Drainage Report

Gateway Christian Center Short Subdivision
Lacey, WA

Prepared For:
Gateway Christian Center

Prepared By:
SCJ Alliance
Bill Dunning, PE
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Lacey, WA 98516
360.352.1465

February 2024

SCJ ALLIANCE
CONSULTING SERVICES

DRAINAGE REPORT

Project Information

Project:	Gateway Christian Center Short Subdivision
Prepared for:	Gateway Christian Center
	Sung Han 3300 Marvin Road NE Lacey, WA 98516

Reviewing Agency

Jurisdiction:	City of Lacey

Project Representative

Prepared by:	SCJ Alliance 8730 Tallon Lane NE, Suite 200 Lacey, WA 98516 360.352.1465 scjalliance.com
Contact:	Bill Dunning, PE
Project Reference:	SCJ #23-000886

PROJECT ENGINEER'S CERTIFICATION

I hereby certify that this Drainage Plan for the Gateway Christian Center has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community for professional engineers. I understand that the City of Lacey does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities prepared by me.

February 26, 2024

Prepared by Bill Dunning, PE
Bill.Dunning@scjalliance.com
360.352.1465

Date

Table of Contents

List of Tables

List of Appendices

List of Attachments

1 Introduction

The following report has been prepared to summarize the Gateway Christian Center Short Subdivision stormwater management requirements and how those requirements are addressed by the existing storm drainage improvements on the developed portion of the Gateway Christian Center site and how the requirements will also be satisfied by the existing regional stormwater management facility that is located immediately south of the Gateway Christian Center property.

The project site is located on the east side of Marvin Rd NE Lacey, WA. As part of this short subdivision, no project action is proposed. However, we understand from the Presubmission Meeting notes from the City, that the following must be constructed before the Final Short Plat can be approved: 1) site access, 2) a watermain extension, 3) a sanitary sewer extension, and 4) construction of a new sidewalk along the street frontage.

This report was prepared to comply with the minimum technical standards and requirements that are set forth in the City of Lacey 2022 *Stormwater Design Manual (SDM).*

2 Proposed Project Description

2.1 Detailed Description

Project Proponent:	Gateway Christian Center
Parcel Numbers:	375900000100
Total Parcel Area:	8.47 ac
Current Zoning:	LI, Light Industrial
Required Permits:	Preliminary and Final Short Plat
Site Address:	3300 Marvin Road NE, Lacey, WA 98516
Section, Township Range:	Section , 02 Township 18, Range 1W, W.M.

PROPERTY

The property is located on the east side of Marvin Road NE. It is currently one parcel with an existing church building and associated parking lot and other improvements constructed on the northern portion of the parcel in 2014. Sidewalk improvements were also constructed along the site frontage at the same time as the church facility. The site is bounded by Target Corporation property to the north, industrial use to the east a regional stormwater pond to the south and Marvin Road NE to the west. This proposed short subdivision plat and this drainage report has been prepared solely to support the extension of utilities, site access and sidewalk improvements along the site frontage. No other development is proposed on the site.

EXISTING IMPROVEMENTS (including stormwater management)

The northern portion of Gateway Christian Center's property was permitted through the City of Lacey and constructed in 2014 in accordance with the applicable stormwater regulations. The stormwater management improvements include a water quality pond and separate detention pond for flow control. These existing on-site stormwater ponds are planned to continue in use at this time. No on-site improvements are proposed for Lot 1 or Lot 2 at this time.

A copy of the Gateway Christian Center Drainage Plan approved for construction has been included in Appendix 1.

REGIONAL STORMWATER MANAGEMENT FACILITY

A copy of the approved Stormwater Calculations for the Regional Storm Drainage Facility has been included in Appendix 2. As noted on page 3 of the Regional Stormwater Management Facility Storm Drainage Report, dated April 20, 2006, the stormwater calculations planned for the Gateway Christian Parcel provide for a maximum of 85% impervious area to be constructed on 8.778 acres. This total area of 8.778 acres includes the right-of-way area which was subsequently dedicated to the City of Lacey by Gateway Christian Center resulting in the remaining parcel area of 8.47 acres.

The project property drains to the regional pond that was designed and constructed by The Meridian Group (and is now managed by Railey Mae HOA). This regional pond and water quality treatment system has been approved to receive stormwater runoff from the Gateway Christian Center property and to provide Flow Control and Water Quality treatment for proposed development associated with this proposed short subdivision as well. This regional stormwater pond was permitted in 2004 and receives stormwater runoff from a total area of 125 acres.

PROPOSED SHORT SUBDIVISION

The Preliminary Short Subdivision Map and the Utility Extensions and Frontage Improvement Plans have been included in Appendix 3. These depict the proposed new property line, dividing the property into two separate lots and also the required water, sanitary sewer, frontage sidewalk and private access road entrance.

As part of this preliminary short subdivision, Proposed Lot 1 will include the portion of the property that has been developed as Gateway Christian Church. Proposed Lot 2 will be the portion that is to be subdivided at this time, but is not proposed to be developed until some time in the future after a buyer of Lot 2 has been identified. Table 1 below describes the land use and surface types of the site.

Table 1 On-site & Off-Site Land Type Designations Summary Section

LAND TYPE DESIGNATION	AREA (ACRES)	% OF TOTAL AREA
Proposed Lot 1 Total On-Site Area	**3.30**	**100**
Existing Pervious Surface	2.19	66.4
Existing Impervious Surface	1.11	33.6
Proposed Lot 2 Total On-site Area	**5.17**	**100**
Existing Pervious Surface	5.17	100

2.2 Summary of Compliance On-Site

The stormwater design complies with all 9 minimum requirements as follows:

Minimum Requirement #1 – Preparation of Stormwater Site Plans – This has been addressed as part of the original development of the Gateway Christian Center and is also addressed through the approved use of the adjacent Regional Stormwater Management Facility that has been designed and permitted to receive the stormwater runoff from this site. Additional information is provided below and also in Appendix 2 and Attachment 5.

Minimum Requirement #2 – Construction Stormwater Pollution Prevention – A pollution prevention plan has been included within the stormwater site plan which describes the 13 required elements. Further, an erosion control plan has been prepared and is part of the engineering plan set.

Minimum Requirement #3 – Source Control of Pollution – At this time, no site improvements or activities are proposed other than the extension of water and sanitary sewer lines, an access road entrance and sidewalk. At the time site improvements are proposed and permitted, all source control BMPs will be evaluated for feasibility and are identified in the Maintenance and Source Control Manual.

Minimum Requirement #4 – Preservation of Natural Drainage Systems and Outfalls – The developed portion of the northern 3.30 acre parcel drains into existing water quality and stormwater detention ponds. Currently, no changes are proposed to the existing stormwater management systems. The natural stormwater runoff outfall for the property is sheet flow to the south. The existing pond on the north parcel discharges stormwater runoff via a sheet flow dispersion trench, which models the natural conditions.

Development of the southern portion of the subject property will require collection of the sheet flow from the dispersion trench and bypassing the stormwater for both sites to the existing culvert located in the southwestern portion of the 8.47 acre property. This culvert is shown as existing on the

Minimum Requirement #5 – On-site Stormwater Management for the developed northern portion of the site is provided through the construction of one water quality pond and one stormwater detention pond. Both of these were constructed in accordance with applicable City of Lacey stormwater regulations. In the future, when improvements are proposed on the balance of the site, stormwater

runoff will be collected across the site and drain to the connection pipe that conveys the stormwater runoff from the site to the existing immediately adjacent regional detention pond located along the southern property boundary.

Minimum Requirement #6 – Runoff Treatment – All of the stormwater flowing from existing north site pollution generating surfaces is receiving basic treatment. Runoff treatment for future development will be provided through the existing adjacent regional stormwater facility.

Minimum Requirement #7 – Flow Control – Flow control for the developed north portion of the site is provided through the existing stormwater detention pond. Future development on the project site is expected to meet the flow control requirement through the adjacent regional stormwater management facility.

Minimum Requirement #8 – Wetlands Protection – There are no known wetlands on-site.

Minimum Requirement #9 – Operation and Maintenance – A Maintenance and Source Control Manual is included as Drainage Control Plan Attachment No. 4.

3 Existing Conditions Description

The Gateway Christian Center property is currently one parcel with an existing church building and associated parking lot and other associated improvements constructed on the northern portion of the parcel. Those improvements, including the stormwater ponds cover approximately 2.5 acres of the site. The remainder of the property consists of mildly sloping terrain vegetated with ferns and intermittent underbrush and a mix of deciduous and evergreen trees as well.

