19-109160-CO_Ochoa's_STORM REPORT_06-05-19

STORMWATER CALCULATIONS

Prepared For:

Carlson Veit Junge Architects

3095 River Road N

Salem, OR 97303

Project Location:

Ochoa's Queseria

3350 Portland Rd NE

Salem, OR 97301

Permit Number: 19-109160-CO

Prepared By:

REGISTERED PROFESSIONAL ENGINEER
76415PE
OREGON
NOV. 12, 2008
WILLIAM J. WELLS
RENEWS: 6/30/2020

APPROVED
Stormwater Design Report
James Lofton, PE 07/09/2019

Westech Engineering, Inc.
3841 Fairview Industrial Drive SE, Suite 100
Salem, OR 97302
(503) 585-2474 FAX: (503) 585-3986

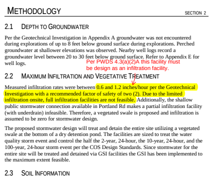
J.O. 3129.0000.0

Updated May 2019

Markup Summary

6 (1)

Westech Comment Responses



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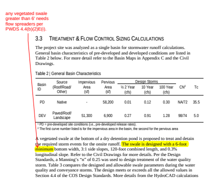
Added drain rock and included soil infiltration for design.

Per PWDS 4.3(a)(2)A this facility must be design as an infiltration facility.

8 (1)



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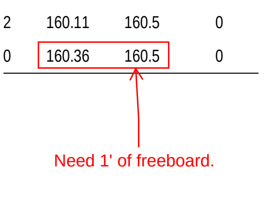
Added rock check dams

any vegetated swale greater than 6' needs flow spreaders per PWDS 4.4(b)(2)E(i).

9 (4)



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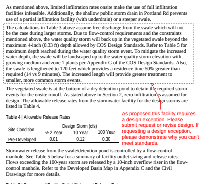
Emergency overflow revised to 160 and top of facility raised to 161 to provide 1' freeboard.

Need 1' of freeboard.



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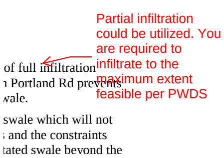
Revised design to meet standards.

As proposed this facility requires a design exception. Please submit request or revise design. If requesting a design exception, please demonstrate why you can't meet standards.



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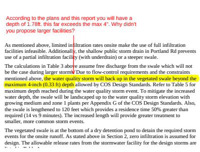
Included infiltration in design.

Partial infiltration could be utilized. You are required to infiltrate to the maximum extent feasible per PWDS



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Revised design stays below 4" in water quality event.

According to the plans and this report you will have a depth of 1.78ft. this far exceeds the max 4". Why didn't you propose larger facilities?

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PROJECT OVERVIEW & DESCRIPTION

1.1 SIZE & LOCATION OF PROJECT

The proposed project is located at 3350 Portland Rd NE in Salem, Oregon. The property has a total site area of approximately 58,200 square feet (1.3 acres) located south of the intersection of Portland Rd NE and Rose Garden St. Refer to the Civil Drawings for a site map of the project area.

1.2 BRIEF DESCRIPTION OF PROJECT SCOPE AND PROPOSED IMPROVEMENTS

The project scope is to develop the vacant lot for commercial business. The project includes a new building (approx. 9,000 square feet), parking lot, and gravel storage area. The project includes site preparation and construction of the facilities.

1.3 DESCRIPTION OF SIZE OF WATERSHED DRAINING TO THE SITE

The project site is 58,200 square feet. No additional drainage area drains to the project site.

1.4 DESCRIPTION OF THE EXISTING SITE CONDITIONS, CONSTRAINTS, SENSITIVE AREAS & WATERWAYS

The existing vacant site is predominately grass-covered. The site does not contain any existing sensitive areas, waterways, etc.

1.5 SUMMARY OF EXISTING TREES & NATIVE VEGETATION

As mentioned above, the vacant site is predominately grass-covered. No trees exist onsite. The southern property line is bordered by trees belonging to the adjacent property.

1.6 SUMMARY OF GREEN STORMWATER INFRASTRUCTURE

Per Appendix 4E of the City of Salem (COS) Design Standards, a large project will be considered to have met the maximum extent feasible (MEF) requirement when the stormwater runoff from the total amount of new plus replaced impervious surfaces flows into an area set aside for GSI that is at least 10% of the total area of the new plus replaced impervious surfaces or at least 80% of all impervious area must be treated by GSI. The design implements GSI for the entire site and therefore meets MEF for GSI. See the Civil Drawings for more details.

1.7 REGULATORY PERMITS REQUIRED

A 1200-C permit from DEQ will be required since more than one acre is disturbed by the project. City of Salem permits are required. No other permits are required for this project.

1.8 100-Year Emergency Storm Escape Routes

Please refer to the Developed Basin Map in Appendix C for emergency overflow routes.

2.1 DEPTH TO GROUNDWATER

Per the Geotechnical Investigation in Appendix A groundwater was not encountered during explorations of up to 8 feet below ground surface. Perched groundwater at shallower elevations was observed. Nearby well logs record a groundwater level between 20 to 30 feet below ground surface. Refer to Appendix E for well logs.

2.2 MAXIMUM INFILTRATION AND VEGETATIVE TREATMENT

Measured infiltration rates were between 0.6 and 1.2 inches/hour per the Geotechnical Investigation. A recommended factor of safety of two is applied to the site's average infiltration for a design infiltration rate of 0.45 inches/hour.

The proposed stormwater design will treat and detain the entire site utilizing a vegetated swale at the bottom of a dry detention pond. Drain rock will be included under the swale to help facilitate infiltration and provide increased detention. The facilities are sized to treat the water quality storm event and control the half the 2-year, 24-hour, the 10-year, 24-hour, and the 100-year, 24-hour storm event per the COS Design Standards. Since stormwater for the entire site will be treated and detained via GSI facilities the GSI has been implemented to the maximum extent feasible.

2.3 SOIL INFORMATION

The pre-developed project site contains hydrologic soil group C soils. Refer to the NRCS Soils Report in Appendix B for more details.

2.4 HAZARDOUS MATERIAL

The owner is not aware of any hazardous material contamination onsite.

3.1 METHODS & SOFTWARE USED

HydroCAD modeling software was used to size the stormwater facilities. The Santa Barbara Unit Hydrograph Type 1A storm was used to model the required design storms. Per the City of Salem (COS) Design Standards the design storms used were the 1.38 inch, 24-hour (water quality storm), half the 2-year, 24-hour, the 10-year, 24-hour, and the 100-year, 24-hour storm events.

Table 1 | City of Salem 24-hour Design Storms

	24-Hour Rainfall Depths for Salem, OR						
Recurrence Interval, Years	2	5	10	25	50	100	WQ
24-Hour Depths, Inches	2.2	2.7	3.2	3.6	4.1	4.4	1.38

Source: City of Salem Administrative Rules Chapter 109 – Division 004 Appendix D

3.2 CURVE NUMBER AND TIME OF CONCENTRATION CALCULATIONS

The developed impervious and pervious areas were assigned curve numbers of 98 and 74 respectively. The impervious areas were assigned a curve number of 98 which corresponds to paved/parking and roof areas. This is conservative considering approximately half the parking lot will be gravel. The pervious areas were assigned a curve number of 74 which corresponds to amended soil coverage with C-rated soils per the City of Salem Design Standards. This is conservative considering much of the developed pervious site area is green stormwater infrastructure.

Time of concentration (Tc) for the pre-developed conditions was calculated using sheet flow equations. See the Pre-Developed Basin Map in Appendix C for the flow path used and refer to the HydroCAD Summaries in Appendix D for calculations. A minimum time of concentration of 5 minutes is applied to the developed basin due to the minimum time-step used by the HydroCAD modeling software.

3.3 TREATMENT & FLOW CONTROL SIZING CALCULATIONS

The project site was analyzed as a single basin for stormwater runoff calculations. General basin characteristics of pre-developed and developed conditions are listed in Table 2 below. For more detail refer to the Basin Maps in Appendix C and the Civil Drawings.

Table 2 | General Basin Characteristics

Basin ID	Source (Roof/Road/ Other)	Impervious Area (sf)	Pervious Area (sf)	Design Storms ½ 2 Year (cfs)	10 Year (cfs)	100 Year (cfs)	CN[2]	Tc
PD	Native	-	58,200	0.01	0.12	0.30	NA/72	35.5
DEV	Paved/Roof/ Landscape	51,300	6,900	0.27	0.91	1.28	98/74	5.0

[1] PD = pre-developed site conditions (i.e., pre-developed release rates).
[2] The first curve number listed is for the impervious area in the basin, the second for the pervious area

A vegetated swale at the bottom of a dry detention pond is proposed to treat and detain the required storm events for the onsite runoff. The swale is designed with a 6-foot minimum bottom width, 3:1 side slopes, 120-foot combined length, and 0.3% longitudinal slope. Regularly spaced rock check dams will help distribute drainage evenly across the swale bottom. Refer to the Civil Drawings for more details. Per the Design Standards, a Manning's "n" of 0.25 was used to design treatment of the water quality storm. Table 3 compares the designed and allowable swale parameters during the water quality and conveyance storms. The design meets or exceeds all the allowed values in Section 4.4 of the COS Design Standards. More details from the HydroCAD calculations can be found in Appendix D.

Table 3 | Summary of Vegetated Swale Design

COS Design Standards Criteria	Allowable	Designed Vegetated Swale
Manning's n - Water Quality	0.25	0.25
Maximum Water Quality Flow Depth (ft)	0.33	0.33
Maximum Water Quality Flow Velocity (fps)	0.90	0.14
Min hydraulic Residence Time (min)	9	14
Manning's n - Conveyance 10-yr	0.03	0.03
Max. Conveyance Flow Depth (ft)	1.0	0.17
Max. Conveyance Flow Velocity (fps)	3.0	0.80
Min Length (ft)	100	120[1]
Side Slope (ft:ft)	3:1	3:1
Longitudinal Slope (%)	-	0.3
Bottom Width (ft)	-	6

[1] Combined length. Swales separated by pipe under pedestrian walkway.

The vegetated swale is at the bottom of a dry detention pond to detain the required storm events for the onsite runoff. The calculations in Table 3 above model the swale as a reach with free discharge which may not be the case during larger storms due to flow-control requirements. The water depth in the stormwater facility is checked by modeling the facility as a detention pond to verify the water surface does back up in the vegetated swale beyond the maximum 4-inch (0.33 ft) depth allowed by COS Design Standards during the water quality storm. The bottom surface of the swale is designed at 157.4 ft. Table 4 below shows the maximum water surface elevation reached during the water quality storm event is 157.47 ft, which is below the maximum allowable elevation of 157.73 ft.

Stormwater release from the facility is controlled by a flow-control manhole. See Table 4 below for a summary of facility outlet sizing and release rates. The entire half the 2-year storm is designed to infiltrate the subsoils. Flows exceeding the 100-year storm are released by a 10-inch overflow riser in the flow-control manhole. Refer to the Developed Basin Map in Appendix C and the Civil Drawings for more details.

Table 4 | Summary of Facility Outlet Sizing and Release Rates

Outlet ID/ Storm Event	Orifice Size (in)	Orifice Elevation (ft)	Release Rate (cfs)	Allowed Release (cfs)	Peak WSE[1] (ft)	Top Pond Elevation (ft)	Infiltration Rate (in/hr)
WQ Event	-	-	0.04	-	157.47	161.0	0.45
Half 2 Year	-	-	0.0	0.01	156.61	161.0	0.45
10 Year	1.8	157.30	0.12	0.12	159.31	161.0	0.45
100 Year	3.2	159.40	0.30	0.30	159.76	161.0	0.45

[1] WSE = water surface elevation

Please note the facility requires 12-inches of drain rock with an area equivalent to the area at the 160-foot elevation contour – 3,450 square feet – to detain and control the design storms in conformance with COS standards.

The HydroCAD modeled release rates from the facility shown in Table 4 assume free-flow through the facility growing media. Release from the facility can also be controlled by the filtration capacity of the growing media. The flowrate through the growing media is calculated to verify the growing media will not be a control point.

The bottom surface of the facility is 1,460 square feet (6 ft x 190 ft). Per the COS Design Standards the growing media has a design filtration rate of 2 inches/hour, which results in a flowrate of 0.05 cfs through the bottom surface of the facility.

The drain rock placed under the swale has a horizontal area of 3,450 square feet. With an infiltration rate of 0.45 inches/hour into the subsoils, the maximum infiltration is 0.04 cfs. Therefore, the growing media does not further restrict drainage into the subsoils and is not a control point.

3.4 Conveyance Capacity Calculations

Per the COS Design Standards for sites less than 50 acres, the stormwater facilities were designed to convey the developed 10-year, 24-hour storm, which has a peak flow of 0.91 cfs before detention and 0.12 cfs after detention. Stormwater runoff is conveyed from the project site to the public storm system in Portland Rd via 10-inch pipes, to a vegetated swale, to a flow-control manhole, to a 10-inch pipe. See the Civil Drawings for more detail. Below is a summary of the conveyance calculations.

- The minimum slope used for the 10-inch storm pipes throughout the site is 0.3%. Using Manning's Equation per the Design Standards, a 10-inch pipe with a slope of 0.3% and Manning's n of 0.013 has a full flow capacity of 1.20 cfs which exceeds the undetained 10-year peak of 0.91 cfs.

- Conveyance calculations for the swale are provided in Table 3 above.

- Stormwater is conveyed through the flow-control manhole via three orifices. HydroCAD modeling simulations of the structure show stormwater reaches an elevation of 159.31 during the developed 10-year storm event, which is below the emergency overflow elevation of 160.0. Refer to Appendix D for the HydroCAD analysis.

3.5 Summary

The stormwater system has been designed to release half the 2-year, 24-hour, the 10-year, 24-hour, and the 100-year, 24-hour storm events at rates less than their respective pre-developed storm. The proposed design also treats the water quality storm. Therefore, the project meets the flow control and treatment requirements as set forth in Administrative Rule 109 Division 004 - Stormwater System.

APPENDIX A

GEOTECHNICAL INVESTIGATION

REDMOND GEOTECHNICAL SERVICES

Geotechnical Investigation and Consultation Services

Proposed Ochoa's Queseria Development Site

Tax Lot No. 5100

3350 Portland Road NE

Salem (Marion County), Oregon

for

Carlson/Veit Architects

Project No. 1111.004.G
March 27, 2019

REDMOND GEOTECHNICAL SERVICES

March 27, 2019

Mr. Chris Veit
Carlson/Veit Architects
3095 River Road North
Keizer, Oregon 97303

Dear Mr. Veit:

Re: Geotechnical Investigation and Consultation Services, Proposed Ochoa's Queseria Development Site, Tax Lot No. 5100, 3350 Portland Road NE, Salem (Marion County), Oregon

Submitted herewith is our report entitled "Geotechnical Investigation and Consultation Services, Proposed Ochoa's Queseria Development Site, Tax Lot No. 5100, 3350 Portland Road NE, Salem (Marion County), Oregon". The scope of our services was outlined in our formal proposal to Mr. Josh Wells of Westech Engineering, Inc. dated November 4, 2018. Written authorization of our services was provided by Mr. Chris Veit of Carlson/Veit Architects on February 12, 2019.

During the course of our investigation, we have kept you and/or others advised of our schedule and preliminary findings. We appreciate the opportunity to assist you with this phase of the project. Should you have any questions regarding this report, please do not hesitate to call.

Sincerely,

Daniel M. Redmond, P.E., G.E.
President/Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
12,309
OREGON
July 15, 1983
DANIEL M. REDMOND
Exp. 12-31-20

CC: Mr. Josh Wells, P.E.
Westech Engineering, Inc.

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Test Pit Logs and Laboratory Test Data

GEOTECHNICAL INVESTIGATION AND CONSULTATION SERVICES PROPOSED OCHOA'S QUESERIA DEVELOPMENT SITE TAX LOT NO. 5100, 3350 PORTLAND ROAD NE SALEM (MARION COUNTY), OREGON

INTRODUCTION

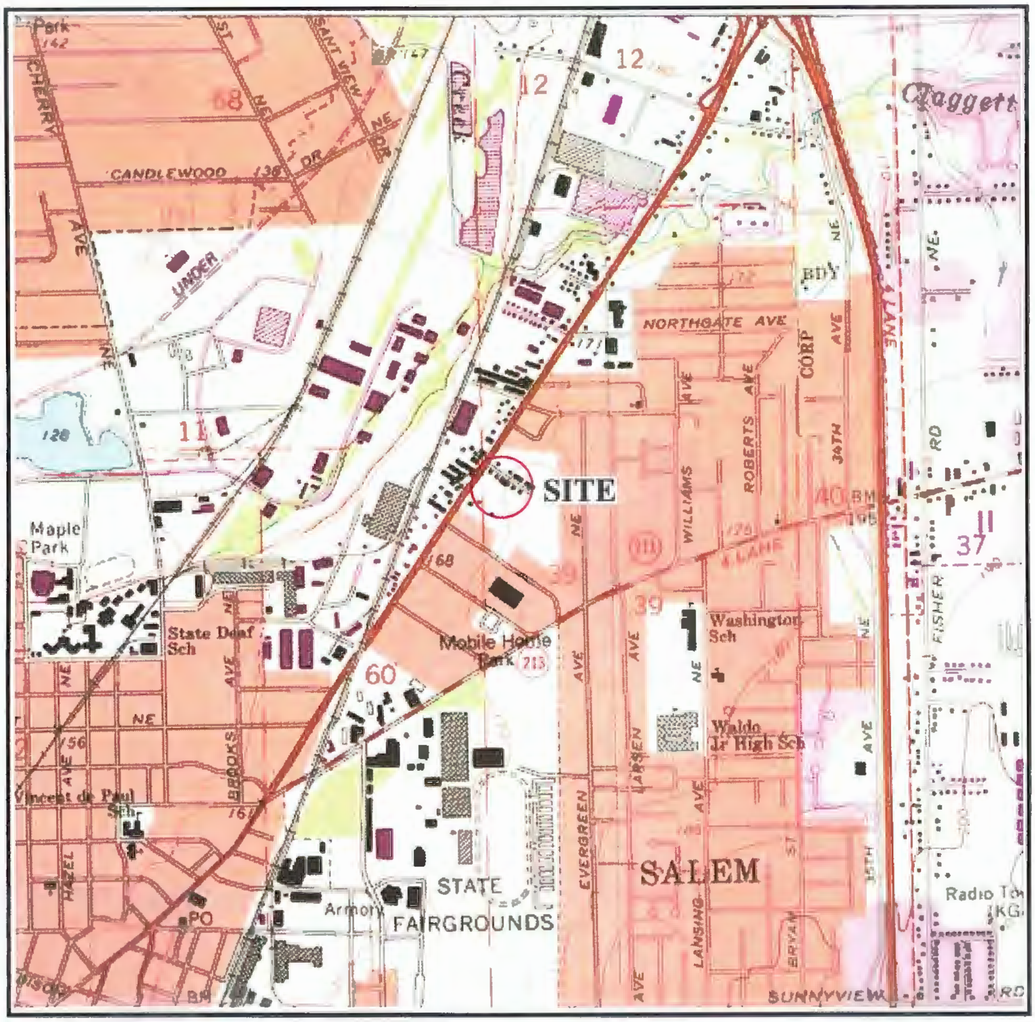
Redmond Geotechnical Services, LLC is please to submit to you the results of our Geotechnical Investigation at the site of the proposed new Ochoa's Queseria development located to the east of Portland Road NE and south of Rose garden Street NE in Salem (Marion County), Oregon. The general location of the subject site is shown on the Site Vicinity Map, Figure No. 1. The purpose of our geotechnical investigation services at this time was to explore the existing subsurface soils and/or groundwater conditions across the subject site and to develop and/or provide appropriate geotechnical design and construction recommendations for the proposed new commercial building development project.

PROJECT DESCRIPTION

Based on a review of the proposed site development plan, we understand that present plans for the project will consist of the construction of a new commercial building. Reportedly, the new commercial building will be a single- and/or two-story structure with a concrete slab-on-grade floor system and will have a base (ground floor) footprint of approximately 8,938 square feet. Support for the new commercial building is anticipated to consist primarily of conventional shallow continuous (strip) footings as well as some individual (spread) column-type footings. Structural loading information, although unavailable at this time, is anticipated to be fairly typical for this type of single- and/or two-story structure and is expected to result in maximum dead plus live continuous (strip) and individual (spread) column-type footing loads on the order of about 2.0 to 3.5 kips per lineal foot (klf) and 10 to 35 kips, respectively.

Earthwork and grading operations associated with bringing the subject property to finish design grades are unknown at this time but are anticipated to result in cuts on the order of approximately one (1) to two (2) feet.

Other associated site improvements for the project will include new paved parking and drive areas as well as underground utility services. Additionally, we understand that storm water from impervious areas (i.e., roofs and pavements) of the project site will be collected for possible treatment and/or disposal and will likely include infiltration through a storm water treatment facility located within the westerly portion of the site.



SALEM WEST QUADRANGLE
OREGON
7.5 MINUTE SERIES (TOPOGRAPHIC)

SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET

DOTTED LINES CROSSING RIVER REPRESENT 5 FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

SITE VICINITY MAP

Project No. 1111.004.G	**OCHOA'S QUESERIA SITE** **3350 PORTLAND ROAD NE**	Figure No. 1

SCOPE OF WORK

The purpose of our geotechnical studies was to evaluate the overall site subsurface soil and/or groundwater conditions underlying the site with regard to the proposed new commercial development and construction at the site and any associated impacts or concerns with respect to the new commercial development as well as provide appropriate geotechnical design and construction recommendations for the project. Specifically, our geotechnical investigation included the following scope of work items:

1. A detailed field reconnaissance and subsurface exploration program of the soil and ground water conditions underlying the site by means of six (6) exploratory test pit excavations. The exploratory test pits were excavated to depths ranging from about four (4) to eight (8) feet beneath existing site grades at the approximate locations as shown on the Site Exploration Map, Figure No. 2. Additionally, field infiltration testing was also performed within two (2) of the exploratory test pit excavations (TP-#1 and TP-#6) in general conformance with current EPA and/or the City of Salem Department of Public Works Administrative Rules Encased Falling Head test method(s).

2. Laboratory testing to evaluate and identify pertinent physical and engineering properties of the subsurface soils encountered relative to the planned site development and construction at the site. The laboratory testing program included tests to help evaluate the natural (field) moisture content and dry density, maximum dry density and optimum moisture content, gradational characteristics and Atterberg Limits as well as consolidation and "R"-value tests.

