moist.				
	2	Medium stiff, gray and brown, gravelly Clay; fine to medium, rounded gravels, moist.	S-1	6		
	4½	Dense, brown, silty, sandy Gravels; well graded, rounded to subrounded gravels, moist.	S-2	31		
	6	Bottom of boring at 6 feet. No free groundwater or seepage encountered.				

LEGEND

- 2" S.P.T. SAMPLE
- GRAB SAMPLE
- * SAMPLE NOT RECOVERED
- U P 3" THIN WALL SAMPLE PITCHER SAMPLE
- IMPERVIOUS SEAL
- WATER LEVEL
- PIEZOMETER TIP
- LIQUID LIMIT
- NATURAL WATER CONTENT
- PLASTIC LIMIT
- WATER CONTENT IN PERCENT
- USC UNIFIED SOIL CLASSIFICATION

NOTES

1. MATERIAL DESCRIPTIONS AND INTERFACES ARE INTERPRETIVE AND ACTUAL CHANGES MAY BE GRADUAL.
2. GROUNDWATER LEVELS DO RISE AND FALL DUE TO THE SEASONS. GROUNDWATER LEVELS MAY RISE CLOSE TO GROUND SURFACE.

DRILLER TGG ATV
DATE START 03/17/17 FINISH 03/17/17
DRILLING TECHNIQUE 4"ø SSA

THE GALLI GROUP
GEOTECHNICAL CONSULTING
612 NW 3rd Street
Grants Pass, OR 97526

SUMMARY BORING LOG
B-1
SNYDER HALL AT U.C.C.
ROSEBURG, OREGON

DATE MARCH 2017
JOB NO. 02-5300-01
FIG. A1

USC	DEPTH IN FEET	MATERIAL DESCRIPTION SURFACE ELEV. (FT.)	SAMPLES NO.	SAMPLES S.P.T.	GROUND WATER DEPTH IN FEET
	0	Medium stiff, gray brown, silty Clay; trace sand, occasional to scattered rounded gravels, moist.	S-1		
	2½	Medium stiff to stiff, orange brown & gray, clayey, sandy, Silt; sands, silts and clays vary somewhat throughout sample; fine sand, scattered, fine, rounded gravels, moist.	S-2	9	
	5	Medium dense, orange brown and gray, silty, Sand; with variable clay, increasing sand content with depth, moist.	S-3	12	
			S-4	16	
			S-5		
	10	Dense, mottled orange, brown and black, silty SAND; trace to scattered, fine to medium, angular gravels (very soft); damp. [Remnant of soft, weathered Sandstone/Siltstone]	S-6	42	
	11½	Bottom of boring at 11½ feet. No free groundwater or seepage encountered.			

STANDARD PENETRATION TEST
▲ BLOWS PER FOOT
0 10 20 30 40

1 2 3 4 5 6 7 8 9 10 11 12 13 14

LEGEND

- 2" S.P.T. SAMPLE
- GRAB SAMPLE
- * SAMPLE NOT RECOVERED
- U P 3" THIN WALL SAMPLE / PITCHER SAMPLE
- IMPERVIOUS SEAL
- WATER LEVEL
- PIEZOMETER TIP
- LIQUID LIMIT / NATURAL WATER CONTENT / PLASTIC LIMIT
- WATER CONTENT IN PERCENT
- USC UNIFIED SOIL CLASSIFICATION

NOTES

1. MATERIAL DESCRIPTIONS AND INTERFACES ARE INTERPRETIVE AND ACTUAL CHANGES MAY BE GRADUAL.
2. GROUNDWATER LEVELS DO RISE AND FALL DUE TO THE SEASONS. GROUNDWATER LEVELS MAY RISE CLOSE TO GROUND SURFACE.