As mentioned above, the northern portion of Gateway Christian Center's property was permitted through the City of Lacey and constructed in 2014 in accordance with the applicable stormwater regulations. The improvements constructed include the main church building and sanctuary and two smaller buildings that provide administrative and teaching purposes. On-site stormwater ponds are also located just south of the Church's parking lot. No on-site improvements are proposed at this time other than the extension of water and sewer improvements. Off-site improvements include the proposed construction of a new access entrance to be located with the existing 40-foot wide access and utility easement that is located immediately south of the property with the easement granting vehicular and utility access for the purpose of serving the Gateway Christian Center property.

For the extension of utilities on the project site, surface areas disturbed to extend those utilities will be restored to their existing condition following completion of the utility work.

An existing maintenance road is already present in the location of the proposed access improvements for the site. The stormwater runoff for the maintenance road currently drains to the regional detention pond which is served by the maintenance road. The stormwater Minimum Requirements associated with the proposed access improvements will be accommodated by the regional detention pond.

The project site is not in a wellhead protection area.

4 Vicinity Analysis and Subbasin Description

There are no known flooding or bank overtopping problems, and no steep slopes are located near the project site.

There are also no known fuel tanks on-site.

4.1 Qualitative Upstream Analysis

There is no offsite run-on onto the project property.

4.2 Qualitative Downstream Analysis

All of the stormwater currently drains overland toward the southwest corner of the 8.47 acre property where an 18" diameter storm drainage culvert exists. The culvert was constructed as part of the regional detention pond improvements to provide drainage under the maintenance road that was also constructed at that time to drain the subject property.

All of the stormwater runoff on the already developed site is collected, treated, and detained by the existing on-site stormwater facility. In the future condition when development is proposed on the undeveloped portion of the site, all applicable Minimum Requirements will be satisfied by the existing regional stormwater management facility located immediately south of the site. The regional detention pond was designed, permitted and constructed to accommodate the development of the Gateway Christian Center property. The Meridian Regional Stormwater Facility design documents accommodate the flow from upstream and identify the specifics of the downstream analysis that are necessary to mitigate the peak flow rates and provide for sufficient downstream stormwater flow capacity. We are not aware of conveyance capacity problems within a quarter mile of the site.

5 Flow Control and Water Quality Facility Sizing

Flow control and water quality treatment for the existing Church related improvements on Proposed Lot 1 have been provided for through the construction of the two ponds. The water quality and flow control ponds were designed in 2014 and sized to meet the City's stormwater design and permitting requirements in effect at that time.

At this time, no development is proposed on Proposed Lot 2 (other than installation of the required sanitary sewer and watermain stubs). Flow Control and Water Quality associated with future site improvements will be provided through the adjacent Regional Stormwater Facility.

6 Aesthetic Considerations for Facilities

All required stormwater management facilities for the current and future have already been constructed.

7 Conveyance System Analysis and Design

The existing piped conveyance systems are sized to convey the developed conditions 25-year return period peak runoff. New conveyance systems are not proposed at this time.

8 Covenants, Dedications, Easements

It is the City of Lacey's policy that the property owner(s) shall maintain their stormwater drainage facilities. Thus, Gateway Christian Church will continue to be responsible for maintaining and ensuring that all existing drainage facilities are functioning in accordance with their design purposes. Gateway Christian Center prepared a Maintenance and Source Control Manual at the time of their project permitting and executed a Maintenance Covenant prior to final occupancy in 2014 in accordance with applicable stormwater regulations.

9 Agreements and Guarantees

Maintenance and/or operational bonding or other appropriate financial guarantees are required for all projects to ensure construction and functionality of drainage facilities in compliance with applicable standards. These guarantees are to be consistent with the most recent edition of the City of Lacey Development Guidelines and Public Works Standards.

10 Other Permits or Conditions Placed on the Project

A right-of-way access permit will be needed prior to construction.

End of Drainage Report

APPENDIX 1

Gateway Christian Center As-Built Drainage Plans

D-14-05/1

NW 1/4, NW 1/4, SE 1/4, NW 1/4 & SW 1/4, NW 1/4, OF SEC. 2, TWP. 18 N., RGE. 1 W., W.M.

GATEWAY CHRISTIAN CENTER

3300 MARVIN ROAD NE, LACEY, WA

GENERAL ENGINEERING NOTES

1. EXISTING UTILITIES AND UNDERGROUND STRUCTURES SHOWN ON THE PLAN ARE BASED UPON THE BEST AVAILABLE PUBLIC RECORDS AND\OR PRIVATE RECORDS AS SUPPLIED BY THE PROJECT OWNER AND\OR DATA OBTAINED VERBALLY FROM OWNERS OR OFFICIALS ASSOCIATED WITH THE PARTICULAR UTILITY. NEITHER THE OWNER NOR THE ENGINEER GUARANTEE THE ACCURACY OR COMPLETENESS OF THIS INFORMATION AND ASSUME NO RESPONSIBILITY FOR IMPROPER LOCATIONS OR FAILURE TO SHOW UTILITY LOCATIONS ON THE CONSTRUCTION PLANS. OTHER UNDERGROUND FACILITIES NOT SHOWN ON THE DRAWINGS MAY BE ENCOUNTERED DURING THE COURSE OF THE WORK. ALL INVERT ELEVATIONS SHOWN ON THE DRAWINGS SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO CONSTRUCTION.
2. IF CHANGED CONDITIONS ARE ENCOUNTERED, THE CONTRACTOR SHALL NOTIFY THE ENGINEER PROMPTLY OF (1) PREEXISTING SUBSURFACE CONDITIONS DIFFERING FROM THOSE INDICATED IN THE PLANS, OR (2) PREEXISTING UNKNOWN SUBSURFACE CONDITIONS, OF AN UNUSUAL NATURE, DIFFERING MATERIALLY FROM THOSE ORDINARILY ENCOUNTERED AND GENERALLY RECOGNIZED AS INHERENT IN WORK OF THE CHARACTER PROVIDED FOR IN THE CONTRACT. THE CONTRACTOR AND/OR THE OWNER SHALL MAKE NO CLAIMS TO THE ENGINEER FOR RECOMPENSATION FOR EXTRA WORK RESULTING FROM CHANGED CONDITIONS UNLESS THE ENGINEER HAS APPROVED THE WORK IN WRITING. (WSDOT SEC 1-04.7)
3. THE CONTRACTOR SHALL CALL THE UTILITIES UNDERGROUND LOCATION CENTER FOR FIELD LOCATION OF ALL UTILITIES AND SHALL NOT BEGIN EXCAVATION UNTIL ALL KNOWN UNDERGROUND FACILITIES IN THE VICINITY OF THE PROPOSED WORK HAVE BEEN LOCATED AND MARKED. IF THE UTILITY IS NOT A SUBSCRIBER OF THE UNDERGROUND LOCATION CENTER THEN THE CONTRACTOR SHALL GIVE INDIVIDUAL NOTICE TO THAT UTILITY.
4. THE CONTRACTOR SHALL TAKE REASONABLE PRECAUTIONS AND EXERCISE SOUND ENGINEERING AND CONSTRUCTION PRACTICES IN CONDUCTING THE WORK. THE CONTRACTOR SHALL PROTECT EXISTING PUBLIC AND PRIVATE UTILITIES FROM DAMAGE DURING CONSTRUCTION. IF EXISTING UTILITIES ARE DAMAGED, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE OWNER AND THE ENGINEER. THE CONTRACTOR SHALL CONTACT UTILITY COMPANY TO HAVE REPAIR COMPLETED. (WSDOT SECTION 1-07.17 APWA SUPPLEMENT). THE CONTRACTOR IS RESPONSIBLE FOR THE MEANS AND METHODS OF CONSTRUCTION FOR DESIGNS SHOWN ON THESE PLANS.
5. WHERE THE PLANS CALL FOR UTILITIES TO BE RELOCATED BY OTHERS, THE CONTRACTOR SHALL NOTIFY THE UTILITY COMPANY AND COORDINATE HIS WORK SO AS TO AVOID CONFLICTS.
6. ALL EXCAVATION, TRENCHING, SUBGRADE PREPARATION, FILL PLACEMENT AND COMPACTION AND ALL SOIL WORK IN GENERAL SHALL BE CONDUCTED IN COMPLIANCE WITH THE RECOMMENDATIONS OF THE PROJECT SOIL ENGINEER AND THE CURRENT GEOTECHNICAL ENGINEERING REPORT.
7. ENGINEERING DESIGN AND APPROVAL FOR STRUCTURES SUCH AS WALLS AND VAULTS MUST BE PREPARED BY THE APPROPRIATE PROFESSIONAL ENGINEER AND IS NOT A PART OF THESE PLANS.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR HIRING PROFESSIONAL LAND SURVEYOR TO REFERENCE EXISTING MONUMENTS ON OR ADJOINING SITE PREVIOUS TO DEMOLITION OR CONSTRUCTION AND TO RE-ESTABLISH SAID POINTS AT PROJECT COMPLETION. THIS RE-ESTABLISHMENT SHALL BE DOCUMENTED BY RECORD OF SURVEY OR CORNER RECORD AS DESCRIBED IN W.A.C. 332-120.
9. CONTRACTOR SHALL RESTORE CONCRETE WALKS, CURBS AND LANDSCAPE AREAS TO ORIGINAL, OR BETTER, CONDITIONS.