3. A literature review and engineering evaluation and assessment of the regional seismicity to evaluate the potential ground motion hazard(s) at the subject site. The evaluation and assessment included a review of the regional earthquake history and sources such as potential seismic sources, maximum credible earthquakes, and reoccurrence intervals as well as a discussion of the possible ground response to the selected design earthquake(s), fault rupture, landsliding, liquefaction, and tsunami and seiche flooding.

4. Engineering analyses utilizing the field and laboratory data as a basis for furnishing recommendations for foundation support of the proposed new commercial structure. Recommendations include maximum design allowable contact bearing pressure(s), depth of footing embedment, estimates of foundation settlement, lateral soil resistance, and foundation subgrade preparation. Additionally, construction and/or permanent subsurface water drainage considerations have also been prepared. Further, our report includes recommendations regarding site preparation, placement and compaction of structural fill materials, suitability of the on-site soils for use as structural fill, criteria for import fill materials, and preparation of foundation, pavement and/or floor slab subgrades.

SITE CONDITIONS

Site Geology

Available geologic mapping of the area and/or subject site (Geologic Map of the Salem West 7.5 Minute Quadrangle) indicates that the near surface soils consist of middle terrace deposits (Qtm) of Quaternary age. Characteristics include semi-consolidated gravel, sand, silt and clay forming very flat terraces of major extent along the Willamette River. Generally 10 to 30 feet of light to medium brown silty clay and interbedded very fine sand and silt (ML or CL-CH) surficial material; believed primarily related to Willamette Silts, including associated glacial erratics consisting of tiny fragments and pebbles up to boulders greater than 4 feet in diameter. Soils are somewhat poorly drained and poorly drained silt loams and silty clay loams to moderately well-drained and well drained silt loams subject to seasonal high groundwater and surface ponding. Sand and gravel usually occur below a depth of 30 feet.

Surface Conditions

The subject proposed new commercial development property is generally rectangular in shape and is comprised of one (1) separate tax lot (Tax Lot No. 5100)) encompassing a total area of approximately 1.33 acres. The proposed new commercial development property is roughly bounded to the west by Portland Road NE, to the north by Rose garden Street NE, and to the south and east by existing and developed commercial and/or multi-family residential properties.

The subject proposed new commercial development site is generally unimproved and generally consists of existing open land. However, the site shows evidence of past site grading and/or fill placement as evidenced by the presence of surface gravel.

Surface vegetation across the proposed new commercial development site generally consists of a light to moderate growth of grass and weeds. Topographically, the site is characterized as relatively flat-lying to gently sloping terrain (less than 5 percent) descending downward towards the west with overall topographic relief estimated at about one (1) to two (2) feet and is estimated to lie between about Elevation 160 feet and Elevation 162 feet.

Subsurface Soil Conditions

Our understanding of the subsurface soil conditions underlying the site was developed by means of six (6) exploratory test pits excavated to depths ranging from about four (4) to eight (8) feet beneath existing site grades on February 25, 2019 with track-mounted excavation equipment. The location of the exploratory test pits were located in the field by marking off distances from existing and/or known site features and are shown in relation to the proposed new commercial structure and/or site improvements on the Site Exploration Map, Figure No. 2. Detailed logs of the test pit explorations, presenting conditions encountered at each location explored, are presented in the Appendix, Figure No's. A-5 through A-7.

The exploratory test pit excavations performed during this study were observed by staff from Redmond Geotechnical Services, LLC who logged each of the test pit explorations and obtained representative samples of the subsurface soils encountered across the site. Additionally, the elevation of the exploratory test pit excavations were referenced from a topographic survey of the subject property and should be considered as approximate. All subsurface soils encountered at the site and/or within the exploratory test pit excavations were logged and classified in general conformance with the Unified Soil Classification System (USCS) which is outlined on Figure No. A-4.

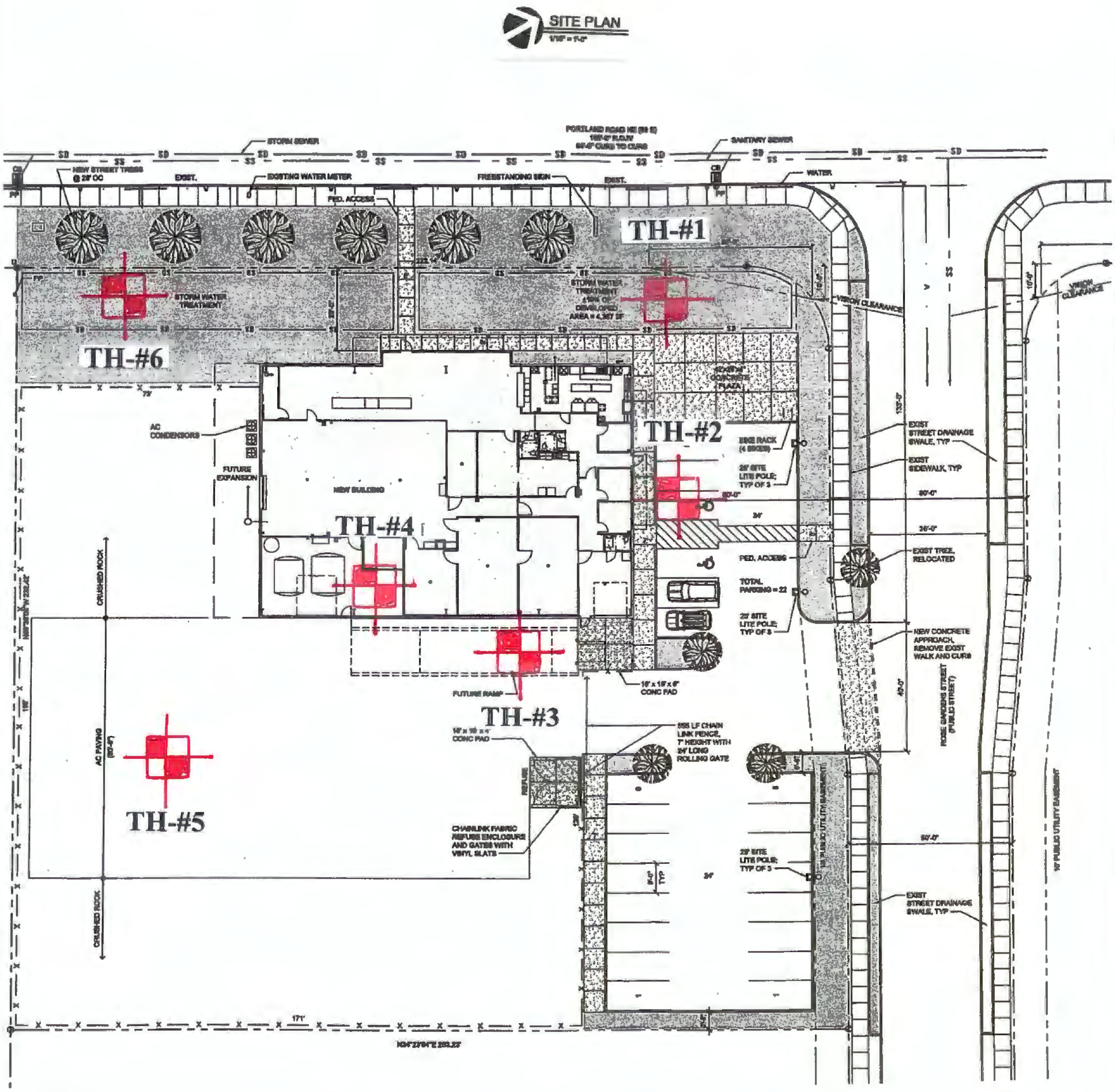
The test pit explorations revealed that the subject site is generally underlain by both surficial fill soils and native soil deposits of Pleistocene age. Specifically, the site was found to be underlain by a surficial and/or upper layer of fill soil materials comprised primarily of gray-brown, wet to saturated, loose to medium dense, silty and sandy gravel with occasional pieces of asphalt and traces of organics to depths ranging from about 1.0 to 2.5 feet beneath the existing site and/or surface grades. These fill soils were found to be moderately well compacted and are best characterized by relatively low to moderate strength and low to moderate compressibility. These upper and/or surficial fill soil materials were inturn underlain by native soil deposits composed of an approximate 8- to 12-inch intermediate layer of dark gray-brown, very moist to wet, soft to medium stiff, sandy, clayey silt with traces of organics. This dark gray-brown layer is considered to represent the old topsoil zone. All soils were found to be underlain at depth by medium to olive-brown, very moist, soft to medium stiff, clayey, sandy silt subgrade soils to the maximum depth explored of about eight (8) feet beneath existing site grades. These clayey, sandy silt subgrade soil become medium stiff to stiff at depth and are best characterized by relatively low to moderate strength and moderate compressibility.

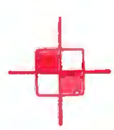
Groundwater

Groundwater, in the form of seepage, was encountered within three (3) of the exploratory test pit explorations (TH-#2, TH-#5 and TH-#6) at the time of excavation at a depth of between one (1) and three (3) feet beneath existing site grades. However, groundwater elevations at and/or below the subject site may fluctuate seasonally in accordance with rainfall conditions as well as changes in site utilization. Additionally, due to the presence of relatively low permeability within the underlying native clayey, sandy silt subgrade soils, water may tend to perch near to and/or at the ground surface during periods of peak and/or prolonged rainfall as was noted at the time of our field work.

INFILTRATION TESTING

We performed two (2) field infiltration tests at the site on February 25, 2019. The infiltration tests were performed in test hole TH-#1 and TH-#6 at depths of about three (3) to four (3) feet beneath existing site grades, respectively. The subgrade soils consisted of clayey, sandy silt. The field infiltration testing was performed in general conformance with current EPA and/or the City of Salem Department of Public Works Administrative Rules Chapter 109 Division 004 Appendix C Open Pit Falling Head Test Method which consisted of advancing a 6-inch inner diameter PVC pipe approximately 6 inches into the exposed soil horizon at each test location. Using a steady water flow, water was discharged into the pipe and allowed to penetrate and saturate the subgrade soils.





LEGEND

TH-#6 Indicates approximate location of exploratory test hole

Approximate Scale: 1" = 30'

SITE EXPLORATION PLAN		
Project No. 1111.004.G	OCHOA'S QUESERIA SITE 3350 PORTLAND ROAD NE	Figure No. 2

The water level was adjusted over a two (2) hour period and allowed to achieve a saturated subgrade soil condition consistent with the bottom elevation of the surrounding test pit excavation. Following the required saturation period, water was again added into the pipe and the time and/or rate at which the water level dropped was monitored and recorded. Each measurable drop in the water level was recorded until a consistent infiltration rate was observed and/or repeated.

Based on the results of the field infiltration testing, we have found that the native slightly clayey, sandy silt subgrade soil deposits posses an ultimate infiltration rate ranging from about 0.6 inches per hour (in/hr) to 1.2 inches per hour (in/hr).

LABORATORY TESTING

Representative samples of the on-site subsurface soils were collected at selected depths and intervals from various test pit excavations and returned to our laboratory for further examination and testing and/or to aid in the classification of the subsurface soils as well as to help evaluate and identify their engineering strength and compressibility characteristics. The laboratory testing consisted of visual and textural sample inspection, moisture content and dry density determinations, maximum dry density and optimum moisture content, gradation analyses and Atterberg Limits as well as consolidation and "R"-value tests. Results of the various laboratory tests are presented in the Appendix, Figure No's. A-8 through A-12.

SEISMICITY AND EARTHQUAKE SOURCES

The seismicity of the southwest Washington and northwest Oregon area, and hence the potential for ground shaking, is controlled by three separate fault mechanisms. These include the Cascadia Subduction Zone (CSZ), the mid-depth intraplate zone, and the relatively shallow crustal zone. Descriptions of these potential earthquake sources are presented below.

The CSZ is located offshore and extends from northern California to British Columbia. Within this zone, the oceanic Juan de Fuca Plate is being subducted beneath the continental North American Plate to the east. The interface between these two plates is located at a depth of approximately 15 to 20 kilometers (km). The seismicity of the CSZ is subject to several uncertainties, including the maximum earthquake magnitude and the recurrence intervals associated with various magnitude earthquakes. Anecdotal evidence of previous CSZ earthquakes has been observed within coastal marshes along the Washington and Oregon coastlines. Sequences of interlayered peat and sands have been interpreted to be the result of large Subduction zone earthquakes occurring at intervals on the order of 300 to 500 years, with the most recent event taking place approximately 300 years ago. A recent study by Geomatrix (1995) suggests that the maximum earthquake associated with the CSZ is moment magnitude (Mw) 8 to 9.

This is based on an empirical expression relating moment magnitude to the area of fault rupture derived from earthquakes that have occurred within Subduction zones in other parts of the world. An Mw 9 earthquake would involve a rupture of the entire CSZ. As discussed by Geomatrix (1995) this has not occurred in other subduction zones that have exhibited much higher levels of historical seismicity than the CSZ, and is considered unlikely. For the purpose of this study an earthquake of Mw 8.5 was assumed to occur within the CSZ.

The intraplate zone encompasses the portion of the subducting Juan de Fuca Plate located at a depth of approximately 30 to 50 km below western Washington and western Oregon. Very low levels of seismicity have been observed within the intraplate zone in western Oregon and western Washington. However, much higher levels of seismicity within this zone have been recorded in Washington and California. Several reasons for this seismic quiescence were suggested in the Geomatrix (1995) study and include changes in the direction of Subduction between Oregon, Washington, and British Columbia as well as the effects of volcanic activity along the Cascade Range. Historical activity associated with the intraplate zone includes the 1949 Olympia magnitude 7.1 and the 1965 Puget Sound magnitude 6.5 earthquakes. Based on the data presented within the Geomatrix (1995) report, an earthquake of magnitude 7.25 has been chosen to represent the seismic potential of the intraplate zone.

The third source of seismicity that can result in ground shaking within the Vancouver and southwest Washington area is near-surface crustal earthquakes occurring within the North American Plate. The historical seismicity of crustal earthquakes in this area is higher than the seismicity associated with the CSZ and the intraplate zone. The 1993 Scotts Mills (magnitude 5.6) and Klamath Falls (magnitude 6.0), Oregon earthquakes were crustal earthquakes.

Liquefaction

Seismic induced soil liquefaction is a phenomenon in which lose, granular soils and some silty soils, located below the water table, develop high pore water pressures and lose strength due to ground vibrations induced by earthquakes. Soil liquefaction can result in lateral flow of material into river channels, ground settlements and increased lateral and uplift pressures on underground structures. Buildings supported on soils that have liquefied often settle and tilt and may displace laterally. Soils located above the ground water table cannot liquefy, but granular soils located above the water table may settle during the earthquake shaking.

Our review of the subsurface soil test pit logs from our exploratory field explorations (TP-#1 through TH-#6) and laboratory test results indicates that the site is generally underlain by medium stiff to stiff, clayey, sandy, silt to depths of at least 8 feet beneath existing site grades. Additionally, groundwater was generally not encountered at the site during our field exploration work above a depth of at least 8.0 feet except for minor seepage between a depth of about 1 to 3 feet.

As such, due to the anticipated depth to groundwater as well as the apparent cohesive characteristics of the underlying medium stiff to stiff, clayey, sandy silt subgrade soils beneath the site, it is our opinion that the native subgrade soil deposits located beneath the subject site do not have the potential for liquefaction during the design earthquake motions previously described. A more detailed liquefaction assessment was not part of the scope of work for this Geotechnical Investigation.

Landslides

No ancient and/or active landslides were observed or are known to be present on the subject site. Additionally, due to the relatively flat-lying to gently sloping nature of the subject site, the risk of seismic induced slope instability at the site resulting in landslides and/or lateral earth movements do not appear to present a serious potential geologic hazard.

Surface Rupture

Although the site is generally located within a region of the country known for seismic activity, no known faults exist on and/or immediately adjacent to the subject site. As such, the risk of surface rupture due to faulting is considered negligible.

Tsunami and Seiche

A tsunami, or seismic sea wave, is produced when a major fault under the ocean floor moves vertically and shifts the water column above it. A seiche is a periodic oscillation of a body of water resulting in changing water levels, sometimes caused by an earthquake. Tsunami and seiche are not considered a potential hazard at this site because the site is not near to the coast and/or there are no adjacent significant bodies of water.

Flooding and Erosion

Stream flooding is a potential hazard that should be considered in lowland areas of Marion County and Salem. The FEMA (Federal Emergency Management Agency) flood maps should be reviewed as part of the design for the proposed new commercial structure and its associated site improvements. Elevations of structures on the site should be designed based upon consultants reports, FEMA (Federal Emergency Management Agency), and Marion County requirements for the 100-year flood levels of any nearby creeks and/or streams.

CONCLUSIONS AND RECOMMENDATIONS

General

Based on the results of our field explorations, laboratory testing, and engineering analyses, it is our opinion that the site is suitable for the proposed new Ochoa's Queseria development and its associated site improvements provided that the recommendations contained within this report are properly incorporated into the design and construction of the project.

The primary features of concern at the site are 1) the presence of the existing fill soils at the site and 2) the presence of the moisture sensitive underlying native silty subgrade soils beneath the site.

In regards to the presence of the existing fill soils at the site, the results of our field and laboratory work indicates that the existing fill soils are generally poorly to moderately compacted. Additionally, the existing fill soils were found to contain occasional fragments of construction debris (i.e., asphaltic concrete) and traces of organics. Further, it appears that the subject property was not stripped and cleared prior to the placement of the existing fill soil materials. As such, the possibility exists that site conditions may vary at other locations. In addition to the above, we are not aware of any written documentation regarding the placement of the existing fill soils at the site. In this regard, we are of the opinion that the existing fill soils should be considered undocumented. As such, based on the apparent poorly to moderately compacted nature of the existing fill soils and assuming that some level of risk will not be acceptable for the new commercial building project, we are generally of the opinion that the existing fill soil materials are generally unsuitable for support of the planned new commercial structure and/or site improvements and should be removed in their entirety down to an approved firm native subgrade soil. Additionally, we are generally of the opinion that the existing fill soil materials are generally unsuitable for use/re-use as structural fill.

With regard to the moisture sensitive of the underlying native silty subgrade soils beneath the site, we recommend that all site grading and earthwork operations be scheduled for the drier summer months which are typically June through September.

The following sections of this report provide specific recommendations regarding subgrade preparation and grading as well as foundation and floor slab design and construction for the new commercial building project.

Site Preparation

As an initial step in site preparation, we recommend that the proposed new commercial building area(s) and its associated structural and/or site improvement area(s) be stripped and cleared of all existing improvements, any existing unsuitable undocumented fill materials, surface debris, existing vegetation, topsoil materials, and/or any other deleterious materials present at the time of construction. In general, outside of areas which presently contain surficial fill materials, we envision that the site stripping to remove existing surface vegetation and topsoil materials will generally be about 8 to 12 inches.

However, localized areas requiring deeper removals will be encountered and should be evaluated at the time of construction by the Geotechnical Engineer. The stripped and cleared materials should be properly disposed of as they are generally considered unsuitable for use/reuse as fill materials.

Following the completion of the site stripping and clearing work and prior to the placement of any required structural fill materials and/or structural improvements, the exposed subgrade soils within the planned structural improvement area(s) should be inspected and approved by the Geotechnical Engineer and possibly proof-rolled with a half and/or fully loaded dump truck. Areas found to be soft or otherwise unsuitable should be over-excavated and removed or scarified and recompacted as structural fill. During wet and/or inclement weather conditions, proof rolling and/or scarification and recompaction as noted above may not be appropriate.

The on-site existing fill soils and/or native sandy silt subgrade soil materials are generally considered suitable for use/reuse as structural fill materials provided that they are free of organic materials, debris, and rock fragments in excess of about 6 inches in dimension. However, if site grading is performed during wet or inclement weather conditions, the use of some of the on-site native soil materials which contain significant silt and clay sized particles will be difficult at best. In this regard, during wet or inclement weather conditions, we recommend that an import structural fill material be utilized which should consist of a free-draining (clean) granular fill (sand & gravel) containing no more than about 5 percent fines. Representative samples of the materials which are to be used as structural fill materials should be submitted to the Geotechnical Engineer and/or laboratory for approval and determination of the maximum dry density and optimum moisture content for compaction.

In general, all site earthwork and grading activities should be scheduled for the drier summer months (June through September) if possible. However, if wet weather site preparation and grading is required, it is generally recommended that the stripping of topsoil materials be accomplished with a tracked excavator utilizing a large smooth-toothed bucket working from areas yet to be excavated. Additionally, the loading of strippings into trucks and/or protection of moisture sensitive subgrade soils will also be required during wet weather grading and construction. In this regard, we recommend that areas in which construction equipment will be traveling be protected by covering the exposed subgrade soils with a woven geotextile fabric such as Mirafi FW404 followed by at least 12 inches or more of crushed aggregate base rock. Further, the geotextile fabric should have a minimum Mullen burst strength of at least 250 pounds per square inch for puncture resistance and an apparent opening size (AOS) between the U.S. Standard No. 70 and No. 100 sieves.

All structural fill materials placed for support of the new commercial building and/or pavement areas should be moistened or dried as necessary to near (within 3 percent) optimum moisture conditions and compacted by mechanical means to a minimum of 92 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Structural fill materials should be placed in lifts (layers) such that when compacted do not exceed about 8 inches. Additionally, all fill materials placed within five (5) lineal feet of the perimeter (limits) of the proposed commercial structure and/or pavements should be considered structural fill.

All aspects of the site grading should be monitored and approved by a representative of Redmond Geotechnical Services, LLC.

Foundation Support

Based on the results of our investigation, it is our opinion that the site of the proposed new commercial development is generally suitable for support of the single- and/or two-story commercial structure provided that the following foundation design recommendations are followed. The following sections of this report present specific foundation design and construction recommendations for the planned new Ochoa's Queseria commercial structure.

Shallow Foundations

In general, conventional shallow continuous (strip) footings and individual (spread) column footings may be supported by approved native (untreated) silty subgrade soil materials based on an allowable contact bearing pressure of 2,000 pounds per square foot (psf). However, where higher allowable contact bearing pressures are required and/or desired, an allowable contact bearing pressure of up to 2,500 pounds per square foot (psf) may be used for design where the commercial building foundations are supported by at least 8 inches or more of granular structural fill material. These recommended allowable contact bearing pressures are intended for dead loads and sustained live loads and may be increased by one-third for the total of all loads including short-term wind or seismic loads. In general, continuous strip footings should have a minimum width of at least 16 inches and be embedded at least 18 inches below the lowest adjacent finish grade (includes frost protection). Individual column footings (where required) should be embedded at least 18 inches below grade and have a minimum width of at least 24 inches. Additionally, where foundation excavations and/or construction is performed during wet and/or inclement weather conditions, we recommend that the exposed foundation bearing surfaces be protected with the placement of at least 3 inches or more of compacted crushed aggregate base rock.