DRILLER TGG ATV
DATE START 03/17/17 FINISH 03/17/17
DRILLING TECHNIQUE 4"ø SSA

THE GALLI GROUP
GEOTECHNICAL CONSULTING
612 NW 3rd Street
Grants Pass, OR 97526

SUMMARY BORING LOG
B-2
SNYDER HALL AT U.C.C.
ROSEBURG, OREGON

DATE MARCH 2017
JOB NO. 02-5300-01
FIG. A2

USC	DEPTH IN FEET	MATERIAL DESCRIPTION SURFACE ELEV. (FT.)	SAMPLES NO.	SAMPLES S.P.T.	GROUND WATER DEPTH IN FEET	STANDARD PENETRATION TEST ▲ BLOWS PER FOOT 0 10 20 30 40
		Medium stiff, gray, silty Clay; trace sand, occasional to scattered rounded gravels, moist.	S-1	*		
	2½	Medium dense, mottled orange brown and black, silty, Sand; silt and sand varies – increasing sand content with depth, some clay, moist.	S-2	27		
	5	Dense, mottled orange, brown and black, silty SAND; trace to scattered, fine to medium, angular gravels (very soft); damp. [Remnant of soft, weathered Sandstone/Siltstone]	S-3	37		
	6½	Bottom of boring at 6½ feet. No free groundwater or seepage encountered.				

1 2 3 4 5 6 7 8 9 10 11 12 13 14

LEGEND

- 2" S.P.T. SAMPLE
- GRAB SAMPLE
- * SAMPLE NOT RECOVERED
- U P 3" THIN WALL SAMPLE PITCHER SAMPLE
- IMPERVIOUS SEAL
- WATER LEVEL
- PIEZOMETER TIP
- LIQUID LIMIT / NATURAL WATER CONTENT / PLASTIC LIMIT
- WATER CONTENT IN PERCENT
- USC UNIFIED SOIL CLASSIFICATION

NOTES

1. MATERIAL DESCRIPTIONS AND INTERFACES ARE INTERPRETIVE AND ACTUAL CHANGES MAY BE GRADUAL.
2. GROUNDWATER LEVELS DO RISE AND FALL DUE TO THE SEASONS. GROUNDWATER LEVELS MAY RISE CLOSE TO GROUND SURFACE.

DRILLER TGG ATV
DATE START 03/17/17 FINISH 03/17/17
DRILLING TECHNIQUE 4"ø SSA

THE GALLI GROUP
GEOTECHNICAL CONSULTING
612 NW 3rd Street
Grants Pass, OR 97526

SUMMARY BORING LOG
B-3

SNYDER HALL AT U.C.C.
ROSEBURG, OREGON

DATE MARCH 2017
JOB NO. 02-5300-01
FIG. A3

USC	DEPTH IN FEET	MATERIAL DESCRIPTION SURFACE ELEV. (FT.)	SAMPLES NO.	SAMPLES S.P.T.	GROUND WATER DEPTH IN FEET	STANDARD PENETRATION TEST ▲ BLOWS PER FOOT 0 10 20 30 40
	0	Medium dense, brown gray, gravelly Clay; trace sand, subrounded to rounded, well graded gravels – gravel content varies somewhat, moist.	S-1			
	1½	Dense, mottled orange, brown and black, silty SAND; trace to scattered, fine to medium, angular gravels (very soft); damp. [Remnant of soft, weathered Sandstone/Siltstone].	S-2	17/5"		
	3	Bottom of boring at 3 feet. No free groundwater or seepage encountered.				

LEGEND

- 2" S.P.T. SAMPLE
- GRAB SAMPLE
- * SAMPLE NOT RECOVERED
- U P 3" THIN WALL SAMPLE
- PITCHER SAMPLE
- IMPERVIOUS SEAL
- WATER LEVEL
- PIEZOMETER TIP
- LIQUID LIMIT
- NATURAL WATER CONTENT
- PLASTIC LIMIT
- ● WATER CONTENT IN PERCENT
- USC UNIFIED SOIL CLASSIFICATION

NOTES

1. MATERIAL DESCRIPTIONS AND INTERFACES ARE INTERPRETIVE AND ACTUAL CHANGES MAY BE GRADUAL.
2. GROUNDWATER LEVELS DO RISE AND FALL DUE TO THE SEASONS. GROUNDWATER LEVELS MAY RISE CLOSE TO GROUND SURFACE.