GENERAL NOTES FOR GRADING

1. PUBLIC STREETS ARE TO BE KEPT CLEAR OF DIRT AND DEBRIS DURING EXCAVATION AND FILL OPERATIONS.
2. THE SITE SOILS ARE GENERALLY CONSIDERED MOISTURE SENSITIVE AND AS SUCH ARE SUSCEPTIBLE TO DISTURBANCE BY CONSTRUCTION EQUIPMENT, PARTICULARLY DURING PERIODS OF WET WEATHER. THE GRADING CONTRACTOR SHALL TAKE ALL PRECAUTIONS TO LIMIT SURFACE DISTURBANCE AND PROTECT THE SITE GRADING AREA FROM EXCESSIVE RUNOFF EROSION.
3. PRIOR TO ANY SITE CONSTRUCTION TO INCLUDE CLEARING/LOGGING OR GRADING THE SITE/LOT CLEARING LIMITS SHALL BE LOCATED AND FIELD IDENTIFIED BY THE PROJECT SURVEYOR/ENGINEER AS REQUIRED BY THESE PLANS.
4. AREAS TO RECEIVE FILL SHALL BE CLEARED OF ALL VEGETATION AND DELETERIOUS MATTER.
5. AREAS TO RECEIVE FILL SHALL BE PROOF ROLLED. ALL LOOSE AND SOFT AREAS SHALL BE REMOVED AND REPLACED WITH STRUCTURAL FILL.
6. ALL FILL MATERIALS USED SHALL BE FREE OF VEGETATION AND DELETERIOUS MATTER AND SHALL NOT CONTAIN ROCKS GREATER THAN SIX INCHES IN DIAMETER.
7. STRUCTURAL FILLS SHALL BE PLACED IN 8" TO 10" THICK LOOSE HORIZONTAL LIFTS AND SPREAD UNIFORMLY, OR AS OTHERWISE DIRECTED BY THE SOILS ENGINEER.
8. THE SURFACE OF ALL SLOPES SHALL BE COMPACTED. THIS MAY BE ACCOMPLISHED BY OVER-BUILDING THE SLOPES THEN CUTTING BACK TO FINAL GRADES, OR BY RUNNING THE COMPACTOR OVER THE SLOPE AS EACH FILL LIFT IS BEING PLACED. ALL SLOPES SHALL BE COMPACTED BY THE END OF EACH WORK DAY.
9. FIELD DENSITY TESTS WILL BE MADE BY A QUALIFIED SOILS ENGINEERING FIRM. DENSITY TESTS SHALL BE TAKEN AT OR JUST BELOW THE SURFACE AT THE FREQUENCY AND AT LOCATIONS DETERMINED BY THE SOILS ENGINEERING FIRM. WHEN THE TESTS INDICATE THAT THE DENSITY OF ANY LAYER OF FILL OR PORTION THEREOF IS BELOW THE SPECIFIED DENSITY, THE PARTICULAR SECTION SHALL BE REWORKED UNTIL THE REQUIRED DENSITY HAS BEEN OBTAINED.
10. STOCKPILES ARE TO BE LOCATED IN SAFE AREAS AND ADEQUATELY PROTECTED BY TEMPORARY SEEDING AND MULCHING. HYDROSEED PREFERRED.
11. THE TEMPORARY EROSION/SEDIMENTATION CONTROL FACILITY SHALL BE CONSTRUCTED PRIOR TO ANY GRADING OR EXTENSIVE LAND CLEARING IN ACCORDANCE WITH THE APPROVED TEMPORARY EROSION/SEDIMENTATION CONTROL PLAN. THESE FACILITIES MUST BE SATISFACTORILY MAINTAINED UNTIL THE CONSTRUCTION AND LANDSCAPING IS COMPLETED AND THE POTENTIAL FOR ON-SITE EROSION HAS PASSED.
12. NON-COMPLIANCE WITH THE EROSION CONTROL REQUIREMENTS, WATER QUALITY REQUIREMENTS AND CLEARING LIMITS VIOLATIONS MAY RESULT IN REVOCATION OF PROJECT PERMITS, PLAN APPROVAL AND BOND FORECLOSURES.

HYDROSEEDING GENERAL NOTES

1. PREPARATION OF SURFACE: ALL AREAS TO BE SEEDED SHALL BE CULTIVATED TO THE SATISFACTION OF THE CITY/COUNTY INSPECTOR. THIS MAY BE ACCOMPLISHED BY DISCING, RAKING, HARROWING OR OTHER ACCEPTABLE MEANS.
2. WITHIN 3 WORKING DAYS IMMEDIATELY FOLLOWING FINISH GRADING, PERMANENT VEGETATION (CONSISTING OF RAPID, PERSISTENT AND LEGUME) WILL BE APPLIED. (MINIMUM 80# PER ACRE). THIS IS TO INCLUDE THE FOLLOWING: 20% ANNUAL, PERENNIAL OR HYBRID RYE GRASS, 40% CREEPING RED FESCUE, 40% WHITE CLOVER. HYDROSEED REQUIRED.

HYDROSEEDING GENERAL NOTES (CONT'D)

3. FERTILIZER: SHALL BE APPLIED AT 400# PER ACRE OF 10-20-20 (10 POUNDS PER 1100 SQUARE FEET) OR EQUIVALENT.

DUTIES AND RESPONSIBILITIES

SPECIAL INSPECTION FIRM AND SPECIAL INSPECTORS:

THE SPECIAL INSPECTION FIRM OF ________________(TO BE DETERMINED)__________________ WILL PERFORM SPECIAL INSPECTION FOR THE FOLLOWING TYPES OF WORK (SEPARATE FORMS MUST BE SUBMITTED IF MORE THAN ONE FIRM IS TO BE EMPLOYED):

REINFORCED CONCRETE ( )
BOLTING IN CONCRETE ( )
PRE-STRESSED CONCRETE ( )
SHOTCRETE ( )
STRUCTURAL MASONRY ( )
STRUCTURAL STEEL & WELDING ( )
HIGH-STRENGTH BOLTING ( )
SPRAY-APPLIED FIREPROOFING ( )
SMOKE-CONTROL SYSTEMS ( )
GRADING* ( )
OTHER ( )
SPECIFY: ________________________________
*GRADING DOES NOT REQUIRE WABO CERTIFICATION

ALL INDIVIDUAL INSPECTORS TO BE EMPLOYED ON THIS PROJECT WILL BE WABO CERTIFIED FOR THE TYPE OF INSPECTION THEY ARE TO PERFORM. IF INSPECTION IS FOR WORK THAT IS NOT COVERED BY THE WABO CATEGORIES, A DETAILED RESUME OF THE INSPECTOR AND FIRM MUST BE SUBMITTED. THE RESUME MUST SHOW THE INSPECTOR AND FIRM ARE QUALIFIED TO PERFORM THE WORK AND TESTING REQUIRED BY THE PROJECT DESIGN AND SPECIFICATIONS.

THE WORK SHALL BE INSPECTED FOR CONFORMANCE WITH THE PLANS AND SPECIFICATIONS APPROVED BY THE CITY. REVISIONS AND ADDENDA SHEETS WILL NOT BE USED FOR INSPECTION UNLESS THEY HAVE BEEN APPROVED BY THE CITY. THE CONTRACTOR SHALL COORDINATE WITH PROJECT INSPECTOR PRIOR TO PLAN REVISIONS.