Total and differential settlements of foundations constructed as recommended above and supported by approved native subgrade soils or by properly compacted structural fill materials are expected to be well within the tolerable limits for this type of single- and/or two-story commercial structure and should generally be less than about 1-inch and 1/2-inch, respectively.

Allowable lateral frictional resistance between the base of the footing element and the supporting subgrade bearing soil can be expressed as the applied vertical load multiplied by a coefficient of friction of 0.35 and 0.45 for native silty subgrade soils and/or import gravel fill materials respectively. In addition, lateral loads may be resisted by passive earth pressures on footings poured "neat" against in-situ (native) subgrade soils or properly backfilled with structural fill materials based on an equivalent fluid density of 300 pounds per cubic foot (pcf). This recommended value includes a factor of safety of approximately 1.5 which is appropriate due to the amount of movement required to develop full passive resistance.

Floor Slab Support

In order to provide uniform subgrade reaction beneath concrete slab-on-grade floors, we recommend that the floor slab area be underlain by a minimum of 6 inches of free-draining (less than 5 percent passing the No. 200 sieve), well-graded, crushed rock. The crushed rock should help provide a capillary break to prevent migration of moisture through the slab. Additional moisture protection, where needed, can be provided by using a 10-mil polyolefin geo-membrane sheeting such as StegoWrap.

The base course materials should be compacted to at least 95 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Where floor slab subgrade materials are undisturbed, firm and stable and where the underslab aggregate base rock section has been prepared and compacted as recommended above, we recommend that a modulus of subgrade reaction of 200 pci be used for design.

Retaining/Below Grade Walls

Retaining and/or below grade walls should be designed to resist lateral earth pressures imposed by native soils or granular backfill materials as well as any adjacent surcharge loads. For walls which are unrestrained at the top and free to rotate about their base, we recommend that active earth pressures be computed on the basis of the following equivalent fluid densities:

Non-Restrained Retaining Wall Pressure Design Recommendations

Slope Backfill (Horizontal/Vertical)	Equivalent Fluid Density/Silt (pcf)	Equivalent Fluid Density/Gravel (pcf)
Level	35	30
3H:1V	60	50
2H:1V	90	80

For walls which are fully restrained at the top and prevented from rotation about their base, we recommend that at-rest earth pressures be computed on the basis of the following equivalent fluid densities:

Restrained Retaining Wall Pressure Design Recommendations

Slope Backfill (Horizontal/Vertical)	Equivalent Fluid Density/Silt (pcf)	Equivalent Fluid Density/Gravel (pcf)
Level	45	35
3H:1V	65	60
2H:1V	95	90

The above recommended values assume that the walls will be adequately drained to prevent the buildup of hydrostatic pressures. Where wall drainage will not be present and/or if adjacent surcharge loading is present, the above recommended values will be significantly higher.

Backfill materials behind walls should be compacted to 90 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. Special care should be taken to avoid over-compaction near the walls which could result in higher lateral earth pressures than those indicated herein. In areas within three (3) to five (5) feet behind walls, we recommend the use of hand-operated compaction equipment.

Pavements

Flexible pavement design for the project was determined on the basis of projected (anticipated) traffic volume and loading conditions relative to subgrade soil strength ("R"-value) characteristics. Based on a laboratory subgrade "R"-value of 32 (Resilient Modulus = 5,000 to 10,000) and utilizing the Asphalt Institute Flexible Pavement Design Procedures and/or the American Association of State Highway and Transportation Officials (AASHTO) 1993 "Design of Pavement Structures" manual, we recommend that the asphaltic concrete pavement section(s) for the new residential development consist of the following:

	Asphaltic Concrete Thickness (inches)	**Crushed Base Rock Thickness (inches)**
Automobile Parking Areas	3.0	8.0
Automobile Drive Areas	3.0	10.0

Note: For wet weather construction, we recommend a minimum gravel base rock thickness of at least 12 inches over a geotextile fabric. Additionally, where heavy vehicle and/or truck loads are anticipated and/or required, we recommend a minimum asphaltic concrete thickness of 4.0 inches. Further, the above recommended flexible pavement section(s) assumes a design life of approximately 20 years.

Pavement Subgrade, Base Course & Asphalt Materials

The above recommended pavement section(s) were based on the design assumptions listed herein and on the assumption that construction of the pavement section(s) will be completed during an extended period of reasonably dry weather. All thicknesses given are intended to be the minimum acceptable. Increased base rock sections and the use of geotextile fabric may be required during wet and/or inclement weather conditions and/or in order to adequately support construction traffic and protect the subgrade during construction. Additionally, the above recommended pavement section(s) assume that the subgrade will be prepared as recommended herein, that the exposed subgrade soils will be properly protected from rain and construction traffic, and that the subgrade is firm and unyielding at the time of paving. Further, it assumes that the subgrade is graded to prevent any ponding of water which may tend to accumulate in the base course.

Pavement base course materials should consist of well-graded 1-1/2 inch and/or 3/4-inch minus crushed base rock having less than 5 percent fine materials passing the No. 200 sieve. The base course and asphaltic concrete materials should conform to the requirements set forth in the latest edition of the Oregon Department of Transportation, Standard Specifications for Highway Construction. The base course materials should be compacted to at least 95 percent of the maximum dry density as determined by the ASTM D-1557 (AASHTO T-180) test procedures. The asphaltic concrete paving materials should be compacted to at least 92 percent of the theoretical maximum density as determined by the ASTM D-2041 (Rice Gravity) test method.

Excavation/Slopes

Temporary excavations of up to about four (4) feet in depth may be constructed with near vertical inclinations. Temporary excavations greater than about four (4) feet but less than eight (8) feet should be excavated with inclinations of at least 1 to 1 (horizontal to vertical) or properly braced/shored. Where excavations are planned to exceed about eight (8) feet, this office should be consulted. All shoring systems and/or temporary excavation bracing for the project should be the responsibility of the excavation contractor.

Depending on the time of year in which trench excavations occur, trench dewatering may be required in order to maintain dry working conditions if the invert elevations of the proposed utilities are located at and/or below the groundwater level. If groundwater is encountered during utility excavation work, we recommend placing trench stabilization materials along the base of the excavation. Trench stabilization materials should consist of 1-foot of well-graded gravel, crushed gravel, or crushed rock with a maximum particle size of 4 inches and less than 5 percent fines passing the No. 200 sieve. The material should be free of organic matter and other deleterious material and placed in a single lift and compacted until well keyed.

Surface Drainage/Groundwater

We recommend that positive measures be taken to properly finish grade the site so that drainage waters from the building and landscaping areas as well as adjacent properties or buildings are directed away from the new commercial structure foundations and/or floor slabs. All roof drainage should be directed into conduits that carry runoff water away from the commercial structure to a suitable outfall. Roof downspouts should not be connected to foundation drains. A minimum ground slope of about 2 percent is generally recommended in unpaved areas around the commercial structure.

Groundwater was generally not encountered at the site in any of the exploratory test pits at the time of excavation to depths of at least 8.0 feet beneath existing site grades except for perched water observed at the time of our field explorations. As such, groundwater elevations in the area and/or beneath the subject site may fluctuate seasonally and may temporarily pond/perch near the ground surface during periods of prolonged rainfall.

In this regard, based on our current understand of the site grading required to bring the subject site to finish design grades, we are of the opinion that an underslab drainage system is not required for the proposed commercial structure. However, due to the presence of slightly clayey, sandy, silt subgrade soils within the foundation bearing level of the proposed new commercial structure, we are generally of the opinion that a footing/foundation drainage system should be utilized around the perimeter of the proposed commercial structure. Additionally, a foundation drain is recommended for any below grade footing and/or retaining walls. A typical recommended perimeter footing and/or retaining wall drain detail is shown on Figure No. 3.

Design Infiltration Rates

Based on the results of our field infiltration testing, we recommend using the following infiltration rates to design the storm water infiltration and/or disposal systems for the project:

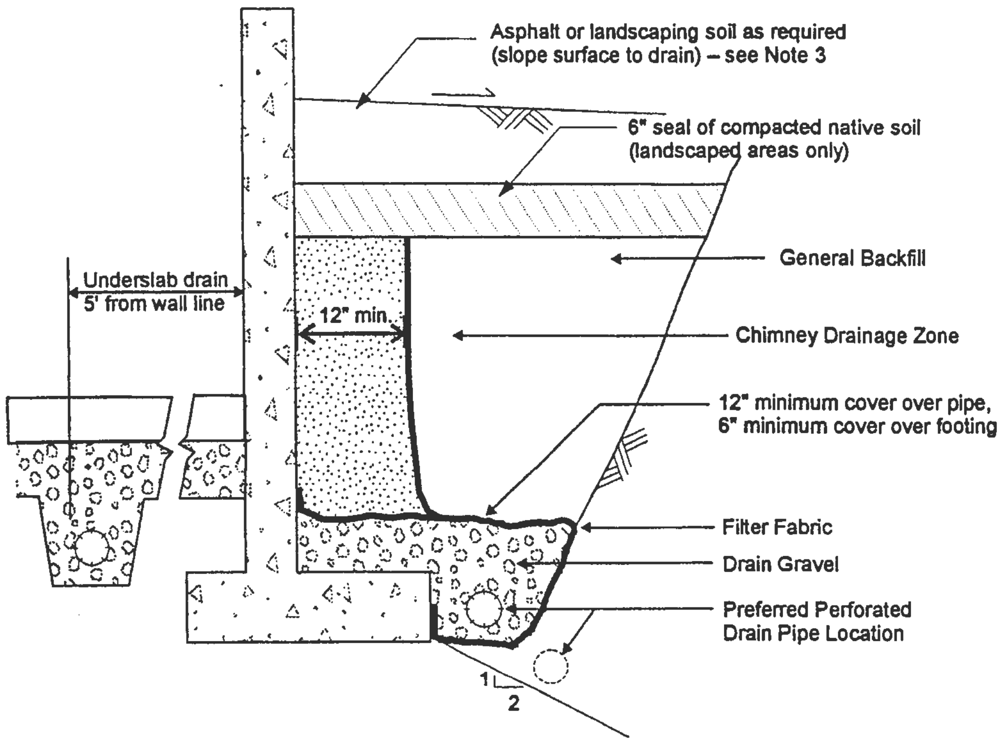
Subgrade Soil Type	Recommended Infiltration Rate
clayey, sandy SILT (ML)	0.3 to 0.6 inches per hour (in/hr)

Note: A safety factor of two (2) was used to calculate the above recommended design infiltration rate. Additionally, given the gradational variability of the on-site slightly clayey, sandy silt subgrade soils beneath the site, it is generally recommended that field testing be performed during and/or following construction of the on-site storm water infiltration system in order to confirm that the above recommended design infiltration rates are appropriate.

Seismic Design Considerations

Structures at the site should be designed to resist earthquake loading in accordance with the methodology described in the 2014 and/or latest edition of the State of Oregon Structural Specialty Code (OSSC) and/or Amendments to the 2015 International Building Code (IBC). The maximum considered earthquake ground motion for short period and 1.0 period spectral response may be determined from the Oregon Structural Specialty Code and/or Figures 1613 (1) and 1613 (2) of the 2009 National Earthquake Hazard Reduction Program (NEHRP) "Recommended Provisions for Seismic Regulations for New Buildings and Other Structures" published by the Building Seismic Safety Council. We recommend Site Class "D" be used for design per Table 1613.5.2.

Using this information, the structural engineer can select the appropriate site coefficient values (F_a and F_v) from Tables 1613.5.3 (1) and 1613.5.3 (2) of the 2015 IBC to determine the maximum considered earthquake spectral response acceleration for the project. However, we have assumed the following response spectrum for the project:



SCHEMATIC - NOT TO SCALE

NOTES:

1. Filter Fabric to be non-woven geotextile (Amoco 4545, Mirafi 140N, or equivalent)
2. Lay perforated drain pipe on minimum 0.5% gradient, widening excavation as required. Maintain pipe above 2:1 slope, as shown.
3. All-granular backfill is recommended for support of slabs, pavements, etc. (see text for structural fill).
4. Drain gravel to be clean, washed ¾" to 1½" gravel.
5. General backfill to be on-site gravels, or ¾""-0 or 1½"-0 crushed rock compacted to 92% Modified Proctor (AASHTO T-180).
6. Chimney drainage zone to be 12" wide (minimum) zone of clean washed, medium to coarse sand or drain gravel if protected with filter fabric. Alternatively, prefabricated drainage structures (Miradrain 6000 or similar) may be used.

PERIMETER FOOTING/RETAINING WALL DRAIN DETAIL		
Project No. 1111.004.G	OCHOA'S QUESERIA SITE 3350 PORTLAND ROAD NE	Figure No. 3

Table 1. IBC Seismic Design Parameters

Site Class	S_S	S_1	F_a	F_v	S_{MS}	S_{M1}	S_{DS}	S_{D1}
D	0.922	0.432	1.131	1.568	1.043	0.677	0.695	0.452

Notes: 1. S_S and S_1 were established based on the USGS 2015 mapped maximum considered earthquake spectral acceleration maps for 2% probability of exceedence in 50 years.

2. F_a and F_v were established based on IBC 2015 tables 1613.5.3 (1) and 1613.5.3 (2) using the selected S_S and S_1 values.

CONSTRUCTION MONITORING AND TESTING

We recommend that **Redmond Geotechnical Services, LLC** be retained to provide construction monitoring and testing services during all earthwork operations for the proposed new commercial development. The purpose of our monitoring services would be to confirm that the site conditions reported herein are as anticipated, provide field recommendations as required based on the actual conditions encountered, document the activities of the grading contractor and assess his/her compliance with the project specifications and recommendations. It is important that our representative meet with the contractor prior to grading to help establish a plan that will minimize costly over-excavation and site preparation work. Of primary importance will be observations made during site preparation, structural fill placement, footing excavations and construction as well as any retaining wall backfill.

CLOSURE AND LIMITATIONS

This report is intended for the exclusive use of the addressee and/or their representative(s) to use to design and construct the proposed new commercial development and its associated site improvements described herein as well as to prepare any related construction documents. The conclusions and recommendations contained in this report are based on site conditions as they presently exist and assume that the explorations are representative of the subsurface conditions between the explorations and/or across the study area. The data, analyses, and recommendations herein may not be appropriate for other structures and/or purposes. We recommend that parties contemplating other structures and/or purposes contact our office. In the absence of our written approval, we make no representation and assume no responsibility to other parties regarding this report. Additionally, the above recommendations are contingent on Redmond Geotechnical Services, LLC being retained to provide all site inspections and construction monitoring services associated with the site grading and earthwork operations as well as all foundation excavation and preparation work for this project. Redmond Geotechnical Services, LLC will not assume any responsibility and/or liability for any engineering judgment, inspection and/or testing services performed by others.

It is the owners/developers responsibility for insuring that the project designers and/or contractors involved with this project implement our recommendations into the final design plans, specifications and/or construction activities for the project. Further, in order to avoid delays during construction, we recommend that the final design plans and specifications for the project be reviewed by our office to evaluate as to whether our recommendations have been properly interpreted and incorporated into the project.

If during any future site grading and construction, subsurface conditions different from those encountered in the explorations are observed or appear to be present beneath excavations, we should be advised immediately so that we may review these conditions and evaluate whether modifications of the design criteria are required. We also should be advised if significant modifications of the proposed site development are anticipated so that we may review our conclusions and recommendations.

LEVEL OF CARE

The services performed by the Geotechnical Engineer for this project have been conducted with that level of care and skill ordinarily exercised by members of the profession currently practicing in the area under similar budget and time restraints. No warranty or other conditions, either expressed or implied, is made.

REFERENCES

Adams, John, 1984, Active Deformation of the Pacific Northwest Continental Margin: Tectonics, v.3, no. 4, p. 449-472.

Applied Technology Council, ATC-13, 1985, Earthquake Damage Evaluation Data for Cilifornia.

Atwater, B.F., 1992, Geologic evidence for earthquakes during the past 2000 years along the Copalis River, southern coastal Washington: Journal of Geophysical Research, v. 97, p. 1901-1919.

Atwater, B.F., 1987a, A periodic Holocene recurrence of widespread, probably coseismic Subsidence in southwestern Washington: EOS, v. 68, no. 44.

Atwater, B.F., 1987b, Evidence for great Holocene earthquakes along the outer coast of Washington State: Science, v. 236, no. 4804, pp. 942-944.

Campbell, K.W., 1990, Empirical prediction of near-surface soil and soft-rock ground motion for the Diablo Canyon Power Plant site, San Luis Obispo County, California: Dames & Moore report to Lawrence Livermore National Laboratory.

Carver, G.A., and Burke, R.M., 1987, Late Holocene paleoseismicity of the southern end of the Cascadia Subduction zone [abs.]: EOS, v. 68, no. 44, p. 1240.

Chase, R.L., Tiffin, D.L., Murray, J.W., 1975, The western Canadian continental margin: In Yorath, C.J., Parker, E.R., Glass, D.J., editors, Canada's continental margins and offshore petroleum exploration: Canadian Society of Petroleum Geologists Memoir 4, p. 701-721.

Crouse, C.B., 1991a, Ground motion attenuation equations for earthquakes on the Cascadia Subduction Zone: Earthquake Spectra, v. 7, no. 2, pp. 201-236.

Crouse, C.B., 1991b, Errata to Crouse (1991a), Earthquake Spectra, v. 7, no. 3, p. 506.

Darienzo, M.E., and Peterson, C.D., 1987, Episodic tectonic subsidence recorded in late Holocene salt marshes, northern Oregon central Cascadia margin: Tectonics, v. 9, p. 1-22.

Darienzo, M.E., and Peterson, C.D., 1987, Episodic tectonic subsidence recorded in late Holocene salt marshes northwest Oregon [abs]: EOS, v. 68, no. 44, p. 1469.

EERI (Earthquake Engineering Research Institute), 1993, The March 25, 1993, Scotts Mill Earthquake, Western Oregon's Wake-Up Call: EERI Newsletter, Vol. 27, No. 5, May.

Geologic Map of the Salem East 7.5 Minute Quadrangle (Open File Report 00-351) , Marion County, Oregon dated 2000.

Geomatrix, 1995 Seismic Design Mapping, State of Oregon: Final Report to Oregon Department of Transportation, January.

Geologic Map Series (GMS-49), Map of Oregon Seismicity, 1841-1986 dated 1986.

Geologic Map Series (GMS-97), Geologic Map of the Salem West Quadrangle, Marion and Polk Counties, Oregon dated 1995.

Grant, W.C., and McLaren, D.D., 1987, Evidence for Holocene Subduction earthquakes along the northern Oregon coast [abs]: EOS v. 68, no. 44, p. 1239.

Grant, W.C., Atwater, B.F., Carver, G.A., Darienzo, M.E., Nelson, A.R., Peterson, C.D., and Vick, G.S., 1989, Radiocarbon dating of late Holocene coastal subsidence above the Cascadia Subduction zone-compilation for Washington, Oregon, and northern California, [abs]: EOS Transactions of the American Geophysical Union, v. 70, p. 1331.

International Conference of Building Officials (ICBO), 1994, Uniform Building Code: 1994 Edition, Whittier, CA. 1994.

Joyner, W.B., and Boore, D.M., 1998, Measurement, characterization and prediction of strong ground motion: Earthquake Engineering and Soil Dynamics II – Recent Advances in Ground Motion Evaluation, ASCE Geotech. Special Publ. No. 20, p. 43-102.

Riddihough, R.P., 1984, Recent movements of the Juan de Fuca plate system: Journal of Geophysical Research, v. 89, no. B8, p. 6980-6994.

Youngs, R.R., Day, S.M., and Stevens, J.L., 1998, Near field ground motions on rock for large Subduction earthquakes: Earthquake Engineering and Soil Dynamics II – Recent Advances in Ground Motion Evaluation, ASCE Geotech. Special Publ. No. 20, p. 445-462.

Appendix “A”

Test Pit Logs and Laboratory Test Results

APPENDIX

FIELD EXPLORATIONS AND LABORATORY TESTING

FIELD EXPLORATION

Subsurface conditions at the site were explored by excavating six (6) exploratory test holes on February 25, 2019. The approximate location of the test hole explorations are shown in relation to the proposed new site improvements on the Site Exploration Map, Figure No. 2.

The test holes were excavated using track-mounted excavating equipment in general conformance with ASTM Methods in Vol. 4.08, D-1586-94 and D-1587-83. The test holes were excavated to depths ranging from about 4.0 to 8.0 feet beneath existing site grades. Detailed logs of the test holes are presented on the Log of Test Pits, Figure No's. A-5 through A-7. The soils were classified in accordance with the Unified Soil Classification System (USCS), which is outlined on Figure No. A-4.

The exploration program was coordinated by a field engineer who monitored the excavating and exploration activity, obtained representative samples of the subsurface soils encountered, classified the soils by visual and textural examination, and maintained continuous logs of the subsurface conditions. Disturbed and/or undisturbed samples of the subsurface soils were obtained at appropriate depths and/or intervals and placed in plastic bags and/or with a thin walled ring sample.

Groundwater was generally not encountered within any of the exploratory test holes (TH-#1 through TP-#6) at the time of excavating to depths of up to eight (8) feet beneath existing site grades except for minor seepage at a depth of between 1 and 3 feet.

LABORATORY TESTING

Pertinent physical and engineering characteristics of the soils encountered during our subsurface investigation were evaluated by a laboratory testing program to be used as a basis for selection of soil design parameters and for correlation purposes. Selected tests were conducted on representative soil samples. The program consisted of tests to evaluate the existing (in-situ) moisture-density, maximum dry density and optimum moisture content, Atterberg Limits and gradational characteristics as well as consolidation and "R"-value tests.

Dry Density and Moisture Content Determinations

Density and moisture content determinations were performed on both disturbed and relatively undisturbed samples from the test hole explorations in general conformance with ASTM Vol. 4.08 Part D-216. The results of these tests were used to calculate existing overburden pressures and to correlate strength and compressibility characteristics of the soils. Test results are shown on the test pit logs at the appropriate sample depths.