DRILLER TGG ATV
DATE START 03/17/17 FINISH 03/17/17
DRILLING TECHNIQUE 4"ø SSA

THE GALLI GROUP
GEOTECHNICAL CONSULTING
612 NW 3rd Street
Grants Pass, OR 97526

SUMMARY BORING LOG
B-4
SNYDER HALL AT U.C.C.
ROSEBURG, OREGON

DATE MARCH 2017
JOB NO. 02-5300-01
FIG. A4

APPENDIX B

TEST PIT LOGS

TEST PIT LOGS

Please note that the soil descriptions given below are representative of how the field representative observed and classified them at the time of test pit excavation. However, these should not be used as a guarantee of subsurface conditions across the site. Any interpretation or estimates made by others based on these logs, is done at their risk.

TP-1

0.0 – 0.5	Soft, orange brown, silty Clay; with rounded to subrounded gravels and small cobbles, moist.
0.5 – 2.0	Dense, orange brown, sandy Gravels and Cobbles; clast supported gravels, moist.
2.0 – 6.0	Extremely soft to very soft (R0 - R1), orange and black, Highly Weathered Siltstone.

No Free Groundwater or Seepage Observed.
Bottom of Test Pit at 6.0 Feet.

TP-2

0.0 – 1.2	Loose, light brown, sandy Gravels and Cobbles; rounded to subrounded gravels and cobbles (up to 4 inches), moist.
1.2 – 4.0	Stiff, gray brown silty Clay; with some fine gravels, moist.
4.0 – 7.0	Dense, light brown, silty, gravelly Sand; trace clay, some cobbles (up to 8 inches at 7.0' depth), moist.

Seepage Observed at 2.5 Feet.
Bottom of Test Pit at 7.0 Feet.

APPENDIX C

LABORATORY TEST RESULTS

THE GALLI GROUP
Geotechnical Consulting

Expansion Index Worksheet (ASTM D-4829)

Client:	Umpqua Community College
Project	Snyder Hall
Job No:	02-5300-01
Test Date:	3/21/2017
Sample Location:	B-1/S-1 @ 2.5' to 4.0'
Sample Date:	3/17/2017
Description of Soil:	Brown, Gravely, silty Clay

Expansion Index measured (EIm):

$EI_m = \Delta H / H_{orig} * 1000$

begin dial :	0.0514
end dial:	0.2567
EI_m:	**205**

Weight of ring (g):	365.3
Wt. Wet sample in ring(g):	745.5
Sample Wet Weight (g):	380.25
Sample Length (in.):	1
Sample Diameter (in.):	4.01
Volume of sample (ft^3):	0.007309
Sample Unit Wt. (PCF):	**114.6**
Sample Dry Unit Wt. (PCF):	**96.0**

Saturation (S):

$S=(SG)(w)\gamma d)/(SG)*62.4)-\gamma d$

SG:	2.7
γd:	96.0
$\%w$:	19.3
S=	**69**

As prepared for testing:

can no.	2-4
wet weight of soil + can (g)	219.42
dry weight of soil + can (g)	198.07
weight of can (g)	87.63
weight of dry soil (g)	110.44
weight of water (g)	21.35
moisture content (% of dry weight)	19.3

EI_{50} Calculation:

$EI_{50=Elm - (50-Sm)*[(65+Elm)/(220-Sm)]}$

EI_M	205
S	69
EI_{50} =	**240**

After testing:

can no.	557
wet weight of soil + can (g)	623.35
dry weight of soil + can (g)	493.94
weight of can (g)	178.96
weight of dry soil (g)	314.98
weight of water (g)	129.41
moisture content (% of dry weight)	41.1

#4 + (dry wt.)	89.37
#4 - (dry wt.)	485.25

% Passing #4 Sieve = 84.4

Tested By: Aaron Reeser