A DAILY RECORD WILL BE MAINTAINED ON SITE ITEMIZING THE INSPECTIONS PERFORMED, FOR THE REVIEW OF ALL PARTIES. ANY NONCONFORMING ITEMS SHALL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE CONTRACTOR FOR RESOLUTION. A WEEKLY REPORT SHALL BE SUBMITTED TO THE CITY; DETAILING THE INSPECTIONS AND TESTING PERFORMED, LISTING ANY NONCONFORMING ITEMS AND RESOLUTION OF NONCONFORMING ITEMS. UNRESOLVED NONCONFORMING ITEMS WILL BE DETAILED ON A DISCREPANCY REPORT AND PRESENTED TO THE BUILDING DEPARTMENT.

A FINAL REPORT SHALL BE SUBMITTED TO THE BUILDING DEPARTMENT PRIOR TO THE CERTIFICATE OF OCCUPANCY BEING ISSUED. THIS REPORT WILL INDICATE THAT INSPECTION AND TESTING WAS COMPLETED IN CONFORMANCE WITH THE APPROVED PLANS, SPECIFICATIONS AND APPROVED REVISIONS OR ADDENDA. ANY UNRESOLVED DISCREPANCIES MUST BE DETAILED IN A FINAL REPORT.

THE SPECIAL INSPECTOR AND SPECIAL INSPECTION FIRM SERVE IN THE ROLE AS "DEPUTY" CITY OF LACEY INSPECTORS AND AS SUCH ARE RESPONSIBLE TO THE CITY OF LACEY BUILDING DEPARTMENT IN THE PERFORMANCE OF THE REQUIRED WORK.

CONTRACTOR:
THE CONTRACTOR SHALL PROVIDE THE SPECIAL INSPECTOR OR AGENCY ADEQUATE NOTIFICATION OF WORK REQUIRING INSPECTION.

THE CITY APPROVED PLANS AND SPECIFICATIONS MUST BE MADE AVAILABLE, AT THE JOB SITE FOR THE USE OF THE SPECIAL INSPECTOR AND THE CITY INSPECTOR. THE CONTRACTOR SHALL MAINTAIN ALL DAILY INSPECTION REPORTS, ON SITE, FOR REVIEW.

THE SPECIAL INSPECTION FUNCTIONS ARE CONSIDERED TO BE IN ADDITION TO THE NORMAL INSPECTIONS PERFORMED BY THE CITY AND THE CONTRACTOR IS RESPONSIBLE FOR CONTRACTING THE CITY TO SCHEDULE REGULAR INSPECTIONS. NO CONCRETE SHALL BE POURED OR OTHER WORK COVERED UNTIL APPROVAL IS GIVEN BY THE CITY INSPECTOR.

BUILDING DEPARTMENT:
THE BUILDING DEPARTMENT SHALL REVIEW ANY REVISIONS AND ADDENDA. APPROVED COPIES WILL BE GIVEN TO THE CONTRACTOR TO MAINTAIN AS PART OF THE APPROVED PLAN SET.

THE CITY INSPECTOR WILL MONITOR THE SPECIAL INSPECTION FUNCTIONS FOR COMPLIANCE WITH THE AGREEMENT AND THE APPROVED PLANS.

THE CITY INSPECTOR SHALL BE RESPONSIBLE FOR APPROVING VARIOUS STAGES OF CONSTRUCTION TO BE COVERED AND WORK TO PROCEED.

DESIGN PROFESSIONALS:
THE ARCHITECT AND ENGINEER WILL CLEARLY INDICATE ON THE PLANS AND SPECIFICATIONS FOR THE SPECIFIC TYPES OF SPECIAL INSPECTION REQUIRED, AND SHALL INCLUDE A SCHEDULE FOR INSPECTION AND TESTING. THE ARCHITECT AND ENGINEER WILL COORDINATE THEIR REVISION AND ADDENDA PROCESS IN SUCH A WAY AS TO INSURE ALL REQUIRED CITY APPROVALS ARE OBTAINED, PRIOR TO WORK SHOWN ON THE REVISIONS BEING PERFORMED.

OWNER:
THE PROJECT OWNER, OR THE ARCHITECT OR ENGINEERING ACTING AS THE OWNERS AGENT, SHALL EMPLOY THE SPECIAL INSPECTOR OR AGENCY.

ENFORCEMENT

A FAILURE OF THE SPECIAL INSPECTOR FIRM TO PERFORM IN KEEPING THE REQUIREMENTS OF THE IBC, THE APPROVED PLANS AND THIS DOCUMENTARY MAY VOID THIS AGREEMENT AND THE BUILDING OFFICIALS APPROVAL OF THE SPECIAL INSPECTOR. IN SUCH A CASE A NEW SPECIAL INSPECTOR AND/OR FIRM WOULD NEED TO BE PROPOSED FOR APPROVAL. A FAILURE OF THE DESIGN AND/OR CONSTRUCTION PARTIES TO PERFORM IN ACCORDANCE WITH THIS AGREEMENT MAY RESULT IN A STOP WORK NOTICE BEING POSTED ON THE PROJECT, UNTIL NONCONFORMING ITEMS HAVE BEEN RESOLVED.

DATUM

CONTROL POINTS FOR TOPOGRAPHY ARE BASED ON CITY OF LACEY COORDINATE SYSTEM, CITY OF LACEY VERTICAL DATUM (NGVD29).

"LACEY CONTROL MARV-30"
Y=645575.9578, X=72401.9681, ELEV=237.9880
PK NAIL IN FLASHER IN SIDEWALK

GEOTECHNICAL REQUREMENTS

1. THE CONTRACTOR SHALL COORDINATE ALL REQUIRED OBSERVATIONS/ INSPECTIONS WITH THE GEOTECHNICAL ENGINEER.
2. SOIL STRIPPING/OVEREXCAVATION PREPARATION MAY BE NECCESSARY. REFER TO THE GEOTECHNICAL REPORT.

INSPECTIONS AND NOTIFICATIONS

Grading Inspection

Grading operations for which a permit is required shall be subject to inspection by the City.

Professional inspection of grading operations shall be provided by the civil engineer, soils engineer and the engineering geologist retained to provide such services in accordance with this chapter for engineered grading and as required by the City for regular grading.

The civil engineer shall provide professional inspection within such engineer's area of technical specialty, which shall consist of observation and review as to the establishment of line, grade and surface drainage of the development area. If revised plans are required during the course of the work they shall be prepared by the civil engineer.

The soils engineer shall provide professional inspection within such engineer's area of technical specialty, which shall include observation during grading and testing for required compaction. The soils engineer shall provide sufficient observation during the preparation of the natural ground and placement and compaction of the fill to verify that such work is being performed in accordance with the conditions of the approved plan and the appropriate requirements of this chapter. Revised recommendations relating to conditions differing from the approved soils engineering and engineering geology reports shall be submitted to the permittee, the City and the civil engineer.

The engineering geologist shall provide professional inspection within such engineer's area of technical specialty, which shall include professional inspection of the bedrock excavation to determine if conditions encountered are in conformance with the approved report. Revised recommendations relating to conditions differing from the approved engineering geology report shall be submitted to the soils engineer.

The permittee shall be responsible for the work to be performed in accordance with the approved plans and specifications and in conformance with the provisions of this code, and the permittee shall engage consultants, if required, to provide professional inspections on a timely basis. The permittee shall act as a coordinator between the consultants, the contractor and the City. In the event of changed conditions, the permittee shall be responsible for informing the City of such change and shall provide revised plans for approval.

The City shall inspect the project at the various stages of work requiring approval to determine that adequate control is being exercised by the professional consultants.

If, in the course of fulfilling their respective duties under this chapter, the civil engineer, the soils engineer or the engineering geologist finds that the work is not being done in conformance with this chapter or the approved grading plans, the discrepancies shall be reported immediately in writing to the permittee and to the City.

If the civil engineer, the soils engineer, or the engineering geologist of record is changed during grading, the work shall be stopped until the replacement has agreed in writing to accept their responsibility within the area of technical competence for approval upon completion of the work. It shall be the duty of the permittee to notify the City in writing of such change prior to the recommencement of such grading.

INSPECTIONS AND NOTIFICATIONS (CONT'D)

Completion of Work

Upon completion of the rough grading work and at the final completion of the work, the following reports and drawings and supplements thereto are required for engineered grading or when professional inspection is performed for regular grading, as applicable.

An as-built grading plan prepared by the civil engineer retained to provide such services showing original ground surface elevations, as-graded ground surface elevations, lot drainage patterns, and the locations and elevations of surface drainage facilities and of the outlets of subsurface drains. As-constructed locations, elevations and details of subsurface drains shall be shown as reported by the soils engineer.

Civil engineers shall state that to the best of their knowledge the work within their area of responsibility was done in accordance with the final approved grading plan.