Maximum Dry Density

One (1) maximum dry density test was performed on a representative sample of the existing fill soils in accordance with ASTM Vol. 4.08 Part D-1557-78. The tests were conducted to facilitate classification of the soils and for correlation purposes. Test results appear on Figure No. A-8.

Atterberg Limits

Liquid Limit (LL) and Plastic Limit (PL) tests were performed on a representative sample of the sandy silt subgrade soils in accordance with ASTM Vol. 4.08 Part D-4318-85. The test results were conducted to help facilitate the classification of the subgrade soils and for correlation purposes. The test results are shown graphically on Figure No. A-9.

Gradation Analysis

Gradation analyses were performed on representative samples of the subsurface silty sand soils in accordance with ASTM Vol. 4.08 Part D-422. The test results were used to classify the soil in accordance with the Unified Soil Classification System (USCS). The test results are shown graphically on Figure No. A-10.

Consolidation Test

One (1) Consolidation test was performed on a representative sample of the clayey, sandy silt subgrade soil to assess the compressibility characteristics of the underlying subgrade soils in accordance with ASTM Vol. 4.08 Part D-2435-80.

Conventional loading increments of 100, 200, 400, ... 12,800 psf were applied after the 100 percent time of primary consolidation was identified for each loading increment. The samples were unloaded and allowed to rebound after the completion of the loading sequence. Deflection versus time readings were recorded for all load increments from 100 through 12,800 psf. The deflection corresponding to 100 percent primary consolidation was plotted on the consolidation strain versus consolidation pressure curve, which is presented on Figure No. A-11.

"R"-Value

One (1) "R"-value test was performed on a representative sample of the near surface silty subgrade soils in general conformance with ASTM Vol. 4.08 Part D-2844. The test results were used to help evaluate the subgrade soils supporting and performance capabilities when subjected to traffic loading. The test results are shown on Figure No. A-12.

The following figures are attached and complete the Appendix:

Figure No. A-4	Key To Exploratory Test Pit Logs
Figure No's. A-5 through A-7	Log of Test Pits
Figure No. A-8	Maximum Dry Density Test Results
Figure No. A-9	Atterberg Limits Test Results
Figure No. A-10	Gradation Test Results
Figure No. A-11	Consolidation Test Results
Figure No. A-12	"R"-Value Test Results

PRIMARY DIVISIONS			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS (LESS THAN 5% FINES)	GW	Well graded gravels, gravel-sand mixtures, little or no fines.
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines.
		GRAVEL WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures, non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures, plastic fines.
	SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS (LESS THAN 5% FINES)	SW	Well graded sands, gravelly sands, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures, non-plastic fines.
			SC	Clayey sands, sand-clay mixtures, plastic fines.
FINE GRAINED SOILS MORE THAN HALF OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT IS LESS THAN 50%		ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS LIQUID LIMIT IS GREATER THAN 50%		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS			Pt	Peat and other highly organic soils.

DEFINITION OF TERMS

U.S. STANDARD SERIES SIEVE: 200, 40, 10, 4

CLEAR SQUARE SIEVE OPENINGS: 3/4", 3", 12"

SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

GRAIN SIZES

SANDS, GRAVELS AND NON-PLASTIC SILTS	BLOWS/FOOT †
VERY LOOSE	0 - 4
LOOSE	4 - 10
MEDIUM DENSE	10 - 30
DENSE	30 - 50
VERY DENSE	OVER 50

RELATIVE DENSITY

CLAYS AND PLASTIC SILTS	STRENGTH ‡	BLOWS/FOOT †
VERY SOFT	0 - 1/4	0 - 2
SOFT	1/4 - 1/2	2 - 4
FIRM	1/2 - 1	4 - 8
STIFF	1 - 2	8 - 16
VERY STIFF	2 - 4	16 - 32
HARD	OVER 4	OVER 32

CONSISTENCY

† Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1-3/8 inch I.D.) split spoon (ASTM D-1586).

‡ Unconfined compressive strength in tons/sq. ft. as determined by laboratory testing or approximated by the standard penetration test (ASTM D-1586), pocket penetrometer, torvane, or visual observation.

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KEY TO EXPLORATORY TEST PIT LOGS
Unified Soil Classification System (ASTM D-2487)

OCHOA'S QUESERIA SITE
Salem, Oregon

PROJECT NO.	DATE	Figure A-4
1111.004.G	3/27/19	

BACKHOE COMPANY: Owen Construction **BUCKET SIZE:** 24 inches **DATE:** 2/25/19

TEST PIT NO. TH-#1 **ELEVATION**

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					GM	FILL: GRay-brown, wet, moderately compacted, Pit Run Gravel
	X			24.4	ML	NATIVE GROUND: Dark gray-brown, wet, soft to medium stiff, sandy, clayey SILT with traces of organics (Old Topsoil Zone)
5					ML	Medium to olive-brown, very moist, medium stiff, clayey, sandy SILT
						Total Depth = 4.0 feet No groundwater encountered at time of exploration
10						
15						

TEST PIT NO. TH-#2 **ELEVATION**

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					GM	FILL: Gray-brown, wet, poorly compacted, crushed aggregate base rock and asphaltic concrete rubble
					ML	FILL: Medium to dark brown, wet, poorly compacted, sandy and clayey SILT with occasional gravel and traces of organics
5					ML	NATIVE GROUND: Dark gray-brown, wet to saturated, soft to medium stiff, slightly organic, sandy, clayey SILT (Old Topsoil Zone)
10					ML	Medium brown, wet, medium stiff, clayey, sandy SILT
						Total Depth = 5.0 feet Minor seepage encountered at 1.5 to 2.5 feet
15						

LOG OF TEST PITS

PROJECT NO. 1111.004.G OCHOA'S QUESERIA SITE **FIGURE NO.** A-5

BACKHOE COMPANY: Owen Construction BUCKET SIZE: 24 inches DATE: 2/25/19

TEST PIT NO. TH-#3 **ELEVATION**

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	Dark brown, wet to saturated, very soft, highly organic, sandy, clayey SILT (Topspol)
	X			26.3		
					ML	Medium to olive-brown, very moist to wet, soft to medium stiff, clayey, sandy SILT
5						Total Depth = 4.0 feet No groundwater encountered at time of exploration
10						
15						

TEST PIT NO. TH-#4 **ELEVATION**

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
0					ML	FILL: Medium to dark brown, wet, poorly compacted, sandy and clayey SILT with miscellaneous debris (i.e., tile and PVC pipe)
	X			25.8		
					ML	NATIVE GROUND: Medium to olive-brown, wet soft to medium stiff, clayey, sandy SILT
5						
	X			24.7		Becomes medium stiff to stiff at 7 feet
						Total Depth = 8.0 feet No groundwater encountered at time of exploration
10						
15						

LOG OF TEST PITS

PROJECT NO. 1111.004.G | OCHOA'S QUESERIA SITE | FIGURE NO. A-6

BACKHOE COMPANY: Dalke Construction BUCKET SIZE: 24 inches DATE: 2/25/19

DEPTH (FEET)	BAG SAMPLE	DENSITY TEST	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	SOIL CLASS. (U.S.C.S.)	SOIL DESCRIPTION
						TEST PIT NO. TH-#5 ELEVATION
0					ML	Dark brown, wet to saturated, very soft, highly organic, sandy, clayey SILT (Topsoil)
					ML	Medium to olive-brown, very moist to wet, soft to medium stiff, clayey, sandy SILT
5						Total Depth = 4.0 feet Minor seepage encountered at 1 to 2 feet
10						
15						
						TEST PIT NO. TH-#6 ELEVATION
0					ML	Dark brown, wet to saturated, very soft, highly organic, sandy, clayey SILT (Topsoil)
					ML	Medium to olive-brown, very moist to wet, soft to medium stiff, clayey, sandy SILT
5						Total Depth = 4.0 feet Minor seepage encountered at 1 to 2 feet
10						
15						

LOG OF TEST PITS

PROJECT NO. 1111.004.G | OCHOA"S QUESERIA SITE | FIGURE NO. A-7

MAXIMUM DENSITY TEST RESULTS

SAMPLE LOCATION	SOIL DESCRIPTION	MAXIMUM DRY DENSITY (pcf)	OPTIMUM MOISTURE CONTENT (%)
TH-#1 @ 3.0'	Medium to olive-brown, clayey, sandy, SILT (ML)	110.0	16.0

EXPANSION INDEX TEST RESULTS

SAMPLE LOCATION	INITIAL MOISTURE (%)	COMPACTED DRY DENSITY (pcf)	FINAL MOISTURE (%)	VOLUMETRIC SWELL (%)	EXPANSION INDEX	EXPANSIVE CLASS.

MAXIMUM DENSITY & EXPANSION INDEX TEST RESULTS

PROJECT NO.: 1111.004.G | OCHOA"S QUESERIA SITE | FIGURE NO.: A-8

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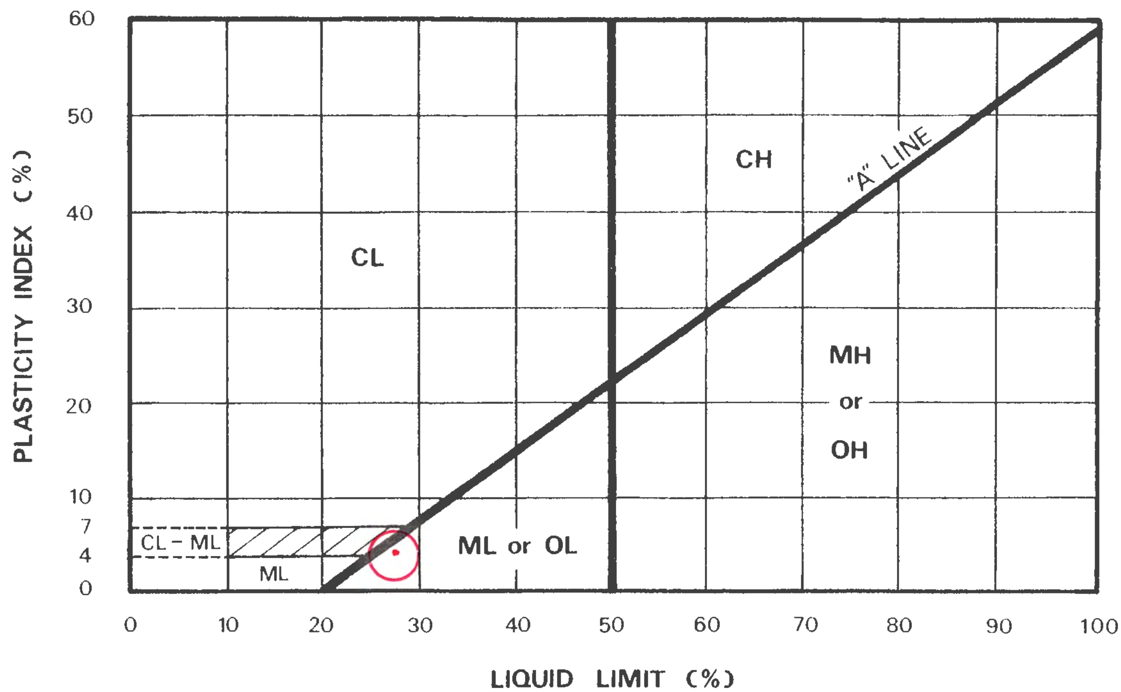

KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	NATURAL WATER CONTENT %	LIQUID LIMIT %	PLASTICITY INDEX %	PASSING NO. 200 SIEVE %	LIQUIDITY INDEX	UNIFIED SOIL CLASSIFICATION SYMBOL
○	TH-#1	3.0	24.4	28.3	4.3	77.8		ML

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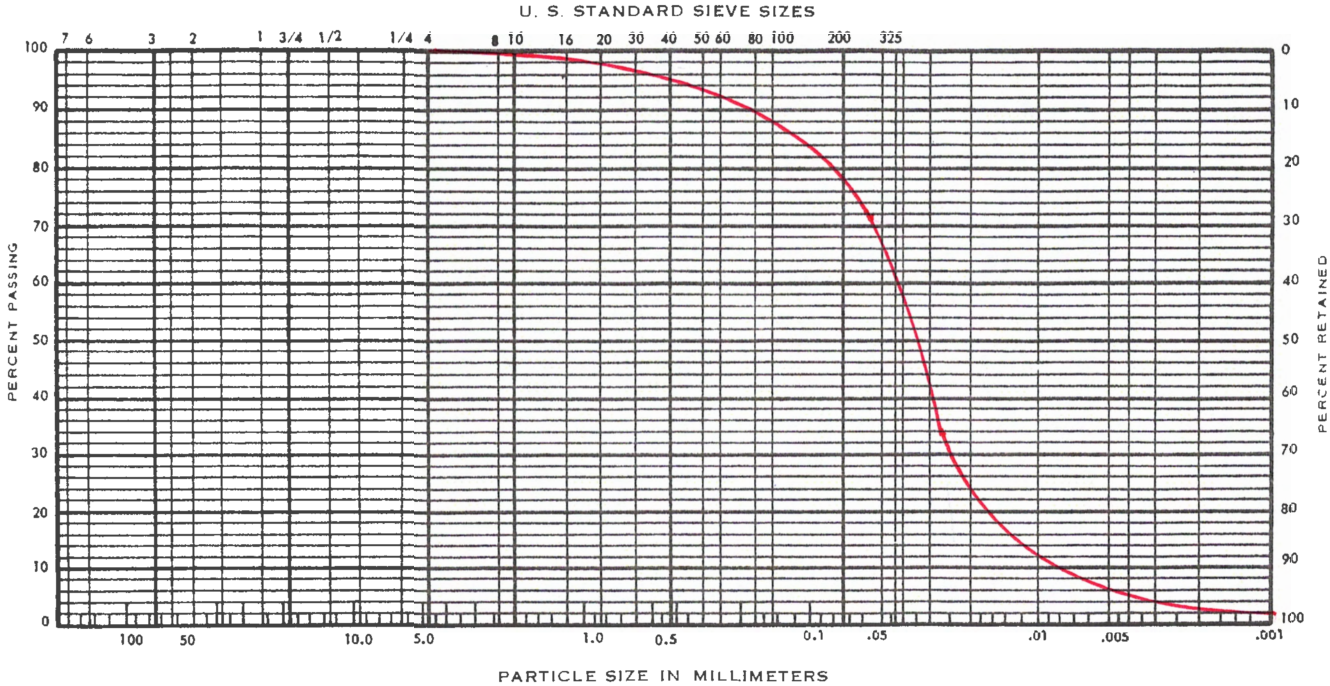
PLASTICITY CHART AND DATA

OCHOA'S QUESERIA SITE
Salem, Oregon

PROJECT NO.	DATE	
1111.004.G	3/27/19	Figure A-9

UNIFIED SOIL CLASSIFICATION SYSTEM

(ASTM D 422-72)



COBBLES	GRAVEL		SAND			SILT AND CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

KEY SYMBOL	BORING NO.	SAMPLE DEPTH (feet)	ELEV. (feet)	UNIFIED SOIL CLASSIFICATION SYMBOL	SAMPLE DESCRIPTION
——	TH-#1	3.0		ML	Medium to olive-brown, clayey, sandy SILT

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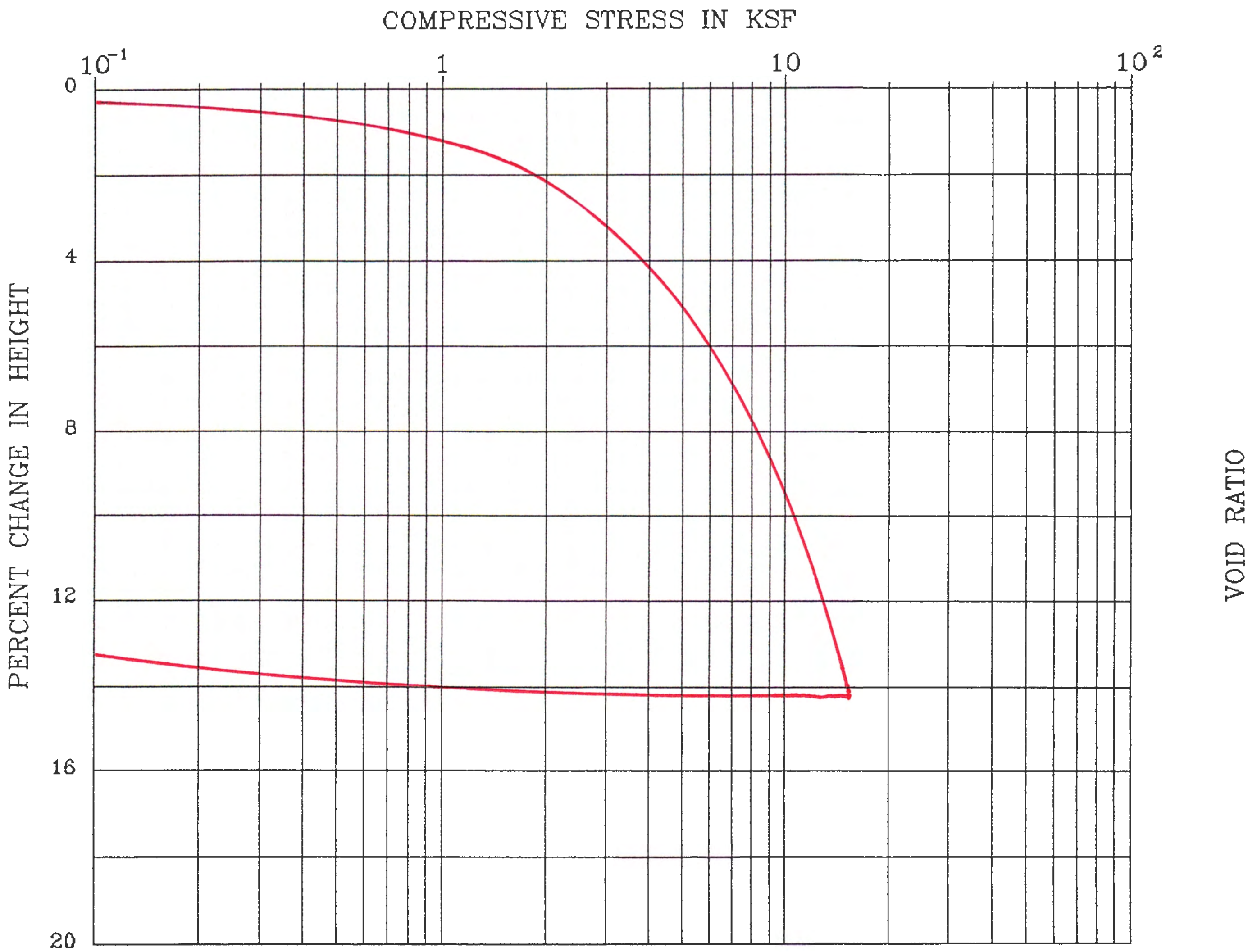
GRADATION TEST DATA

OCHOA'S QUESERIA SITE
Salem, Oregon

PROJECT NO.	DATE	FIGURE
1111.004.G	3/27/19	A-10



BORING : TH-#1
DEPTH (ft) : 3.0
SPEC. GRAVITY : 2.5 (assumed)

DESCRIPTION : clayey, sandy SILT (ML)
LIQUID LIMIT : 28.3
PLASTIC LIMIT : 24.0

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	24.4	86.7	89.1	
FINAL	13.2	97.4	96.9	

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CONSOLIDATION TEST DATA

OCHOA'S QUESERIA SITE
Salem, Oregon

PROJECT NO.	DATE	
1111.004.G	3/27/19	Figure A-11

RESULTS OF R (RESISTANCE) VALUE TESTS

SAMPLE LOCATION: TH-#3

SAMPLE DEPTH: 2.0 feet bgs

Specimen	A	B	C
Exudation Pressure (psi)	219	329	431
Expansion Dial (o.ooo1”)	0	0	1
Expansion Pressure (psf)	0	0	3
Moisture Content (%)	19.6	15.4	11.1
Dry Density (pcf)	98.4	103.2	108.6
Resistance Value, “R”	19	33	45
“R”-Value at 300 psi Exudation Pressure = 32			

SAMPLE LOCATION:

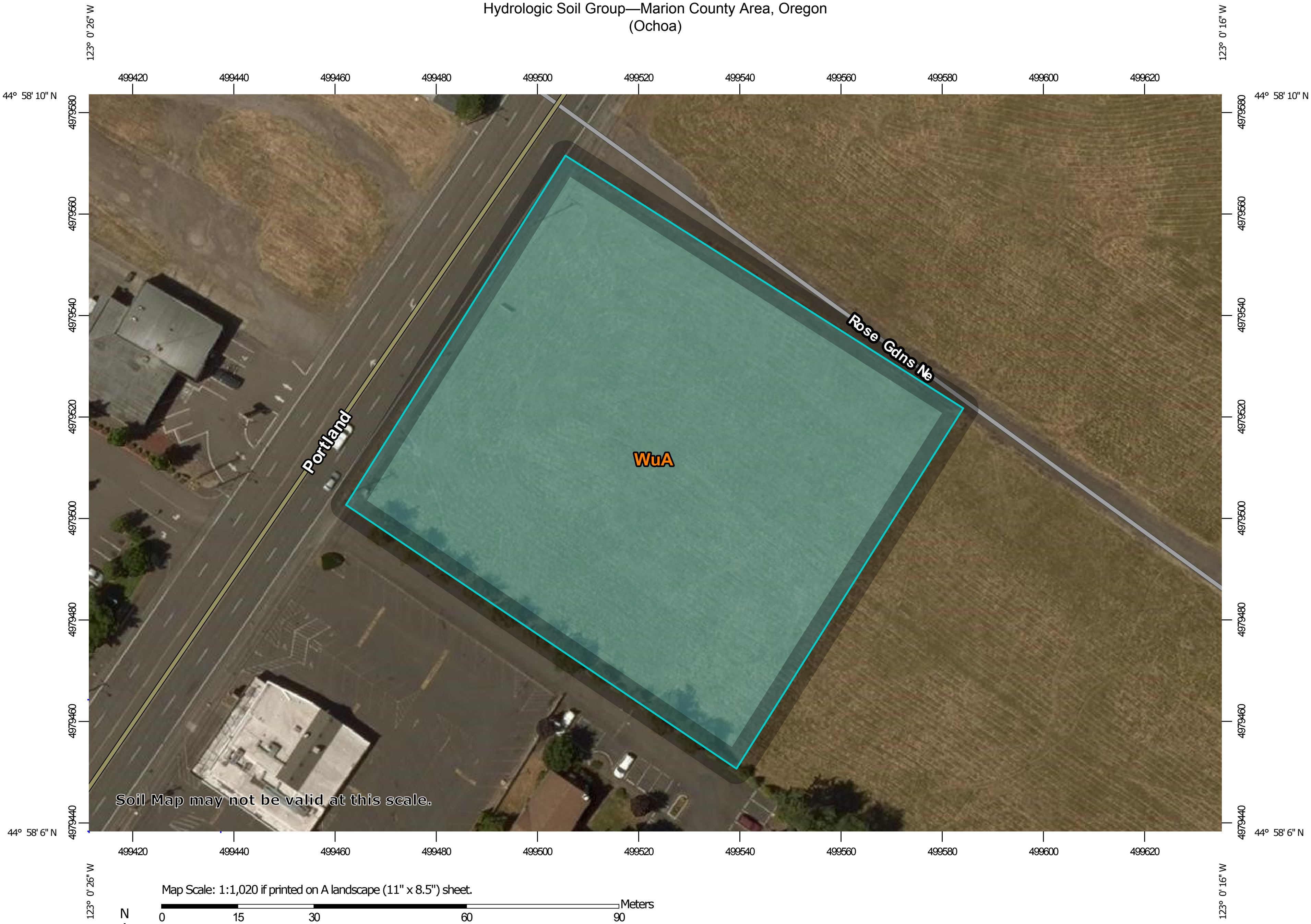
SAMPLE DEPTH:

Specimen	A	B	C
Exudation Pressure (psi)			
Expansion Dial (0.0001”)			
Expansion Pressure (psf)			
Moisture Content (%)			
Dry Density (pcf)			
Resistance Value “R”			
“R”-Value at 300 psi Exudation Pressure =			

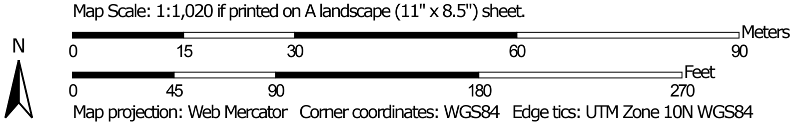
APPENDIX B

NRCS SOIL REPORT

Hydrologic Soil Group—Marion County Area, Oregon
(Ochoa)



Map Scale: 1:1,020 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Marion County Area, Oregon
Survey Area Data: Version 15, Sep 18, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 15, 2015—Jun 23, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
WuA	Woodburn silt loam, 0 to 3 percent slopes	C	1.9	100.0%
Totals for Area of Interest			**1.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

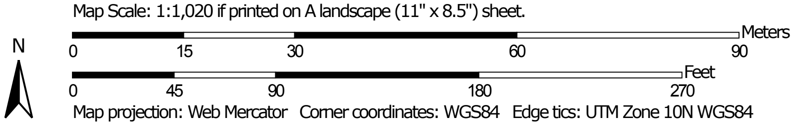
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Soil Map—Marion County Area, Oregon
(Ochoa)

Map Scale: 1:1,020 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Marion County Area, Oregon
Survey Area Data: Version 15, Sep 18, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 15, 2015—Jun 23, 2015

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

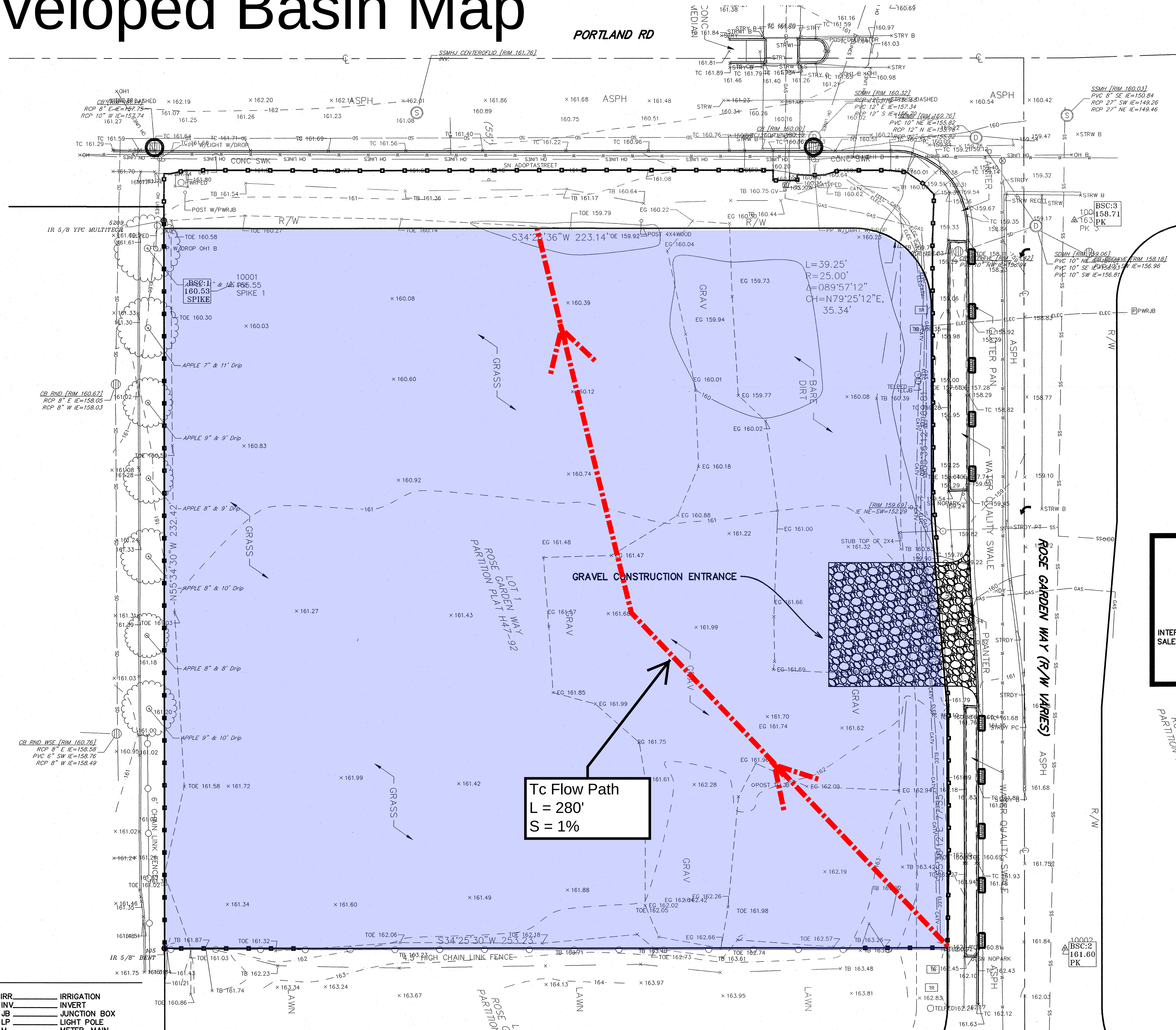
Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
WuA	Woodburn silt loam, 0 to 3 percent slopes	1.9	100.0%
Totals for Area of Interest		**1.9**	**100.0%**

APPENDIX C

BASIN MAPS

Predeveloped Basin Map



0 10 20 40
(feet)

EROSION CONTROL LEGEND	
◯	SILT SACK INLET PROTECTION, PER DTL
	BIO BAGS, PER DTL
	SILT FENCE

NOTES:
1. NO CONCRETE WASHOUTS OR STOCKPILES ALLOWED ON SITE

BENCHMARK UTILIZED:
CITY OF SALEM – HYHAWTH

ELEV: 159.21' NGVD 29

2" ALUMINUM CAP LOCATED IN TOP OF CURB AT N.W. CORNER OF INTERSECTION HYACINTH AND HAWTHORN. 2" ALUMINUM CAP STAMPED CITY OF SALEM – SURVEY – HYHAWTH, AT ER OF CURB. 20' S.E. OF PGE POLE, 35' E. OF STORM MH, 50' WEST OF WV.

DISCLAIMER: UTILITIES DEPICTED ARE BASED ON EVIDENCE FOUND IN THE FIELD, MUNICIPALITY AND/OR OTHER GOVERNMENT ENTITY AS-BUILT PLANS, CONTRACTOR PLANS AND OTHER DOCUMENTS OF RECORD. BARKER SURVEYING ASSUMES NO RESPONSIBILITY FOR UTILITIES THAT ARE NO LONGER IN USE, INSTALLED AFTER THE DATE OF ACTUAL SURVEY, NOT IDENTIFIED OR NOT LOCATED. THIS INCLUDES UTILITIES UPON PUBLIC OR PRIVATE PROPERTY.

SPECIFIC UTILITY POSITIONS INDICATED ON THE GROUND SURFACE PROVIDED BY LOCATION SERVICES MAY VARY DUE TO UNDERGROUND DETECTION CAPABILITIES.

ABBREVIATIONS

ASPH	ASPHALT	IRR	IRRIGATION
AD	AREA DRAIN	INV	INVERT
ASSY	ASSEMBLY	JB	JUNCTION BOX
BLDG, BLD	BUILDING	LP	LIGHT POLE
BW	BOTTOM OF WALL	M	METER, MAIN
CATV	CABLE TELEVISION	MB	MAILBOX
CB	CATCH BASIN	MH	MANHOLE
CO	CLEAN-OUT	OH	OVER-HEAD
CONC	CONCRETE	P/L, ℄	PROPERTY LINE
CL, ℄	CENTERLINE	PP	POWER POLE
DIP	DUCTILE IRON PIPE	PVC	POLYVINYL CHLORIDE
EG	EDGE OF GRAVEL	PWR	POWER
EOP, EP	EDGE OF PAVEMENT	R, RAD	RADIUS
ELEV	ELEVATION	ROW, R/W	RIGHT-OF-WAY
EX, EXIST	EXISTING	SS	SANITARY SEWER
FDC	FIRE DEPT. CONNECTOR	SD	STORM DRAIN
FT	FEET	SVC	SERVICE
FF	FINISH FLOOR	SWK, S/W	SIDEWALK
FG	FINISH GRADE	TC	TOP OF CURB
FH	FIRE HYDRANT	TEL	TELEPHONE
FI	FIELD INLET	TRANS	TRANSFORMER
FM	FORCE MAIN	TS	TRAFFIC SIGNAL
GRAV	GRAVEL	TW	TOP OF WALL
GM	GAS METER	TYP	TYPICAL
GP	GATE POST	UG, U/G	UNDER GROUND
GS	GROUND SHOT	UTIL	UTILITY
GV	GAS VALVE	W/	WITH
HC	HANDICAP	WM	WATER METER
HYD	HYDRANT	WLM	WETLANDS MARKER
IR	IRON ROD	YPC	YELLOW PLASTIC CAP
IP	IRON PIPE		

SYMBOLS

AD	AREA DRAIN		SIGN POST
	CATCH BASIN	PED	PEDESTAL
CO	CLEANOUT		MAIL BOX
	FIRE HYDRANT		IRRIGATION VALVE
GV	GAS VALVE		LIGHT POLE
WV	WATER VALVE		UTILITY/POWER POLES
GPW	GAS/POWER/WATER METER	TP	TEST PIT
DS	DOWN SPOUT		MONUMENT FOUND
	MANHOLE TELEPHONE		
	MANHOLE STORM DRAIN		
	MANHOLE SANITARY SEWER		

TREES – *TREENAME* DIAMETER (INCHES)/DRIP RADIUS (FEET)
NOTE: DIAMETER MEASURED AT BREAST HEIGHT

LINE TYPES

CATV LINE	—CATV—CATV—CATV—
COMMUNICATION LINE	—COM—COM—COM—
EASEMENT LINE	— — — —
FENCE LINE	—o—o—o—
FIBER OPTIC LINE	—FOC—FOC—FOC—
GAS LINE	—GAS—GAS—GAS—
OVERHEAD LINE	—OH LINES—OH LINES—
PHONE LINE	—PH—PH—PH—
POWER LINE	—ELEC—ELEC—ELEC—
SANITARY SEWER LINE	—SS—SS—SS—
STORM DRAIN LINE	—SD—SD—SD—
WATER LINE	—W—W—W—

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RENEWS: 6/30/2020

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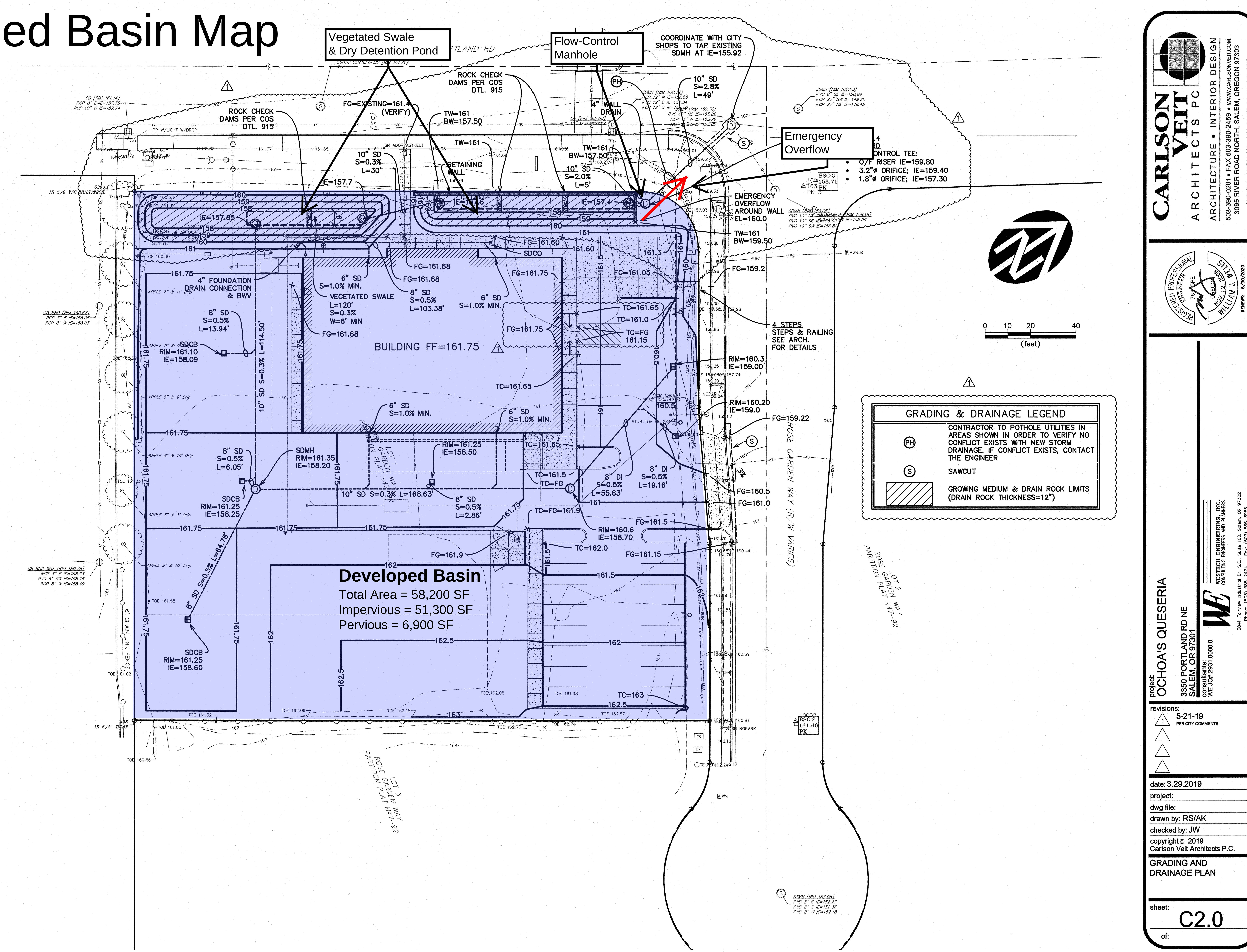
revisions:

date: 3.29.2019
project:
dwg file:
drawn by: RS/AK
checked by: JW

EXISTING CONDITIONS, EROSION CONTROL & DEMOLITION PLAN

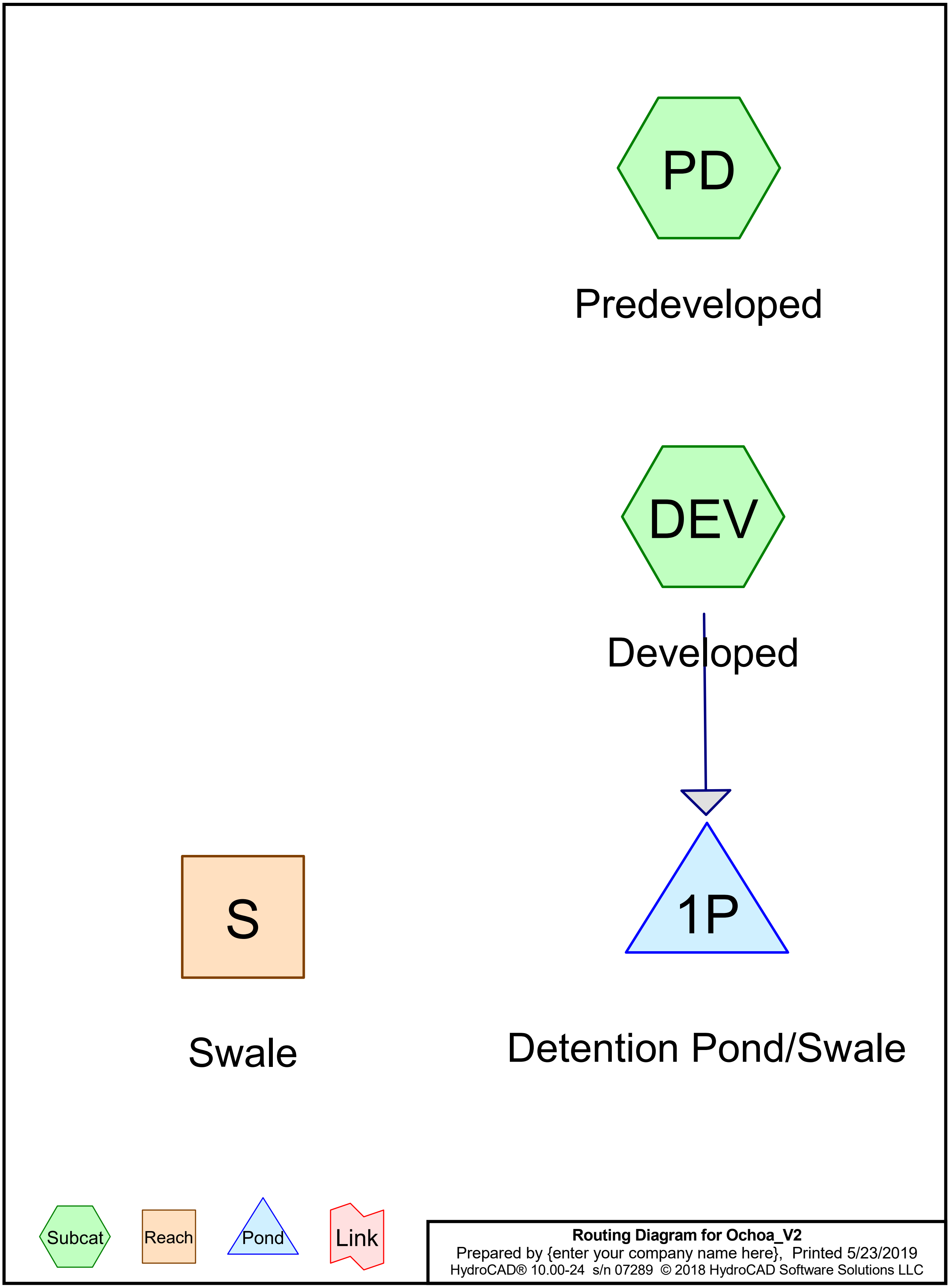
sheet: C1.0
of:

Developed Basin Map

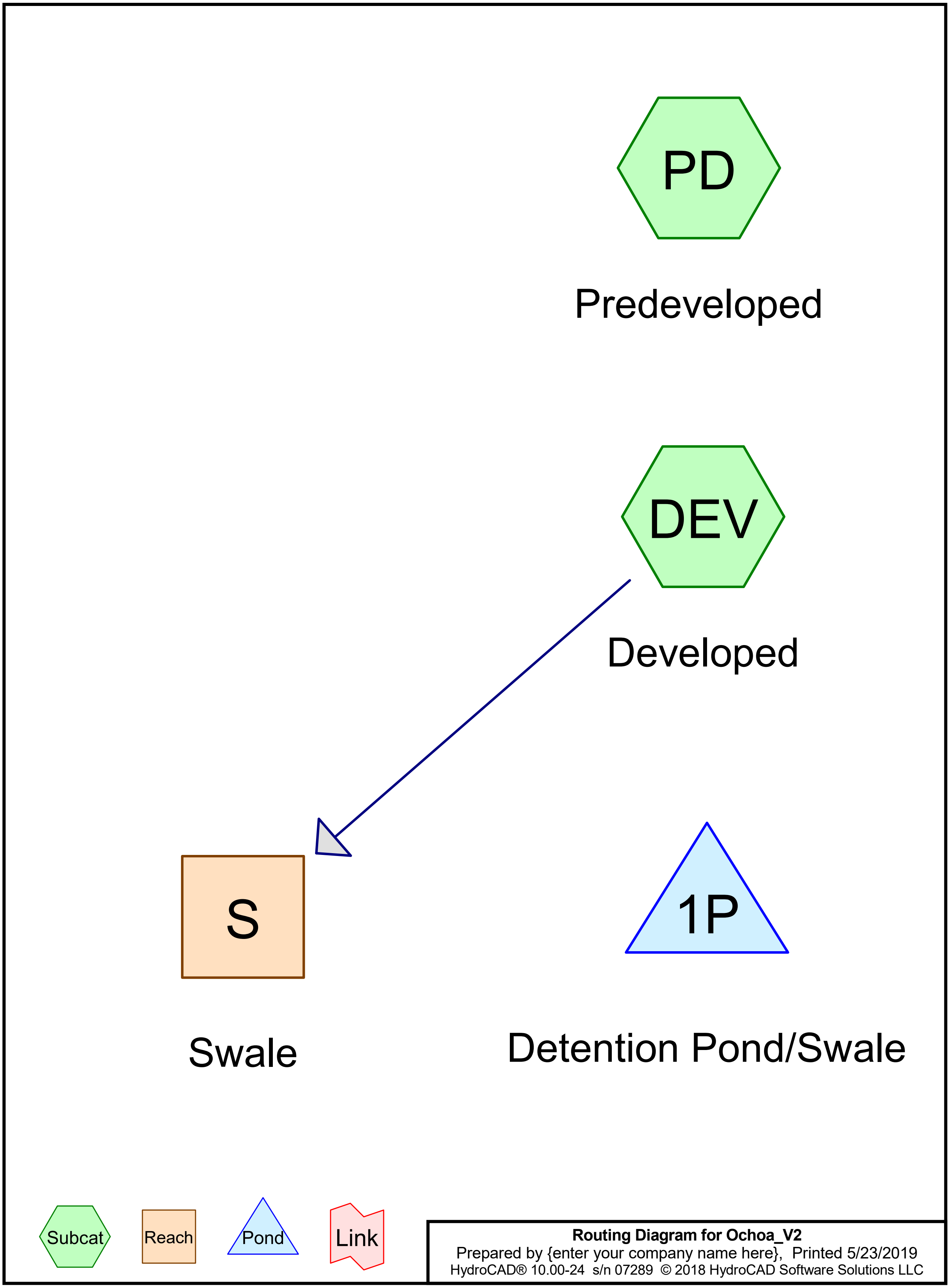


APPENDIX D

HYDROCAD SUMMARIES



Routing Diagram for Ochoa_V2
Prepared by {enter your company name here}, Printed 5/23/2019
HydroCAD® 10.00-24 s/n 07289 © 2018 HydroCAD Software Solutions LLC