A report prepared by the soils engineer retained to provide such services in accordance with this chapter, including locations and elevations of field density tests, summaries of field and laboratory tests, other substantiating data, and comments on any changes made during grading and their effect on the recommendations made in the approved soils engineering investigation report.

Soil engineers shall submit a statement that, to the best of their knowledge, the work within their area of responsibilities is in accordance with the approved soils engineering report and applicable provisions of this chapter.

A report prepared by the engineering geologist retained to provide such services in accordance with this chapter, including a final description of the geology of the site and any new information disclosed during the grading and the effect of same on recommendations incorporated in the approved grading plan.

Engineering geologists shall submit a statement that, to the best of their knowledge, the work within their area of responsibility is in accordance with the approved engineering geologist report and applicable provisions of this chapter.

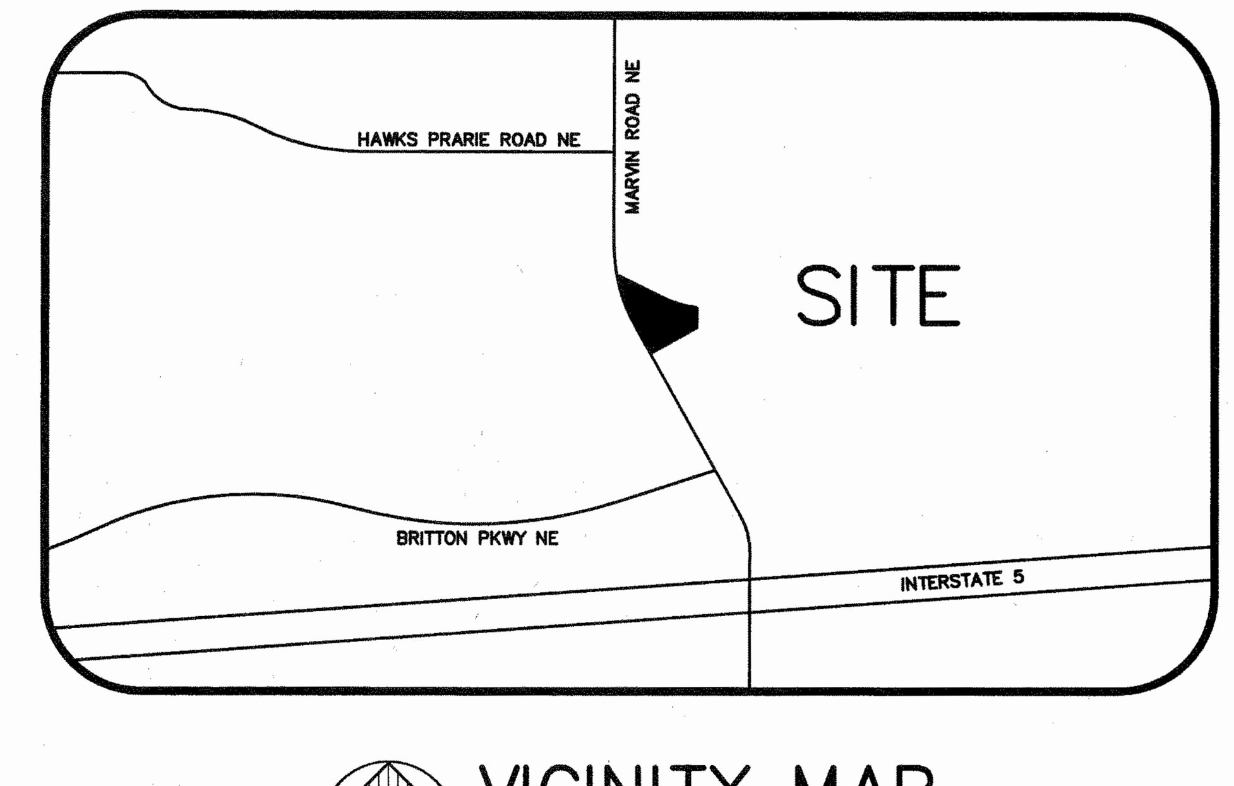
The grading contractor shall submit in a form prescribed by the City a statement of conformance to said as-built plan and the specifications.

The permittee shall notify the City when the grading operation is ready for final inspection. Final approval shall not be given until all work, including installation of all drainage facilities and their protective devices, and all erosion-control measures have been completed in accordance with the final approved grading plan, and the required reports have been submitted.

PROPOSED CUT/FILL QUANTITIES:

CUT = 2891 CU FT

FILL = 470 CU FT



N

VICINITY MAP

SCALE: 1"=2560'

OWNER/DEVELOPER

NORTH THURSTON LIFE CENTER
PASTOR MIKE FOGARAS
2425 MARVIN ROAD NE
LACEY, WA 98516

PROJECT ARCHITECT

GLENN C. WELLS, ARCHITECT
324 WEST BAY DRIVE, SUITE 102
OLYMPIA, WA 98502
(360) 352-4553

CIVIL ENGINEER

SOUND CONSULTANTS, LLC
MR. JIM HARRISON
10509 NE 120th PLACE
KIRKLAND, WA 98034
(425) 765-5053

SITE ADDRESS

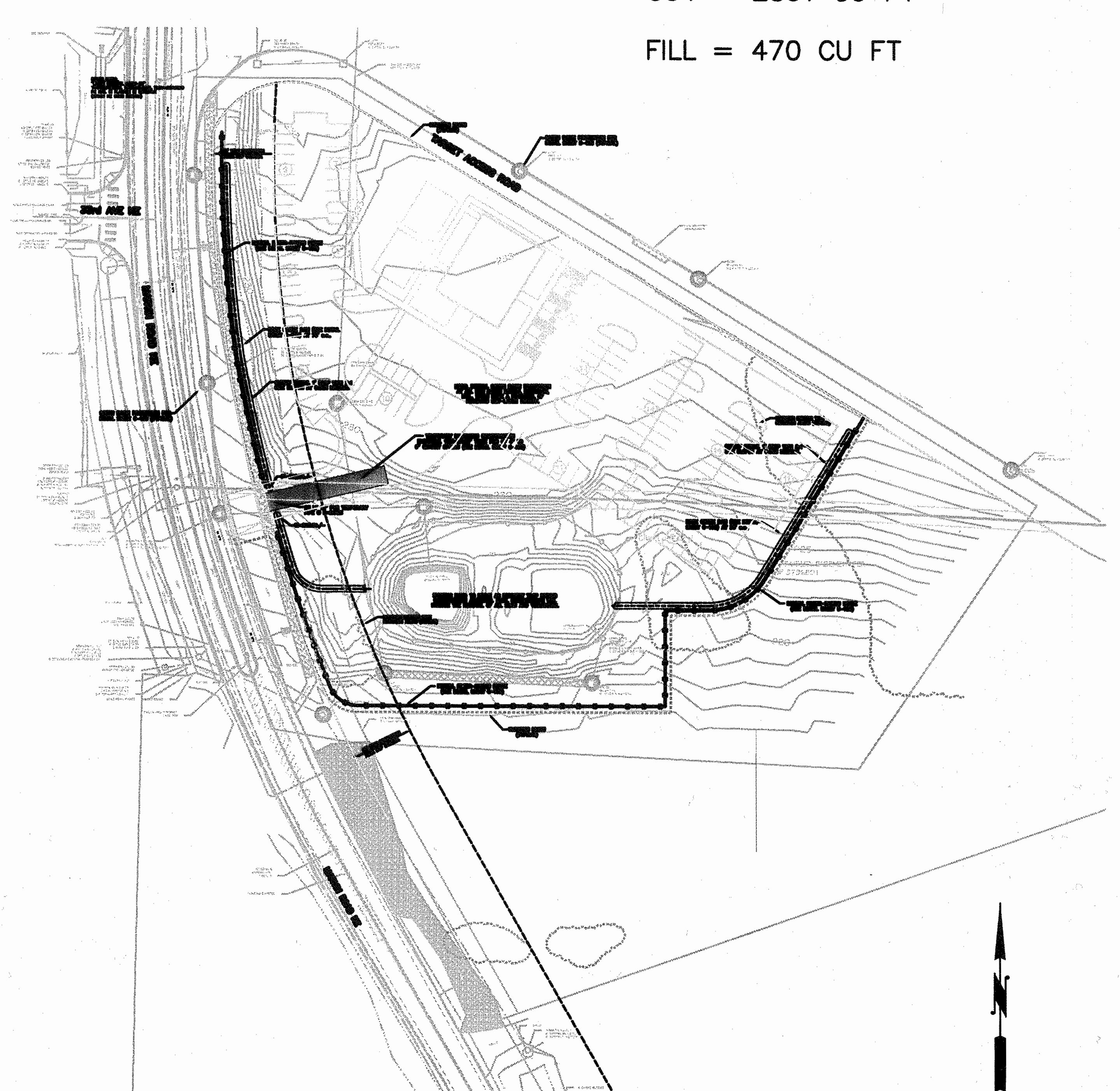
3300 MARVIN ROAD NE
LACEY, WA 98516
PARCEL No. 37590000100

SHEET INDEX

LEGEND

— 100 — (dashed)	EXISTING CONTOUR
— 100 — (solid)	PROPOSED CONTOUR
CF	CURB FACE
TC	TOP OF CURB
FL	FLOWLINE
BW	BACK OF WALK
CB	CATCH BASIN
GR	GRATE ELEVATION
IE	INVERT ELEVATION
CO	CLEANOUT
RD	ROOF DRAIN
T.I.	TOP OF ISLAND
---R---	RIDGE
—·—·—	SWALE
(shading)	ASPHALT SURFACING
(shading)	CONCRETE SURFACING

"AS-BUILT"



KEY MAP

SCALE: 1"=100'

Call 2 Working Days Before You Dig
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Utilities Underground Location Center
(ID,MT,ND,OR,WA)

THE FOLLOWING PLANS SUBMITTED TO THE CITY OF LACEY FOR REVIEW HAVE BEEN REVIEWED UNDER MY SUPERVISION.

BY:_______________________DATE:________
PUBLIC WORKS DIRECTOR

FOR THE CITY OF LACEY

BY:_______________________DATE:________
PUBLIC WORKS REVIEWER

PLANS EXPIRE TWO YEARS FROM ABOVE DATE

HAROLD E. HAGENS — STATE OF WASHINGTON — 21823 REGISTERED PROFESSIONAL ENGINEER
05-19-14
PROFESSIONAL ENGINEER

NO	REVISION	DATE
4	AS-BUILTS	05-19-14
3	REVISED PER CITY COMMENTS	02-10-14
2	REVISIONS PERMIT PER CITY COMMENTS	01-17-14
1	REVISIONS FOR GRADING PERMIT PER CITY COMMENTS	12-10-13
-	PERMIT SUBMITTAL	08-22-13

SOUND CONSULTANTS, LLC
LAND DEVELOPMENT CONSULTANTS
10509 NE 120th PLACE, KIRKLAND, WA 98034
phone 425-765-5053 fax 425-242-0894
email j.jvh@comcast.net

PROJECT NO.: 2006022.00
DRAWN BY: JVH
CHECKED BY: HEH

COVER SHEET
GATEWAY CHRISTIAN CENTER
ENGINEERED GRADING
LACEY WASHINGTON

SHEET TITLE: COVER SHEET

SHEET NO. 1 of 11

D-14-05/3

NW 1/4, NW 1/4, SE 1/4, NW 1/4 & SW 1/4, NW 1/4, OF SEC. 2, TWP. 18 N., RGE. 1 W., W.M.

FOR THE CITY OF LACEY

BY: ____________________ DATE: ________

PUBLIC WORKS REVIEWER

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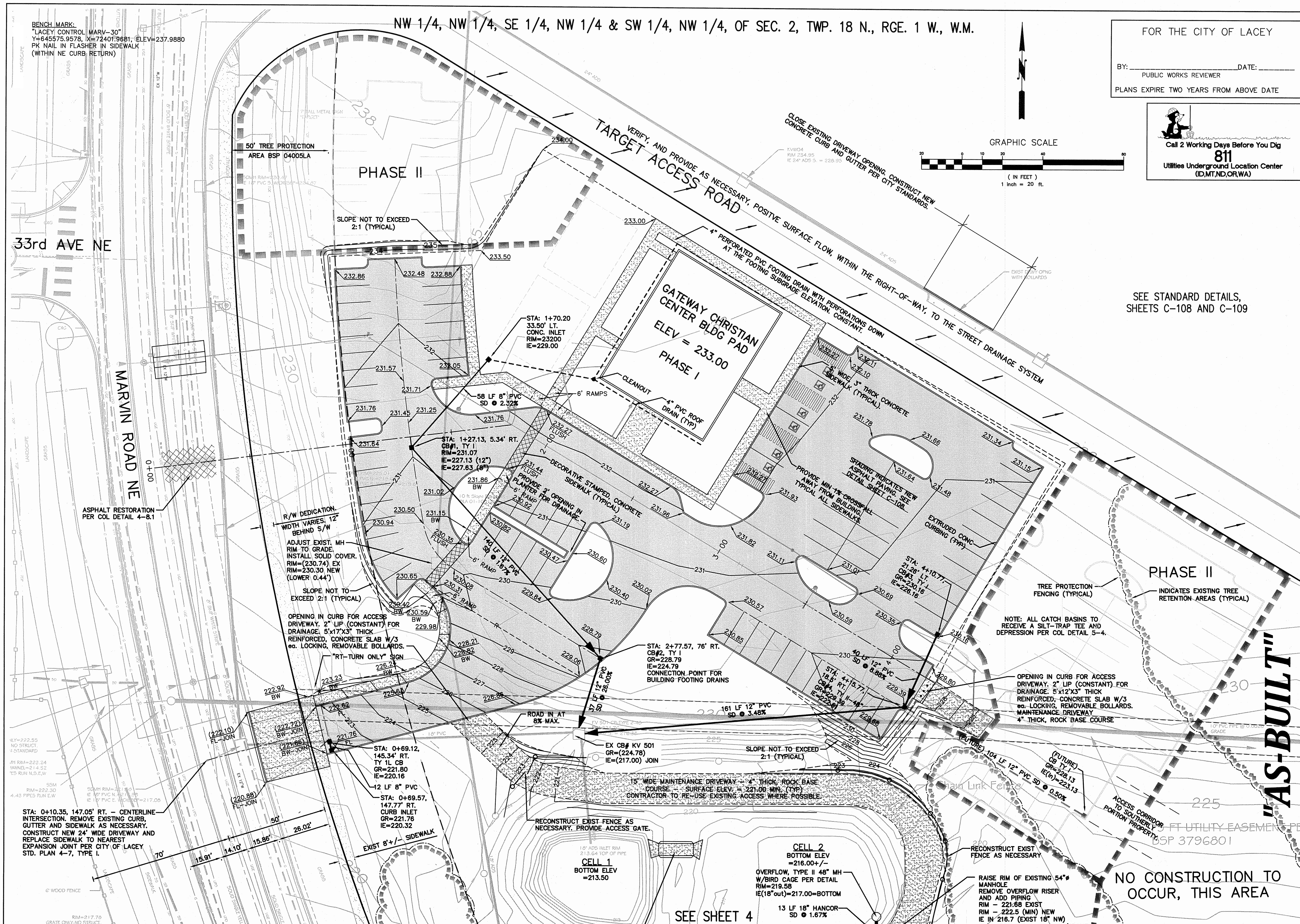

HAROLD E. HAGENS, STATE OF WASHINGTON, REGISTERED PROFESSIONAL ENGINEER

05-19-14

PROFESSIONAL ENGINEER

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PROJECT NO. 2006022.00

DRAWN BY: JVH

CHECKED BY: HEH

SITE GRADING AND DRAINAGE PLAN
GATEWAY CHRISTIAN CENTER
ENGINEERED GRADING

LACEY WASHINGTON

SHEET TITLE

ENGINEERED GRADING AND STORM DRAINAGE PLAN

SHEET NO.

D-14-05/4

NW 1/4, NW 1/4, SE 1/4, NW 1/4 & SW 1/4, NW 1/4, OF SEC. 2, TWP. 18 N., RGE. 1 W., W.M.