Routing Diagram for Ochoa_V2
Prepared by {enter your company name here}, Printed 5/23/2019

Summary for Subcatchment PD: Predeveloped

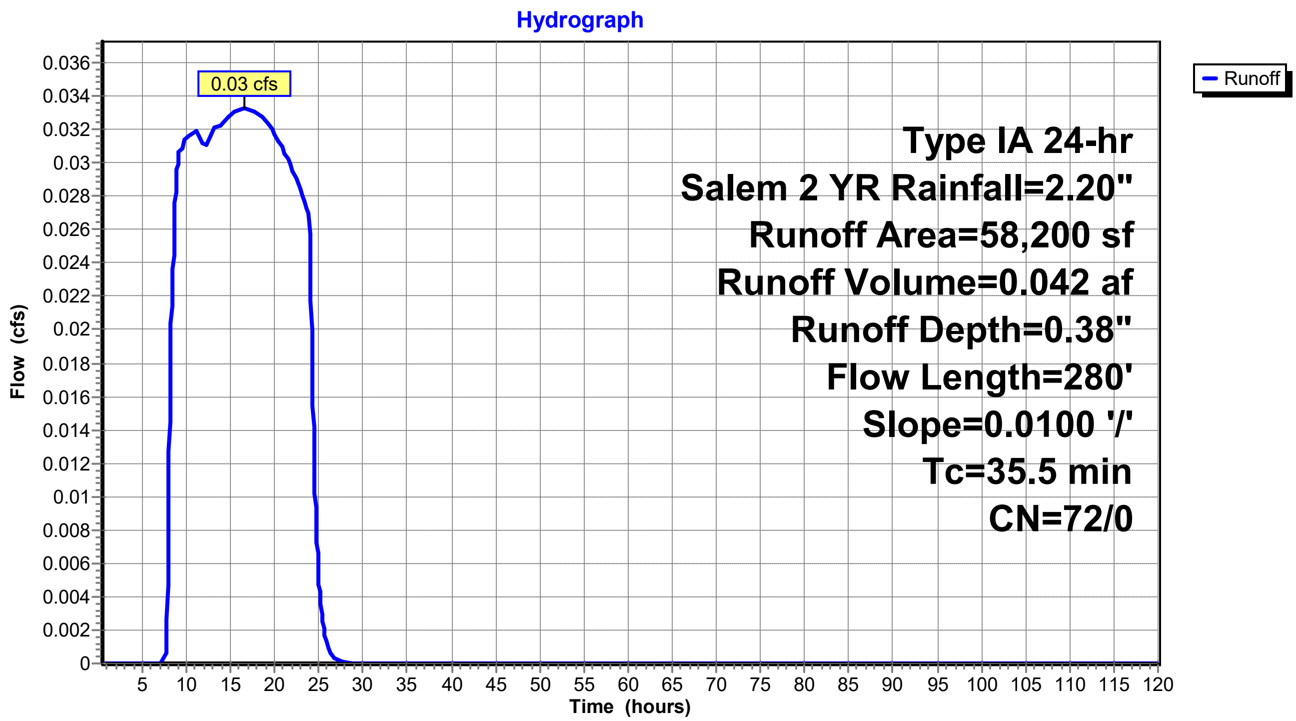
Runoff = 0.03 cfs @ 16.62 hrs, Volume= 0.042 af, Depth= 0.38"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 2 YR Rainfall=2.20"

Area (sf)	CN	Description
58,200	72	Woods/grass comb., Good, HSG C
58,200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.5	280	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.20"

Subcatchment PD: Predeveloped



Summary for Subcatchment PD: Predeveloped

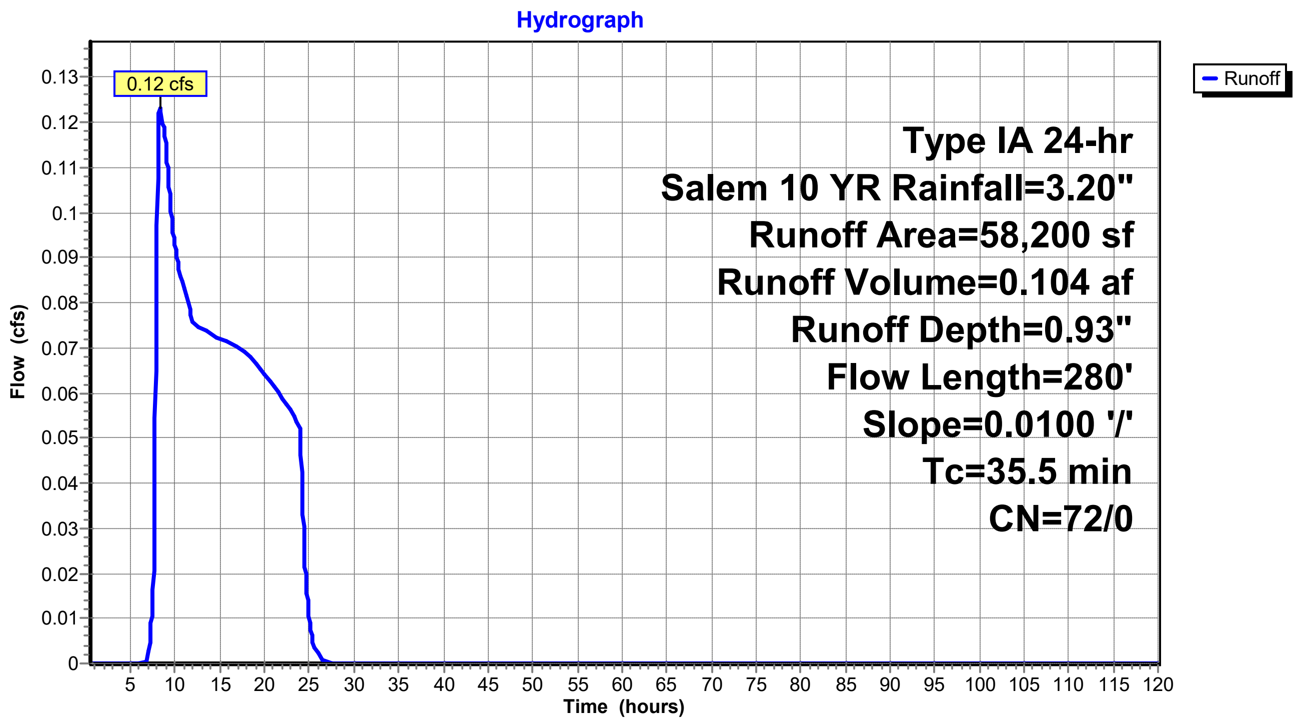
Runoff = 0.12 cfs @ 8.31 hrs, Volume= 0.104 af, Depth= 0.93"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

Area (sf)	CN	Description
58,200	72	Woods/grass comb., Good, HSG C
58,200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.5	280	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.20"

Subcatchment PD: Predeveloped



Summary for Subcatchment PD: Predeveloped

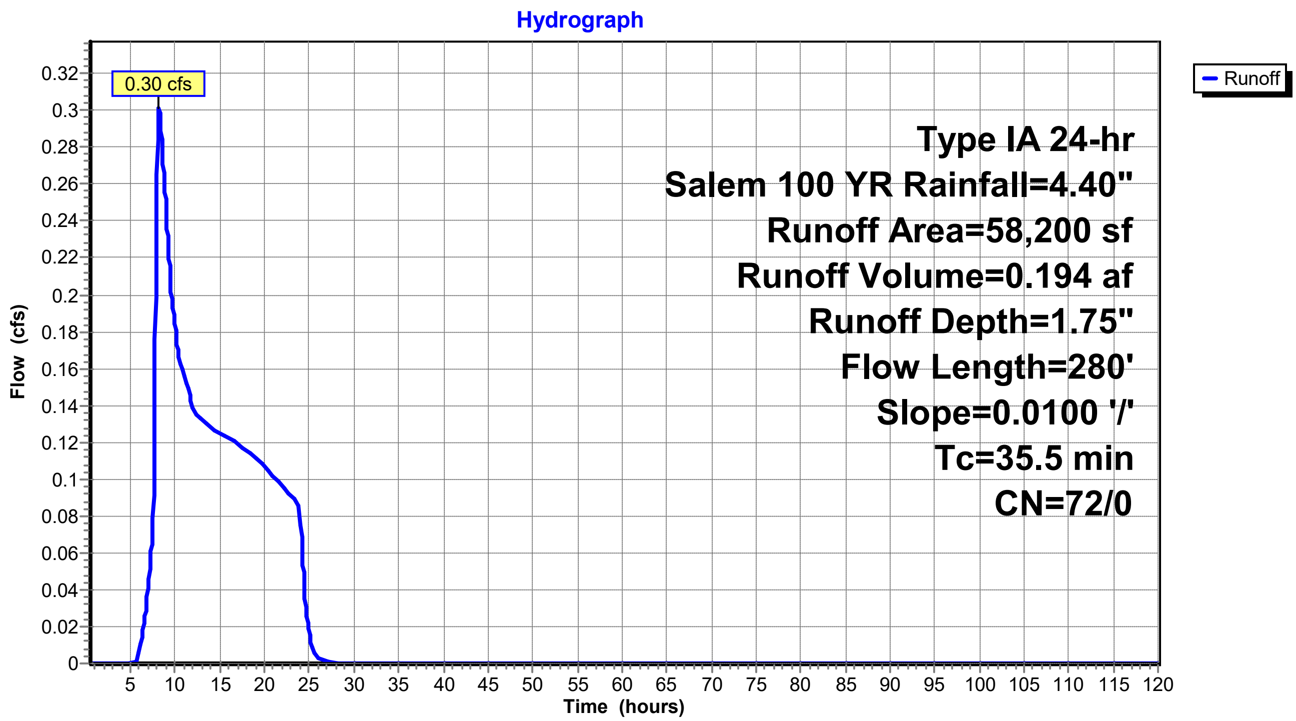
Runoff = 0.30 cfs @ 8.17 hrs, Volume= 0.194 af, Depth= 1.75"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

Area (sf)	CN	Description
58,200	72	Woods/grass comb., Good, HSG C
58,200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.5	280	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.20"

Subcatchment PD: Predeveloped



Summary for Subcatchment DEV: Developed

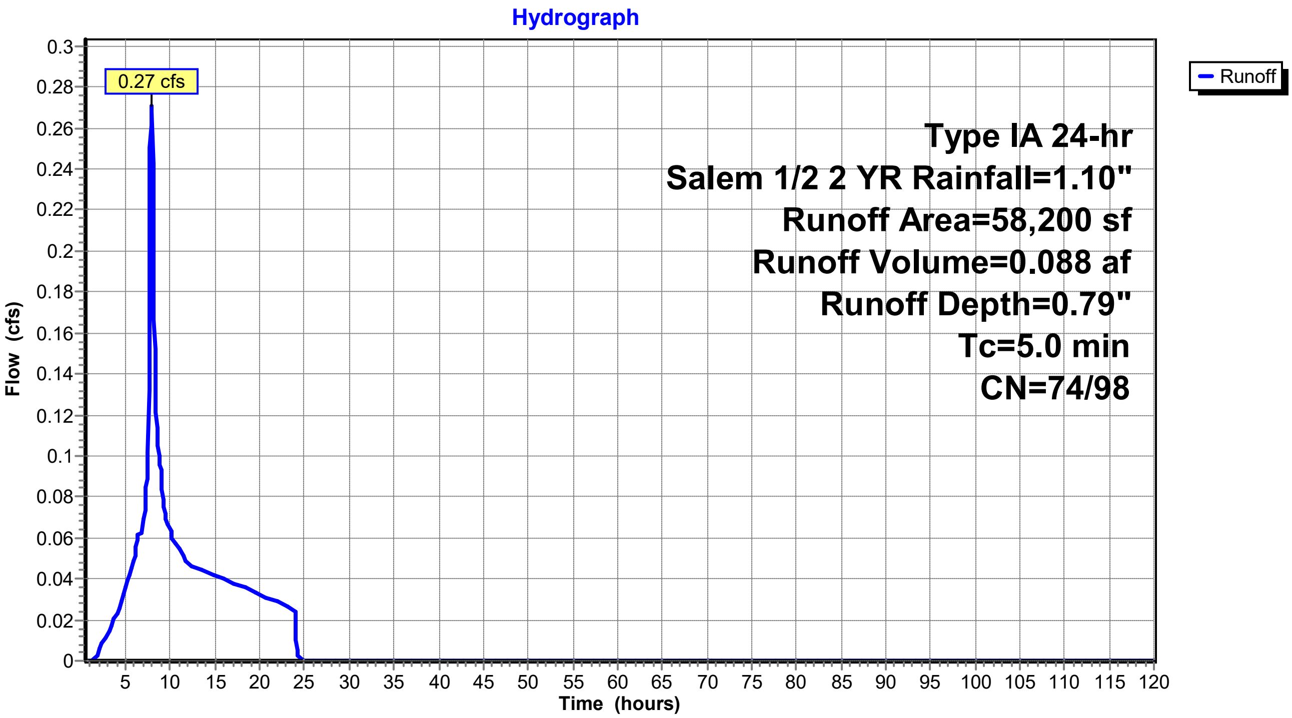
Runoff = 0.27 cfs @ 7.92 hrs, Volume= 0.088 af, Depth= 0.79"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 1/2 2 YR Rainfall=1.10"

	Area (sf)	CN	Description
*	51,300	98	Paved parking, HSG C
*	6,900	74	Landscaping, HSG C
	58,200	95	Weighted Average
	6,900		11.86% Pervious Area
	51,300		88.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment DEV: Developed



Summary for Pond 1P: Detention Pond/Swale

Inflow Area = 1.336 ac, 88.14% Impervious, Inflow Depth = 0.79" for Salem 1/2 2 YR event
Inflow = 0.27 cfs @ 7.92 hrs, Volume= 0.088 af
Outflow = 0.04 cfs @ 5.60 hrs, Volume= 0.088 af, Atten= 87%, Lag= 0.0 min
Discarded = 0.04 cfs @ 5.60 hrs, Volume= 0.088 af
Primary = 0.00 cfs @ 0.50 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 156.61' @ 18.06 hrs Surf.Area= 3,450 sf Storage= 1,331 cf

Plug-Flow detention time= 409.5 min calculated for 0.088 af (100% of inflow)
Center-of-Mass det. time= 409.3 min (1,120.6 - 711.2)

Volume	Invert	Avail.Storage	Storage Description
#1	155.65'	10,991 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

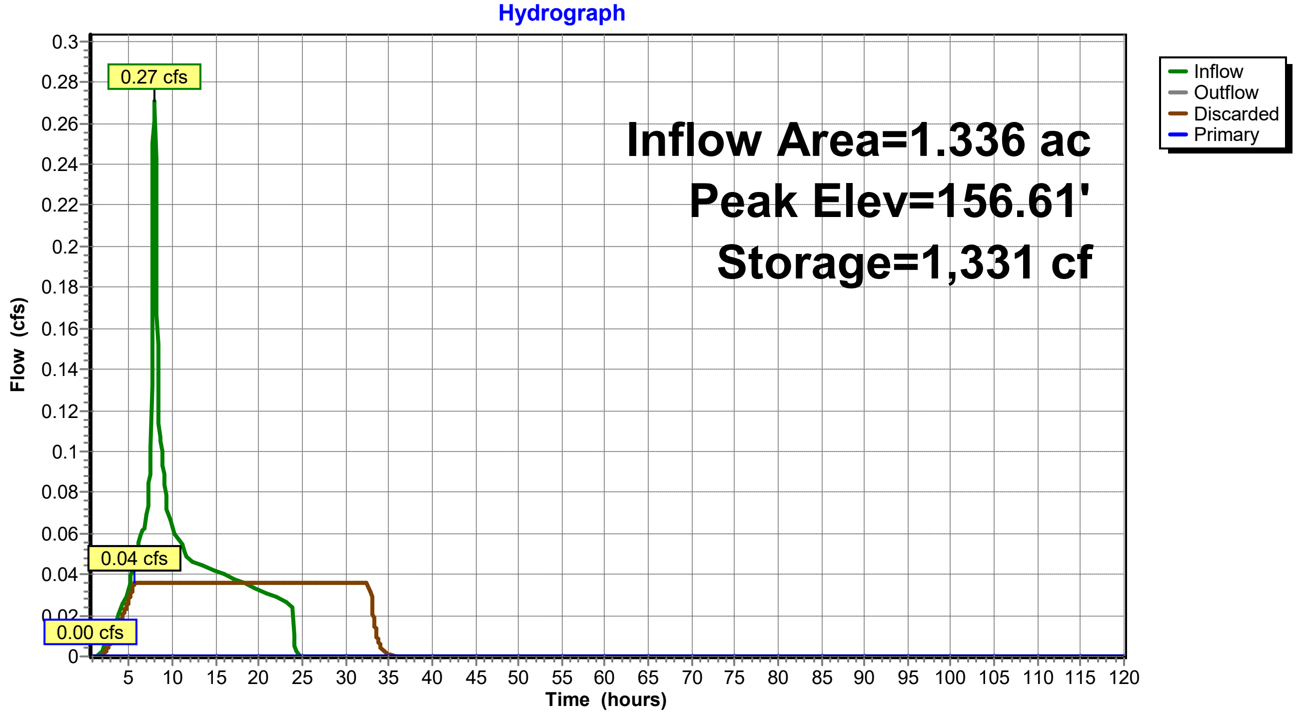
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
155.65	3,450	0.0	0	0
156.85	3,450	40.0	1,656	1,656
157.39	3,450	0.1	2	1,658
157.40	0	100.0	17	1,675
158.00	1,470	100.0	441	2,116
159.00	2,430	100.0	1,950	4,066
160.00	3,450	100.0	2,940	7,006
161.00	4,520	100.0	3,985	10,991

Device	Routing	Invert	Outlet Devices
#1	Discarded	155.65'	**0.450 in/hr Exfiltration over Horizontal area**
#2	Primary	157.30'	**1.8" Horiz. Orifice - 10 YR** C= 0.600 Limited to weir flow at low heads
#3	Primary	159.40'	**3.2" Horiz. Orifice - 100 YR** C= 0.600 Limited to weir flow at low heads
#4	Primary	159.80'	**10.0" Horiz. Overflow Riser** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 5.60 hrs HW=155.70' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.00 cfs @ 0.50 hrs HW=155.65' (Free Discharge)
├─**2=Orifice - 10 YR** (Controls 0.00 cfs)
├─**3=Orifice - 100 YR** (Controls 0.00 cfs)
└─**4=Overflow Riser** (Controls 0.00 cfs)

Pond 1P: Detention Pond/Swale



Summary for Subcatchment DEV: Developed

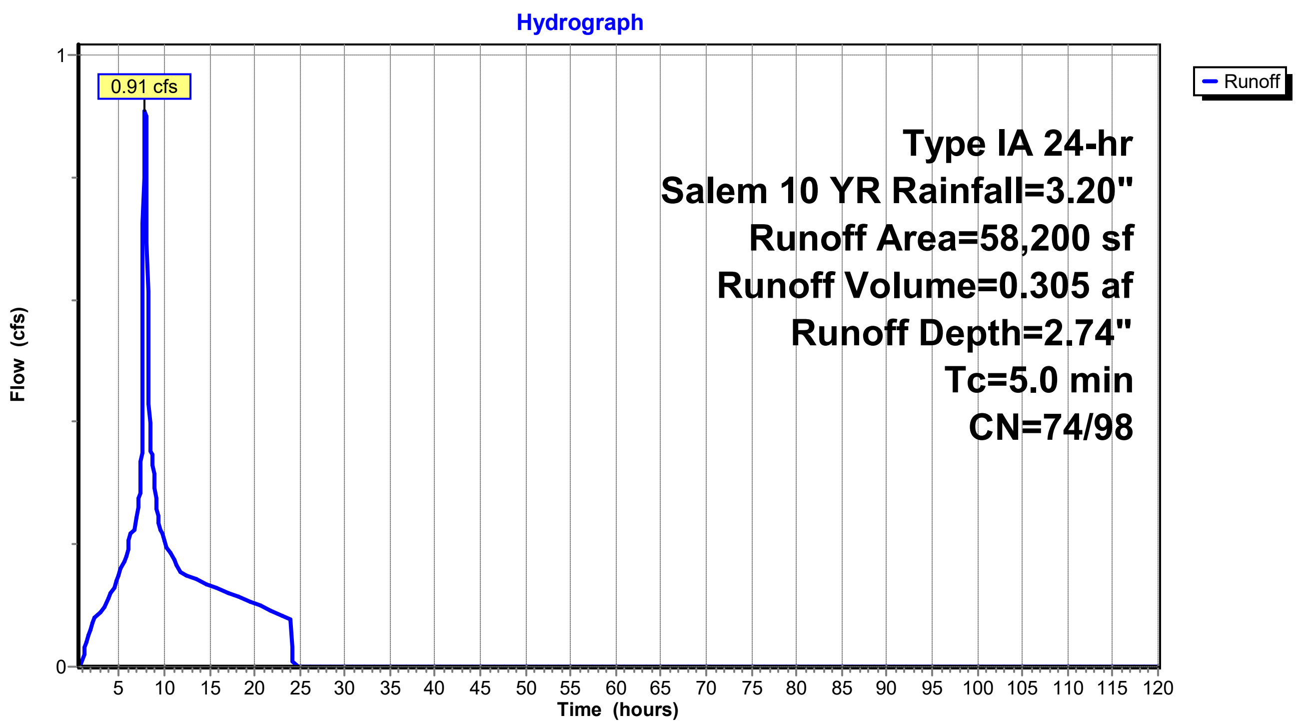
Runoff = 0.91 cfs @ 7.90 hrs, Volume= 0.305 af, Depth= 2.74"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

	Area (sf)	CN	Description
*	51,300	98	Paved parking, HSG C
*	6,900	74	Landscaping, HSG C
	58,200	95	Weighted Average
	6,900		11.86% Pervious Area
	51,300		88.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment DEV: Developed



Summary for Pond 1P: Detention Pond/Swale

Inflow Area = 1.336 ac, 88.14% Impervious, Inflow Depth = 2.74" for Salem 10 YR event
Inflow = 0.91 cfs @ 7.90 hrs, Volume= 0.305 af
Outflow = 0.16 cfs @ 11.67 hrs, Volume= 0.305 af, Atten= 83%, Lag= 226.0 min
Discarded = 0.04 cfs @ 1.85 hrs, Volume= 0.118 af
Primary = 0.12 cfs @ 11.67 hrs, Volume= 0.187 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 159.31' @ 11.67 hrs Surf.Area= 2,748 sf Storage= 4,875 cf

Plug-Flow detention time= 439.8 min calculated for 0.305 af (100% of inflow)
Center-of-Mass det. time= 440.1 min (1,115.4 - 675.3)

Volume	Invert	Avail.Storage	Storage Description
#1	155.65'	10,991 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

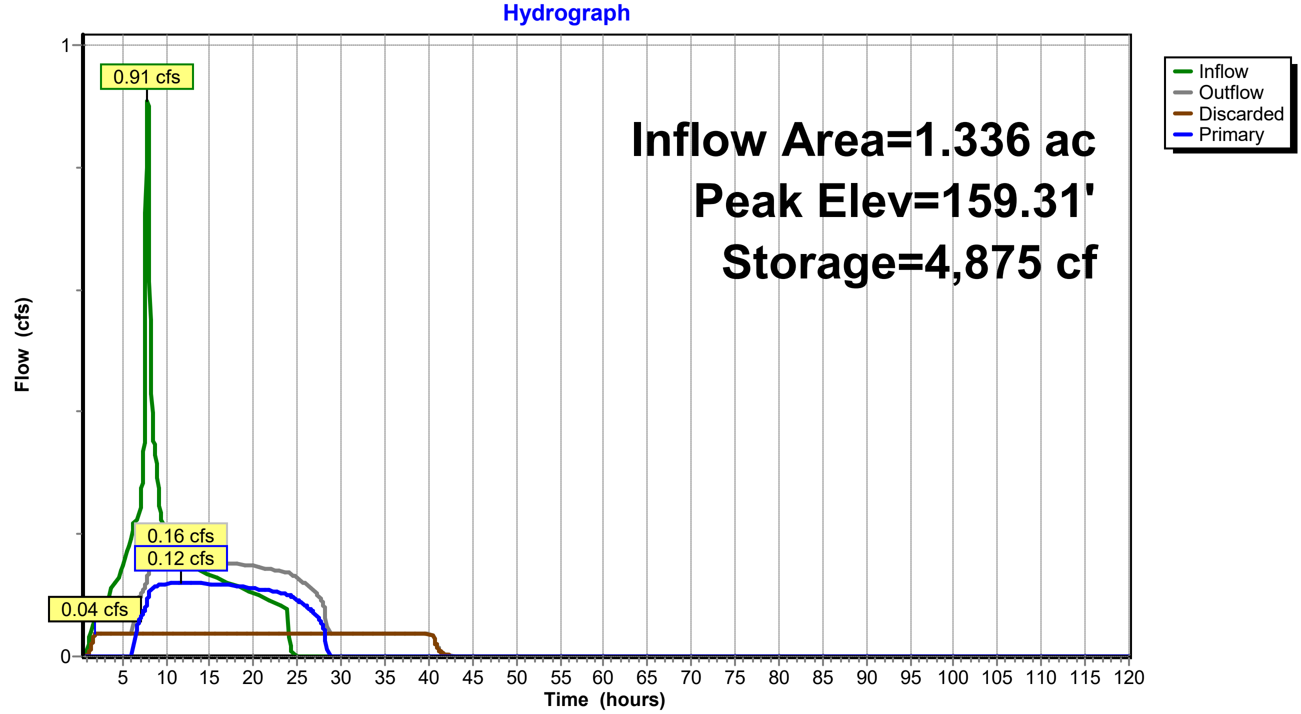
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
155.65	3,450	0.0	0	0
156.85	3,450	40.0	1,656	1,656
157.39	3,450	0.1	2	1,658
157.40	0	100.0	17	1,675
158.00	1,470	100.0	441	2,116
159.00	2,430	100.0	1,950	4,066
160.00	3,450	100.0	2,940	7,006
161.00	4,520	100.0	3,985	10,991

Device	Routing	Invert	Outlet Devices
#1	Discarded	155.65'	**0.450 in/hr Exfiltration over Horizontal area**
#2	Primary	157.30'	**1.8" Horiz. Orifice - 10 YR** C= 0.600 Limited to weir flow at low heads
#3	Primary	159.40'	**3.2" Horiz. Orifice - 100 YR** C= 0.600 Limited to weir flow at low heads
#4	Primary	159.80'	**10.0" Horiz. Overflow Riser** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 1.85 hrs HW=155.70' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.12 cfs @ 11.67 hrs HW=159.31' (Free Discharge)
├─**2=Orifice - 10 YR** (Orifice Controls 0.12 cfs @ 6.83 fps)
├─**3=Orifice - 100 YR** (Controls 0.00 cfs)
└─**4=Overflow Riser** (Controls 0.00 cfs)

Pond 1P: Detention Pond/Swale



Summary for Subcatchment DEV: Developed

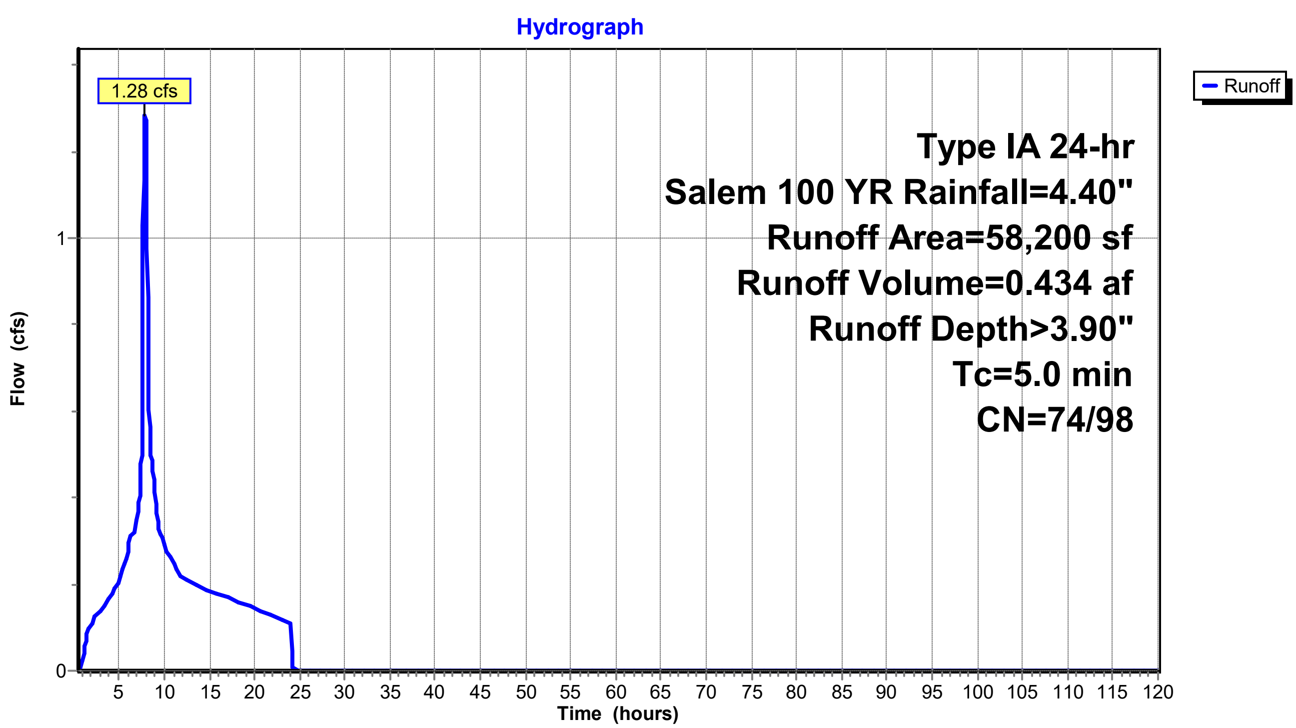
Runoff = 1.28 cfs @ 7.90 hrs, Volume= 0.434 af, Depth> 3.90"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

	Area (sf)	CN	Description
*	51,300	98	Paved parking, HSG C
*	6,900	74	Landscaping, HSG C
	58,200	95	Weighted Average
	6,900		11.86% Pervious Area
	51,300		88.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment DEV: Developed



Summary for Pond 1P: Detention Pond/Swale

Inflow Area = 1.336 ac, 88.14% Impervious, Inflow Depth > 3.90" for Salem 100 YR event
Inflow = 1.28 cfs @ 7.90 hrs, Volume= 0.434 af
Outflow = 0.33 cfs @ 9.36 hrs, Volume= 0.434 af, Atten= 74%, Lag= 87.5 min
Discarded = 0.04 cfs @ 1.45 hrs, Volume= 0.126 af
Primary = 0.30 cfs @ 9.36 hrs, Volume= 0.308 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 159.76' @ 9.36 hrs Surf.Area= 3,210 sf Storage= 6,222 cf

Plug-Flow detention time= 403.5 min calculated for 0.434 af (100% of inflow)
Center-of-Mass det. time= 403.8 min (1,072.0 - 668.2)

Volume	Invert	Avail.Storage	Storage Description
#1	155.65'	10,991 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

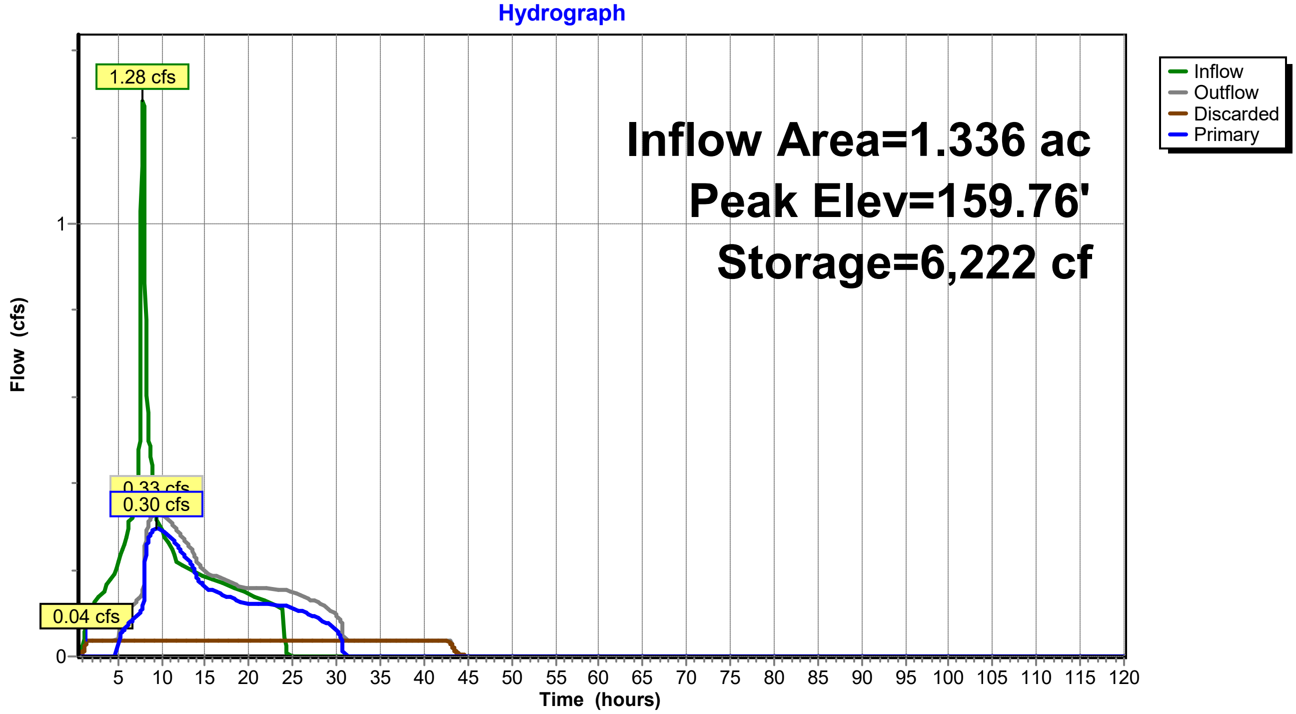
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
155.65	3,450	0.0	0	0
156.85	3,450	40.0	1,656	1,656
157.39	3,450	0.1	2	1,658
157.40	0	100.0	17	1,675
158.00	1,470	100.0	441	2,116
159.00	2,430	100.0	1,950	4,066
160.00	3,450	100.0	2,940	7,006
161.00	4,520	100.0	3,985	10,991

Device	Routing	Invert	Outlet Devices
#1	Discarded	155.65'	**0.450 in/hr Exfiltration over Horizontal area**
#2	Primary	157.30'	**1.8" Horiz. Orifice - 10 YR** C= 0.600 Limited to weir flow at low heads
#3	Primary	159.40'	**3.2" Horiz. Orifice - 100 YR** C= 0.600 Limited to weir flow at low heads
#4	Primary	159.80'	**10.0" Horiz. Overflow Riser** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 1.45 hrs HW=155.71' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.30 cfs @ 9.36 hrs HW=159.76' (Free Discharge)
├─**2=Orifice - 10 YR** (Orifice Controls 0.13 cfs @ 7.56 fps)
├─**3=Orifice - 100 YR** (Orifice Controls 0.16 cfs @ 2.91 fps)
└─**4=Overflow Riser** (Controls 0.00 cfs)

Pond 1P: Detention Pond/Swale



Summary for Subcatchment DEV: Developed

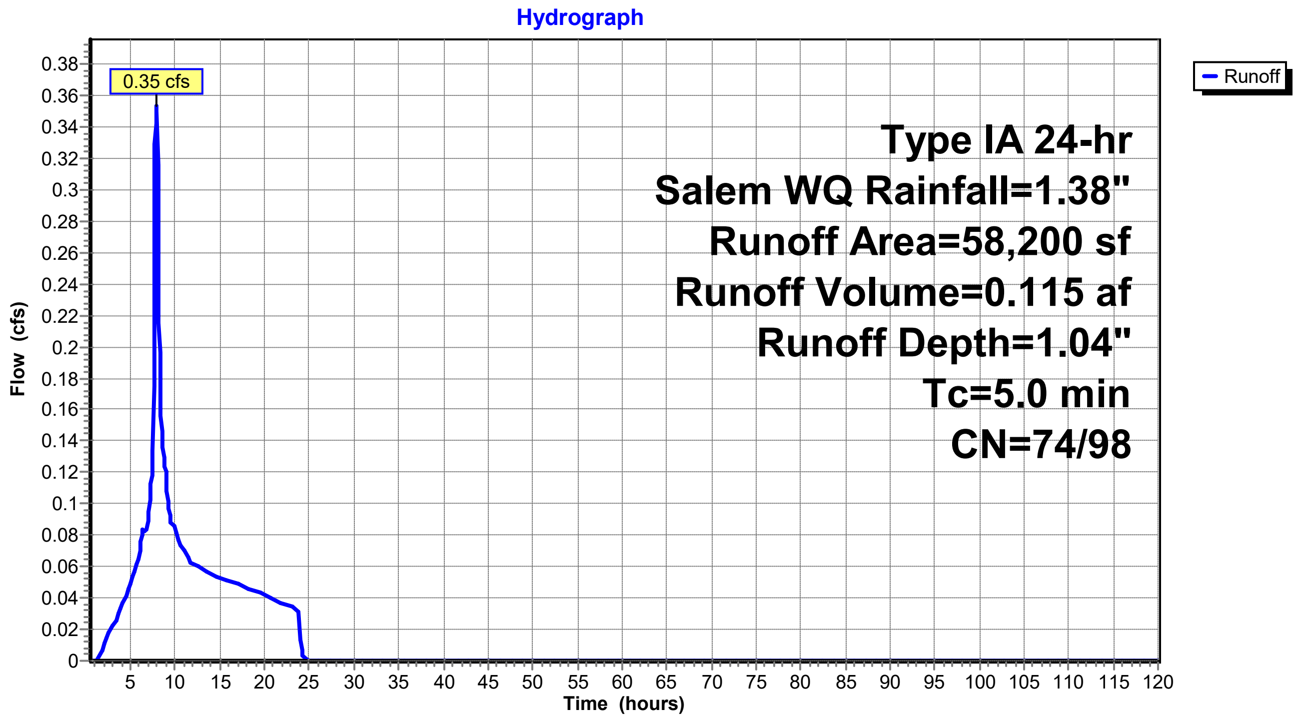
Runoff = 0.35 cfs @ 7.91 hrs, Volume= 0.115 af, Depth= 1.04"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	51,300	98	Paved parking, HSG C
*	6,900	74	Landscaping, HSG C
	58,200	95	Weighted Average
	6,900		11.86% Pervious Area
	51,300		88.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment DEV: Developed



Summary for Pond 1P: Detention Pond/Swale

Inflow Area = 1.336 ac, 88.14% Impervious, Inflow Depth = 1.04" for Salem WQ event
Inflow = 0.35 cfs @ 7.91 hrs, Volume= 0.115 af
Outflow = 0.07 cfs @ 11.01 hrs, Volume= 0.115 af, Atten= 80%, Lag= 185.9 min
Discarded = 0.04 cfs @ 4.65 hrs, Volume= 0.100 af
Primary = 0.04 cfs @ 11.01 hrs, Volume= 0.016 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 157.47' @ 11.01 hrs Surf.Area= 178 sf Storage= 1,682 cf

Plug-Flow detention time= 449.4 min calculated for 0.115 af (100% of inflow)
Center-of-Mass det. time= 449.6 min (1,151.3 - 701.6)

Volume	Invert	Avail.Storage	Storage Description
#1	155.65'	10,991 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

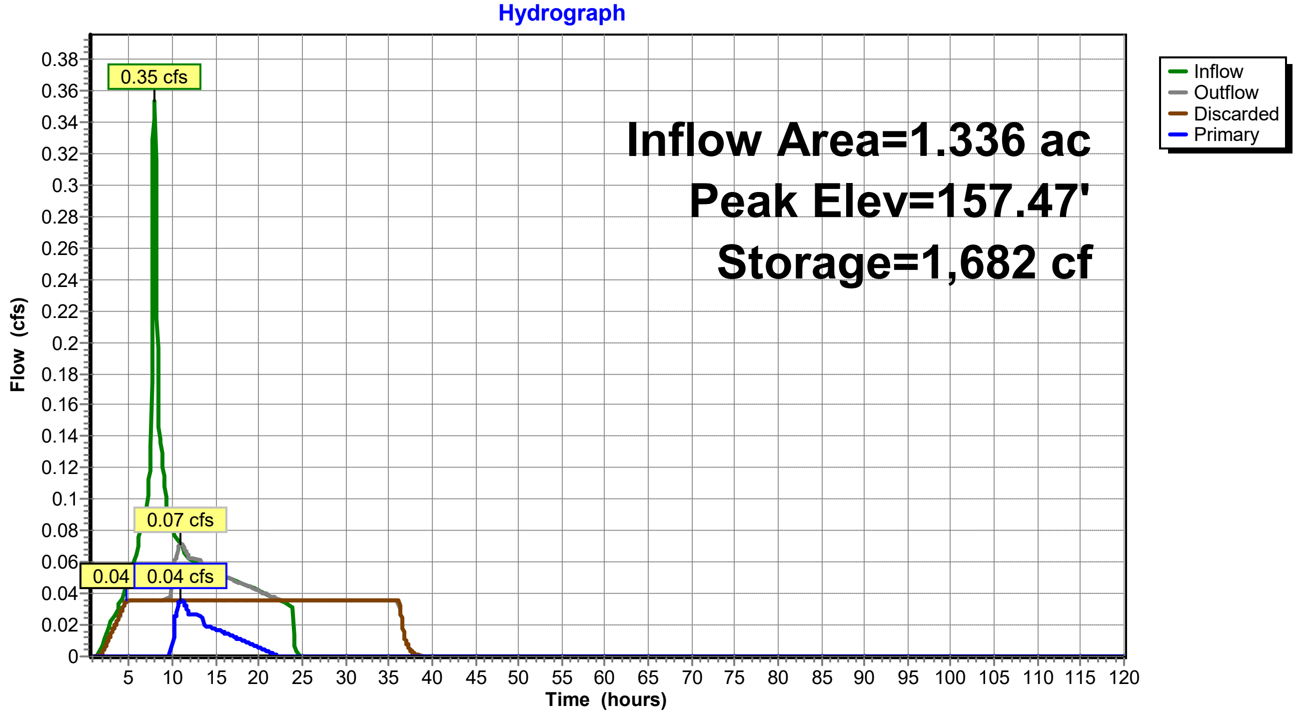
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
155.65	3,450	0.0	0	0
156.85	3,450	40.0	1,656	1,656
157.39	3,450	0.1	2	1,658
157.40	0	100.0	17	1,675
158.00	1,470	100.0	441	2,116
159.00	2,430	100.0	1,950	4,066
160.00	3,450	100.0	2,940	7,006
161.00	4,520	100.0	3,985	10,991