SEE SHEET 3

FOR THE CITY OF LACEY

BY: ______________________ DATE: ________
PUBLIC WORKS REVIEWER

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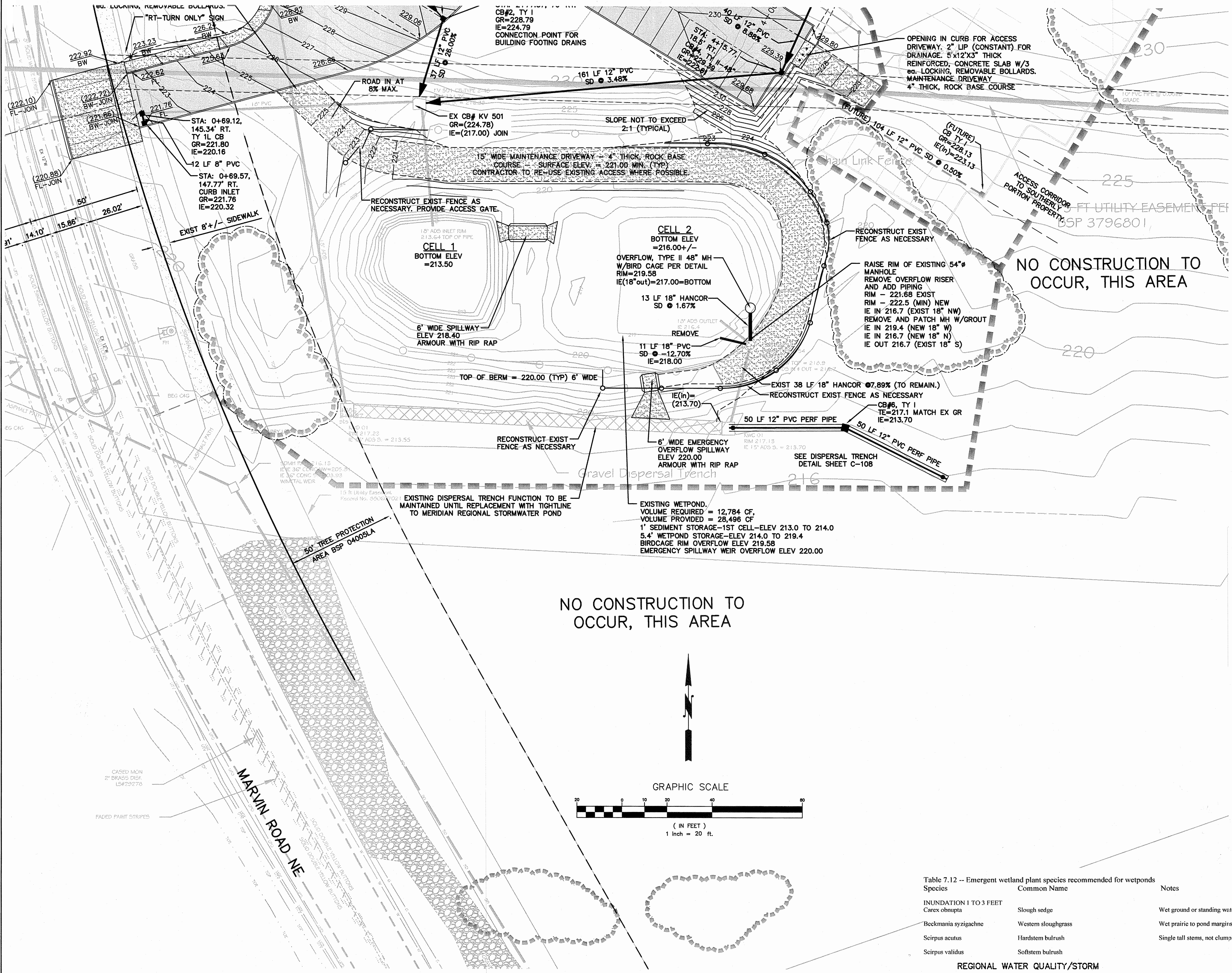
SEE STANDARD DETAILS, SHEETS C-108 AND C-109



"RT-TURN ONLY" SIGN
STA: 0+69.12, 145.34' RT. TY 1L CB GR=221.80 IE=220.16
12 LF 8" PVC
STA: 0+69.57, 147.77' RT. CURB INLET GR=221.76 IE=220.32
EXIST 8'+/- SIDEWALK
ROAD IN AT 8% MAX.
EX CB# KV 501 GR=(224.78) IE=(217.00) JOIN
CB#2, TY I GR=228.79 IE=224.79 CONNECTION POINT FOR BUILDING FOOTING DRAINS
37 LF 12" PVC SD @ 26.00%
161 LF 12" PVC SD @ 3.48%
SLOPE NOT TO EXCEED 2:1 (TYPICAL)
OPENING IN CURB FOR ACCESS DRIVEWAY. 2" LIP (CONSTANT) FOR DRAINAGE. 5'x12'X3" THICK REINFORCED, CONCRETE SLAB W/3 ea. LOCKING, REMOVABLE BOLLARDS. MAINTENANCE DRIVEWAY 4" THICK, ROCK BASE COURSE
(FUTURE) 104 LF 12" PVC SD @ 0.50%
(FUTURE) CB TY I GR=228.13 IE(in)=223.13
ACCESS CORRIDOR TO SOUTHERLY PORTION PROPERTY
15' WIDE MAINTENANCE DRIVEWAY – 4" THICK, ROCK BASE COURSE – SURFACE ELEV. = 221.00 MIN. (TYP) CONTRACTOR TO RE-USE EXISTING ACCESS WHERE POSSIBLE.
RECONSTRUCT EXIST FENCE AS NECESSARY. PROVIDE ACCESS GATE.
CELL 1 BOTTOM ELEV =213.50
CELL 2 BOTTOM ELEV =216.00+/-
OVERFLOW, TYPE II 48" MH W/BIRD CAGE PER DETAIL RIM=219.58 IE(18"out)=217.00=BOTTOM
13 LF 18" HANCOR SD @ 1.67%
REMOVE
11 LF 18" PVC SD @ -12.70% IE=218.00
6' WIDE SPILLWAY ELEV 218.40 ARMOUR WITH RIP RAP
TOP OF BERM = 220.00 (TYP) 6' WIDE
IE(in)=(213.70)
RECONSTRUCT EXIST FENCE AS NECESSARY
RAISE RIM OF EXISTING 54"ø MANHOLE REMOVE OVERFLOW RISER AND ADD PIPING RIM – 221.68 EXIST RIM – 222.5 (MIN) NEW IE IN 216.7 (EXIST 18" NW) REMOVE AND PATCH MH W/GROUT IE IN 219.4 (NEW 18" W) IE IN 216.7 (NEW 18" N) IE OUT 216.7 (EXIST 18" S)
NO CONSTRUCTION TO OCCUR, THIS AREA
EXIST 38 LF 18" HANCOR @7.89% (TO REMAIN.)
RECONSTRUCT EXIST FENCE AS NECESSARY
CB#6, TY I TE=217.1 MATCH EX GR IE=213.70
50 LF 12" PVC PERF PIPE
50 LF 12" PVC PERF PIPE
SEE DISPERSAL TRENCH DETAIL SHEET C-108
6' WIDE EMERGENCY OVERFLOW SPILLWAY ELEV 220.00 ARMOUR WITH RIP RAP
Gravel Dispersal Trench
EXISTING DISPERSAL TRENCH FUNCTION TO BE MAINTAINED UNTIL REPLACEMENT WITH TIGHTLINE TO MERIDIAN REGIONAL STORMWATER POND
EXISTING WETPOND. VOLUME REQUIRED = 12,784 CF, VOLUME PROVIDED = 28,496 CF 1' SEDIMENT STORAGE-1ST CELL-ELEV 213.0 TO 214.0 5.4' WETPOND STORAGE-ELEV 214.0 TO 219.4 BIRDCAGE RIM OVERFLOW ELEV 219.58 EMERGENCY SPILLWAY WEIR OVERFLOW ELEV 220.00
50' TREE PROTECTION AREA BSP 04005LA
NO CONSTRUCTION TO OCCUR, THIS AREA
MARVIN ROAD NE
N
GRAPHIC SCALE
(IN FEET) 1 inch = 20 ft.