Device	Routing	Invert	Outlet Devices
#1	Discarded	155.65'	**0.450 in/hr Exfiltration over Horizontal area**
#2	Primary	157.30'	**1.8" Horiz. Orifice - 10 YR** C= 0.600 Limited to weir flow at low heads
#3	Primary	159.40'	**3.2" Horiz. Orifice - 100 YR** C= 0.600 Limited to weir flow at low heads
#4	Primary	159.80'	**10.0" Horiz. Overflow Riser** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.04 cfs @ 4.65 hrs HW=155.70' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=0.04 cfs @ 11.01 hrs HW=157.47' (Free Discharge)
├─**2=Orifice - 10 YR** (Orifice Controls 0.04 cfs @ 2.00 fps)
├─**3=Orifice - 100 YR** (Controls 0.00 cfs)
└─**4=Overflow Riser** (Controls 0.00 cfs)

Pond 1P: Detention Pond/Swale



Summary for Reach S: Swale

Inflow Area = 1.336 ac, 88.14% Impervious, Inflow Depth = 1.04" for Salem WQ event
Inflow = 0.35 cfs @ 7.91 hrs, Volume= 0.115 af
Outflow = 0.33 cfs @ 8.04 hrs, Volume= 0.115 af, Atten= 8%, Lag= 7.5 min

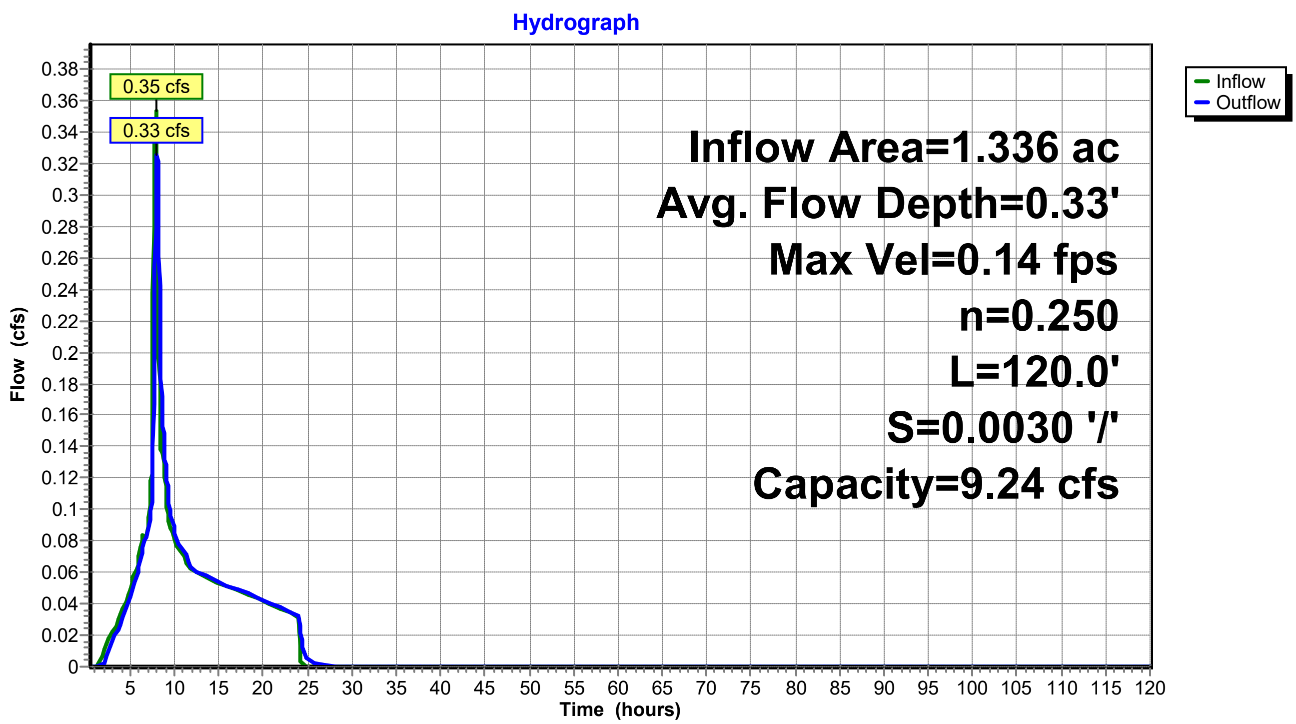
Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.14 fps, Min. Travel Time= 14.2 min
Avg. Velocity = 0.06 fps, Avg. Travel Time= 34.9 min

Peak Storage= 277 cf @ 8.04 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 9.24 cfs

6.00' x 2.00' deep channel, n= 0.250
Side Slope Z-value= 3.0 '/' Top Width= 18.00'
Length= 120.0' Slope= 0.0030 '/'
Inlet Invert= 157.76', Outlet Invert= 157.40'

‡

Reach S: Swale



Summary for Reach S: Swale

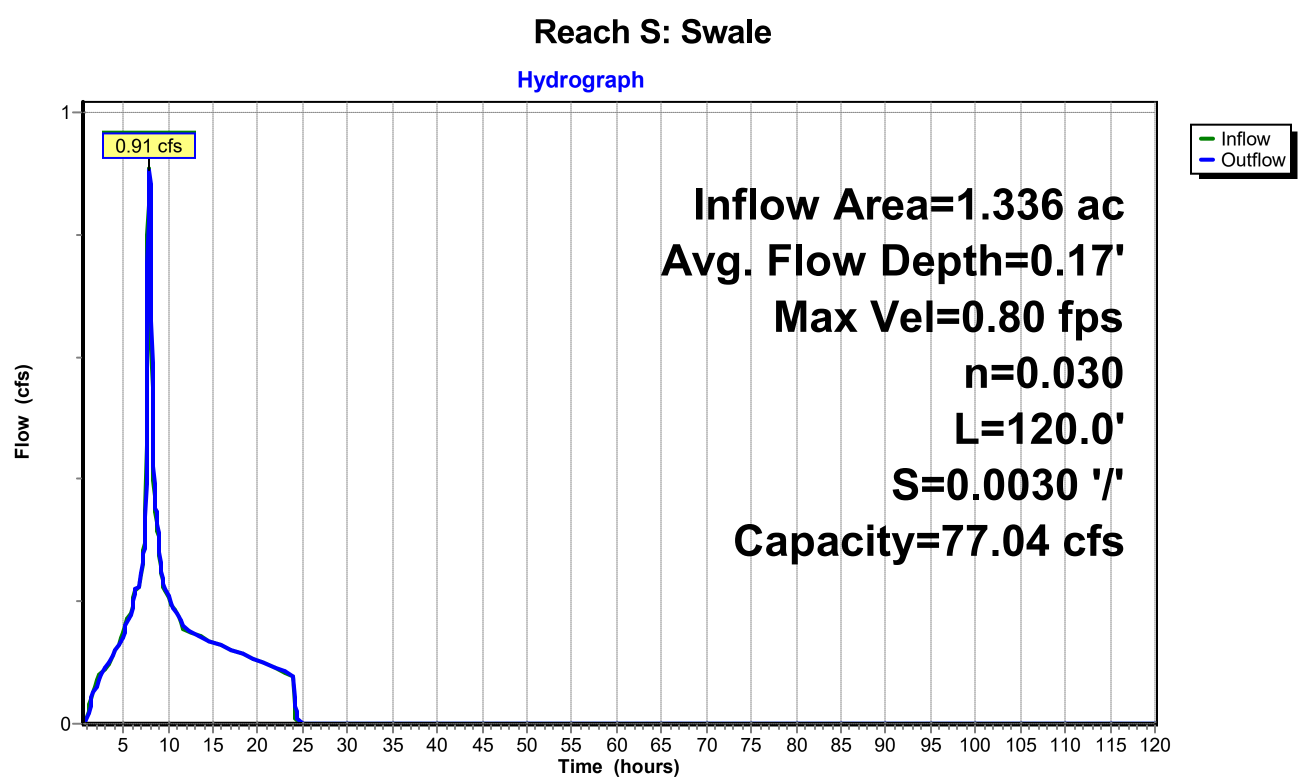
Inflow Area = 1.336 ac, 88.14% Impervious, Inflow Depth = 2.74" for Salem 10 YR event
Inflow = 0.91 cfs @ 7.90 hrs, Volume= 0.305 af
Outflow = 0.91 cfs @ 7.93 hrs, Volume= 0.305 af, Atten= 0%, Lag= 1.6 min

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.80 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 5.2 min

Peak Storage= 136 cf @ 7.93 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 2.00' Flow Area= 24.0 sf, Capacity= 77.04 cfs

6.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 18.00'
Length= 120.0' Slope= 0.0030 '/'
Inlet Invert= 157.76', Outlet Invert= 157.40'

‡



APPENDIX E

WELL LOGS

RECEIVED
APR 19 1961
STATE ENGINEER

MAR 17005

File Original and First Copy with the STATE ENGINEER, SALEM, OREGON

WATER WELL REPORT
STATE OF OREGON

State Well No. 7/3W-13

State Permit No. ....

(1) OWNER:

Name DUTCH MAID FOOD PRODUCTS INC.

Address 3371 PORTLAND RD

SALEM, OREGON

(2) LOCATION OF WELL:

County MARION Owner's number, if any—

¼ ¼ Section 13 T. 7S R. 3W W.M.

Bearing and distance from section or subdivision corner

(3) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 11.

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☒ Municipal ☐

Irrigation ☐ Test Well ☐ Other ☐

(5) TYPE OF WELL:

Rotary ☐ Driven ☐

Cable ☒ Jetted ☐

Dug ☐ Bored ☐

(6) CASING INSTALLED: Threaded ☐ Welded ☒

8" Diam. from top ft. to 144 ft. Gage

" Diam. from ft. to ft. Gage

" Diam. from ft. to ft. Gage

(7) PERFORATIONS: Perforated? ☒ Yes ☐ No

Type of perforator used MILLS

SIZE of perforations ½x2 in. by in.

96 perforations from 82 ft. to 94 ft.

perforations from ft. to ft.

perforations from ft. to ft.

perforations from ft. to ft.

perforations from ft. to ft.

(8) SCREENS: Well screen installed ☐ Yes ☒ No

Manufacturer's Name

Type Model No.

Diam. Slot size Set from ft. to ft.

Diam. Slot size Set from ft. to ft.

(9) CONSTRUCTION:

Was well gravel packed? ☐ Yes ☒ No Size of gravel:

Gravel placed from ft. to ft.

Was a surface seal provided? ☒ Yes ☐ No To what depth? ft.

Material used in seal— PUDDLE CLAY

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? Depth of strata

Method of sealing strata off

(10) WATER LEVELS:

Static level 30 ft. below land surface Date

Artesian pressure lbs. per square inch Date

Log Accepted by: Dutch Maid Food Products

[Signed] by S.A. Hansen (Owner) Date April 14, 1961

(11) WELL TESTS: Drawdown is amount water level is lowered below static level

Was a pump test made? ☒ Yes ☐ No If yes, by whom? DRILLER

Yield: 100 gal./min. with 20 ft. drawdown after 6 hrs.

" 145 " 34 " 6 "

" 205 " 45 " 6 "

~~Bailer test~~ 250 gal./min. with 56 ft. drawdown after 6 hrs.

Artesian flow g.p.m. Date

Temperature of water 54 Was a chemical analysis made? ☐ Yes ☐ No

(12) WELL LOG: Diameter of well 8 inches.

Depth drilled 144 ft. Depth of completed well 144 ft.

Formation: *Describe by color, character, size of material and structure, and show thickness of aquifers and the kind and nature of the material in each stratum penetrated, with at least one entry for each change of formation.*

MATERIAL	FROM	TO
TOP SOIL	0	3
YELLOW CLAY	3	15
YELLOW CLAY SANDY	15	22
SAND & GRAVEL	22	50
BLUE CLAY	50	67
HARD & LOOSE GRAVEL	67	144

Work started MARCH 25 1961 Completed APRIL 11 1961

(13) PUMP:

Manufacturer's Name

Type: H.P.

Well Driller's Statement:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

NAME WILLAMETTE DRILLING CO (Person, firm, or corporation) (Type or print)

Address RT.2 BOX 276 SALEM, OREGON

Driller's well number 633

[Signed] Herman G Beier (Well Driller)

License No. 293 Date APRIL 11, 1961

(USE ADDITIONAL SHEETS IF NECESSARY)

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the

STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date of well completion.

WATER WELL REPORT

STATE OF OREGON
(Please type or print)
(Do not write above this line)

RECEIVED
SEP 17 1974
STATE ENGINEER
SALEM, OREGON

17068
MAR1

State Well No. 7S/3W-13a

State Permit No.

(1) OWNER:

Name CECIL ZINN
Address 3315 DUNCAN N.E
SALEM ORE.

(2) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☒ Industrial ☐ Municipal ☐
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED:

Threaded ☐ Welded ☒

6" Diam. from 0 ft. to 80 ft. Gage 1/4
" Diam. from ft. to ft. Gage
" Diam. from ft. to ft. Gage

(6) PERFORATIONS:

Perforated? ☐ Yes ☒ No.

Type of perforator used
Size of perforations in. by in.
perforations from ft. to ft.
perforations from ft. to ft.
perforations from ft. to ft.

(7) SCREENS:

Well screen installed? ☐ Yes ☒ No

Manufacturer's Name
Type Model No.
Diam. Slot size Set from ft. to ft.
Diam. Slot size Set from ft. to ft.

(8) WELL TESTS:

Drawdown is amount water level is lowered below static level

Was a pump test made? ☐ Yes ☒ No If yes, by whom?

Yield: gal./min. with ft. drawdown after hrs.
" " "
" " "

Bailer test 25 gal./min. with 48 ft. drawdown after 1 hrs.

Artesian flow g.p.m.

Temperature of water Depth artesian flow encountered ft.

(9) CONSTRUCTION:

Well seal—Material used WELL JELL
Well sealed from land surface to 30' ft.
Diameter of well bore to bottom of seal 10" in.
Diameter of well bore below seal 6 in.
Number of sacks of cement used in well seal NONE sacks
Number of sacks of bentonite used in well seal 1 1/2 sacks
Brand name of bentonite WELL JELL
Number of pounds of bentonite per 100 gallons of water 100 lbs./100 gals.
Was a drive shoe used? ☒ Yes ☐ No Plugs NO Size: location ft.
Did any strata contain unusable water? ☒ Yes ☐ No
Type of water? SANDY depth of strata 74'
Method of sealing strata off CASED
Was well gravel packed? ☐ Yes ☒ No Size of gravel:
Gravel placed from ft. to ft.

(10) LOCATION OF WELL:

County MARION Driller's well number

1/4 NE 1/4 Section 13 T. 7S R. 3W W.M.

Bearing and distance from section or subdivision corner

(11) WATER LEVEL: Completed well.

Depth at which water was first found 74' ft.
Static level 32 ft. below land surface. Date 9-10 74
Artesian pressure lbs. per square inch. Date

(12) WELL LOG:

Diameter of well below casing 6

Depth drilled 80 ft. Depth of completed well 80 ft.

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
TOPSOIL	0	2	
CLAY YELLOW COLOR	2	25	
CLAY BLUE COLOR	25	29	
CONGLOMERATE	29	74	
SAND AND SMALL PEBBLES	74	78	32'
GRAVEL & COARSE SAND 1½	78	80	32

Work started 9-5 1974 Completed 9-10 1974

Date well drilling machine moved off of well 9-10 1974

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] R.F. Sneed Date 9-10, 1974
(Drilling Machine Operator)

Drilling Machine Operator's License No. 187

Water Well Contractor's Certification:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Name J.R. SNEED & SONS
(Person, firm or corporation) (Type or print)

Address 3910 SILVERTON RD SALEM ORE

[Signed] R.F. Sneed
(Water Well Contractor)

Contractor's License No. 6 Date 9-10, 1974

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45656-119

MARI 50867

STATE OF OREGON
MONITORING WELL REPORT
(as required by ORS 537.765 & OAR 690-240-095)

Start Card # 75645

(1) OWNER/PROJECT:

WELL NO. MW-1

Name MERRIT TRUAX, INC.

Address P.O. BOX 2099

City SALEM State OREGON Zip 97308-2099

(2) TYPE OF WORK:

☐ New construction ☐ Repair ☐ Recondition

☐ Conversion ☐ Deepening ☒ Abandonment

(3) DRILLING METHOD

☐ Rotary Air ☐ Rotary Mud ☐ Cable

☐ Hollow Stem Auger ☐ Other

(4) BORE HOLE CONSTRUCTION

Special Standards Yes ☐ No ☒ Depth of completed well 29.5 ft.

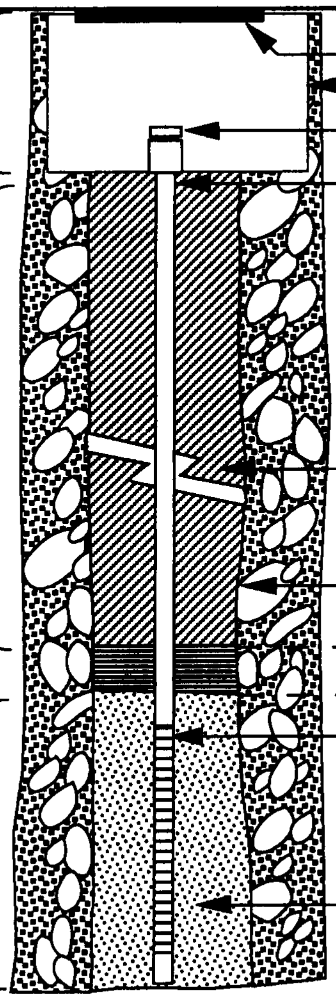
Land surface

Vault 0 ft. TO 1 ft.

Monument Lid Removed + Filled w/ concrete

Seal 1 ft. TO 29.5 ft.

Filter pack 7 ft. TO 29.5 ft.



Water-tight cover

Surface flush vault

Locking cap

Casing diameter 2" in. material PVC

Welded ☐ Threaded ☒ Glued ☐

Liner diameter ___ in. material ___

Welded ☐ Threaded ☐ Glued ☐

Well seal: Material 3/8" BENTONITE CHIPS Amount 50-lbs

Borehole diameter 6.25 in.

Bentonite plug at least 2 ft. thick

Screen material PVC interval(s): From 9 To 29.5' From ___ To ___ Slot size .020 in.

Filter pack: Material Colo. Si SAND Size 8-12 in.

(5) WELL TEST:

☐ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Permeability ___ Yield ___ GPM

Conductivity ___ PH ___

Temperature of water ___ °F/C Depth artesian flow found ___ ft.

Was water analysis done? ☐ Yes ☐ No

By whom? ___

Depth of strata to be analyzed. From ___ ft. to ___ ft.

Remarks: ___

Name of supervising Geologist/Engineer ___

(6) LOCATION OF WELL By legal description

Well Location: County MARION

Township 7 (N or S) Range 3 (E or W) Section 13

1. SW 1/4 of NE 1/4 of above section.
2. Street address of well location 3025 INDUSTRIAL WAY SALEM, OREGON
3. Tax lot number of well location ___
4. ATTACH MAP WITH LOCATION IDENTIFIED.

(7) STATIC WATER LEVEL:

20 Ft. below land surface. Date 8/26/96

Artesian Pressure ___ lb/sq. in. Date ___

(8) WATER BEARING ZONES:

Depth at which water was first found 20'

From	To	Est. Flow Rate	SWL
20	29.5'	Low	20'

(9) WELL LOG:

Ground elevation 160'

Material	From	To	SWL
ABANDONMENT:			
PVC CASING FILLED w/			
3/8" Bentonite CHIPS			
FROM BOTTOM TO TOP	1	29.5'	20'
HYDRATED IN 2' LIFTS			
ABOVE SWL.			
MONUMENT LID Removed			
+ FILLED w/CONCRETE	0	1'	

RECEIVED
SEP - 9 1996
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 8/26/96 Completed 8/26/96

(unbonded) Monitor Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon well construction standards. Materials used and information reported above are true to the best knowledge and belief.

MWC Number ___

Signed ___ Date ___

(bonded) Monitor Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon well construction standards. This report is true to the best of my knowledge and belief.

MWC Number 10032

Signed Scott C. Bourey Date 9/3/96

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

MARI 54941

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)
Instructions for completing this report are on the last page of this form.

WELL I.D. # L 37360
START CARD # W130764

(1) OWNER: Well Number 3491
Name ANDREW BROCK
Address 3295 DUNCAN AVE
City SALEM State OR Zip 97303

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☒ Rotary Air ☐ Rotary Mud ☐ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☒ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☐ Yes ☒ No Depth of Completed Well 80 ft.
Explosives used ☐ Yes ☒ No Type ______ Amount ______

HOLE Diameter	From	To	SEAL Material	From	To	Sacks or pounds
10"	0	18	BENTONITE	0	18	9 SACKS
6"	18	80				

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☒ Other POURED DRY
Backfill placed from ___ ft. to ___ ft. Material ___
Gravel placed from ___ ft. to ___ ft. Size of gravel ___

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	6"	+1	80	.250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:					☐	☐	☐	☐
					☐	☐	☐	☐

Final location of shoe(s) 80'

(7) PERFORATIONS/SCREENS:
☐ Perforations Method NONE
☐ Screens Type ______ Material ______

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
☐ Pump ☐ Bailer ☒ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
50		80'	1 hr.

Temperature of water 53° Depth Artesian Flow Found ______
Was a water analysis done? NO ☐ Yes By whom ______
Did any strata contain water not suitable for intended use? NO ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata: ______

(9) LOCATION OF WELL by legal description:
County MARION Latitude ______ Longitude ______
Township 7S N or S Range 3W E or W. WM.
Section 13 NE 1/4 NW 1/4
Tax Lot 11600 Lot ______ Block ______ Subdivision ______
Street Address of Well (or nearest address) SAME AS ABOVE

(10) STATIC WATER LEVEL:
28 ft. below land surface. Date 6/15/00
Artesian pressure ______ lb. per square inch. Date ______

(11) WATER BEARING ZONES:
Depth at which water was first found 56

From	To	Estimated Flow Rate	SWL
56	62	5 gpm	28
62	80	50 gpm	28

(12) WELL LOG:
Ground Elevation ______

Material	From	To	SWL
TOPSOIL	0	2	
SOFT BROWN CLAY	2	29	
SOFT GRAY CLAY	29	33	
CEMENTED BROWN GRAVEL	33	56	
BROWN SAND W/GRAVEL	56	62	28
BROWN GRAVEL	62	80	28

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JUN 27 2000
WATER RESOURCES DEPT.
SALEM, OREGON

Date started 6/15/00 Completed 6/15/00

(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
WWC Number 1750
Signed [signature] Date 6/15/00

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 561
Signed Dallas L Bair Date 6/15/00