"AS-BUILT"

Table 7.12 -- Emergent wetland plant species recommended for wetponds

Species	Common Name	Notes	Maximum Depth
INUNDATION 1 TO 3 FEET			
Carex obnupta	Slough sedge	Wet ground or standing water	1.5 to 3 feet
Beckmania syzigachne	Western sloughgrass	Wet prairie to pond margins	
Scirpus acutus	Hardstem bulrush	Single tall stems, not clumping	to 3 feet
Scirpus validus	Softstem bulrush		

REGIONAL WATER QUALITY/STORM

NO	REVISION	DATE
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	PERMIT SUBMITTAL	08-22-13

HAROLD E. HAGENS, PROFESSIONAL ENGINEER, 05-19-14

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LAND DEVELOPMENT CONSULTANTS
10509 NE 120th PLACE, KIRKLAND, WA 98034
phone 425-765-5053 fax 425-242-0894
email j.jvh@comcast.net

PROJECT NO. 2006022.00
DRAWN BY: JVH
CHECKED BY: HEH

SITE GRADING AND DRAINAGE PLAN
GATEWAY CHRISTIAN CENTER
LACEY WASHINGTON

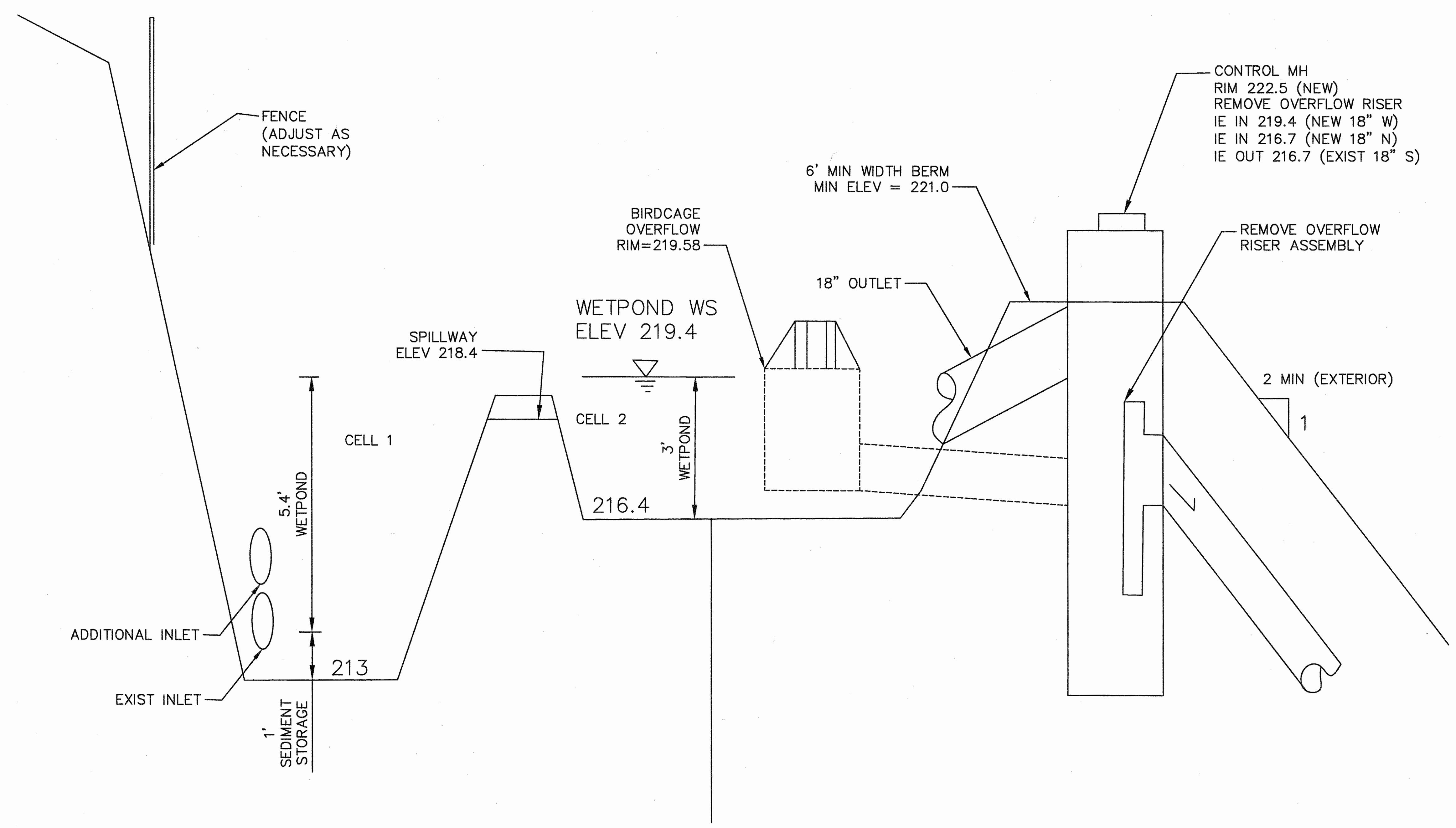
SHEET TITLE
ENGINEERED GRADING AND STORM DRAINAGE PLAN

SHEET NO.
4 of 11

D-14-05/5

NW 1/4, NW 1/4, SE 1/4, NW 1/4 & SW 1/4, NW 1/4, OF SEC. 2, TWP. 18 N., RGE. 1 W., W.M.

	REQUIRED	PROVIDED
WETPOND VOLUME	12,784 CF	28,496 CF



FOR THE CITY OF LACEY

BY:______________________DATE:________
PUBLIC WORKS REVIEWER

PLANS EXPIRE TWO YEARS FROM ABOVE DATE

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SEE STANDARD DETAILS, SHEETS C-108 AND C-109

"AS-BUILT"

PROFESSIONAL ENGINEER 05-19-14

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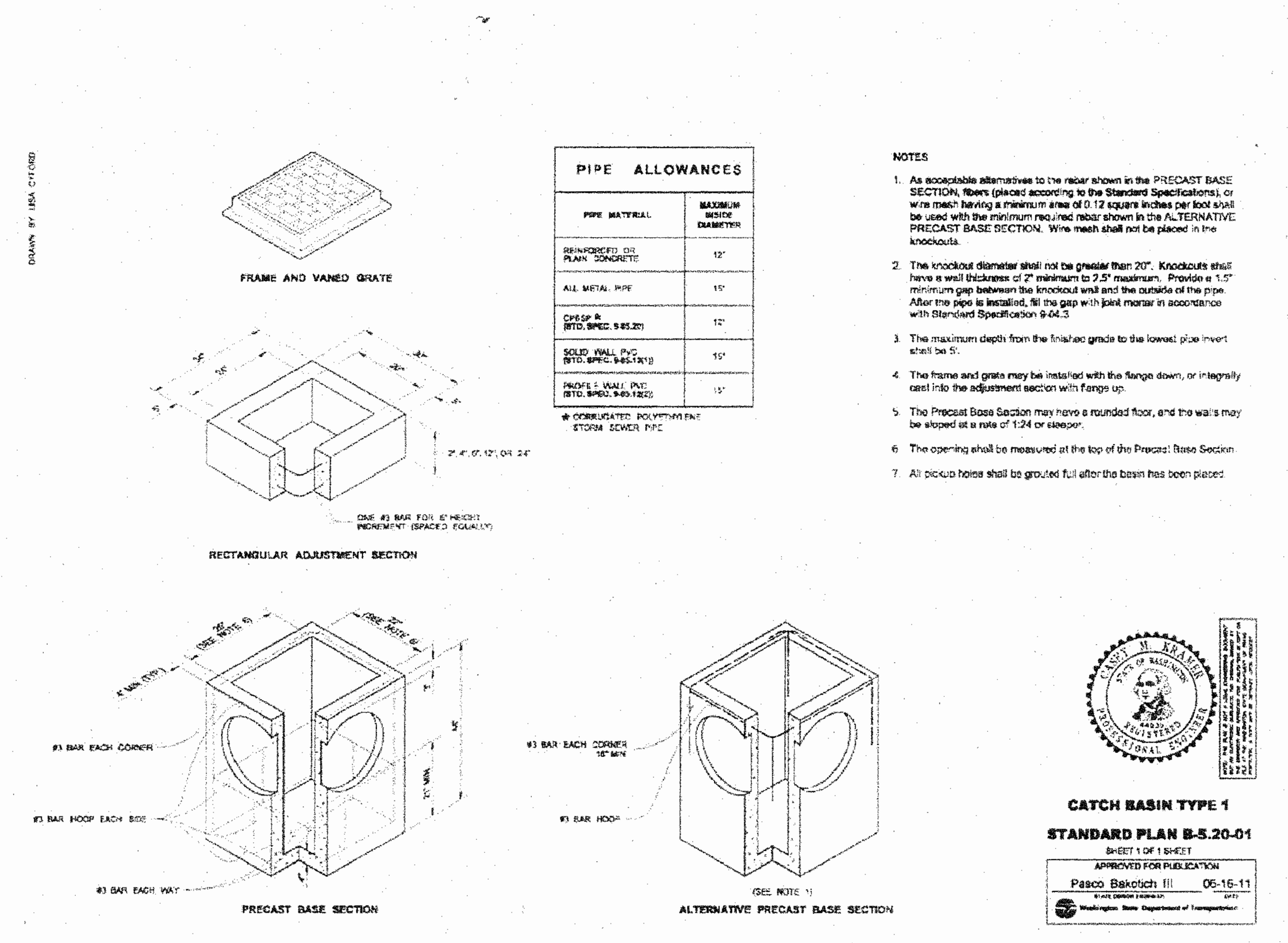
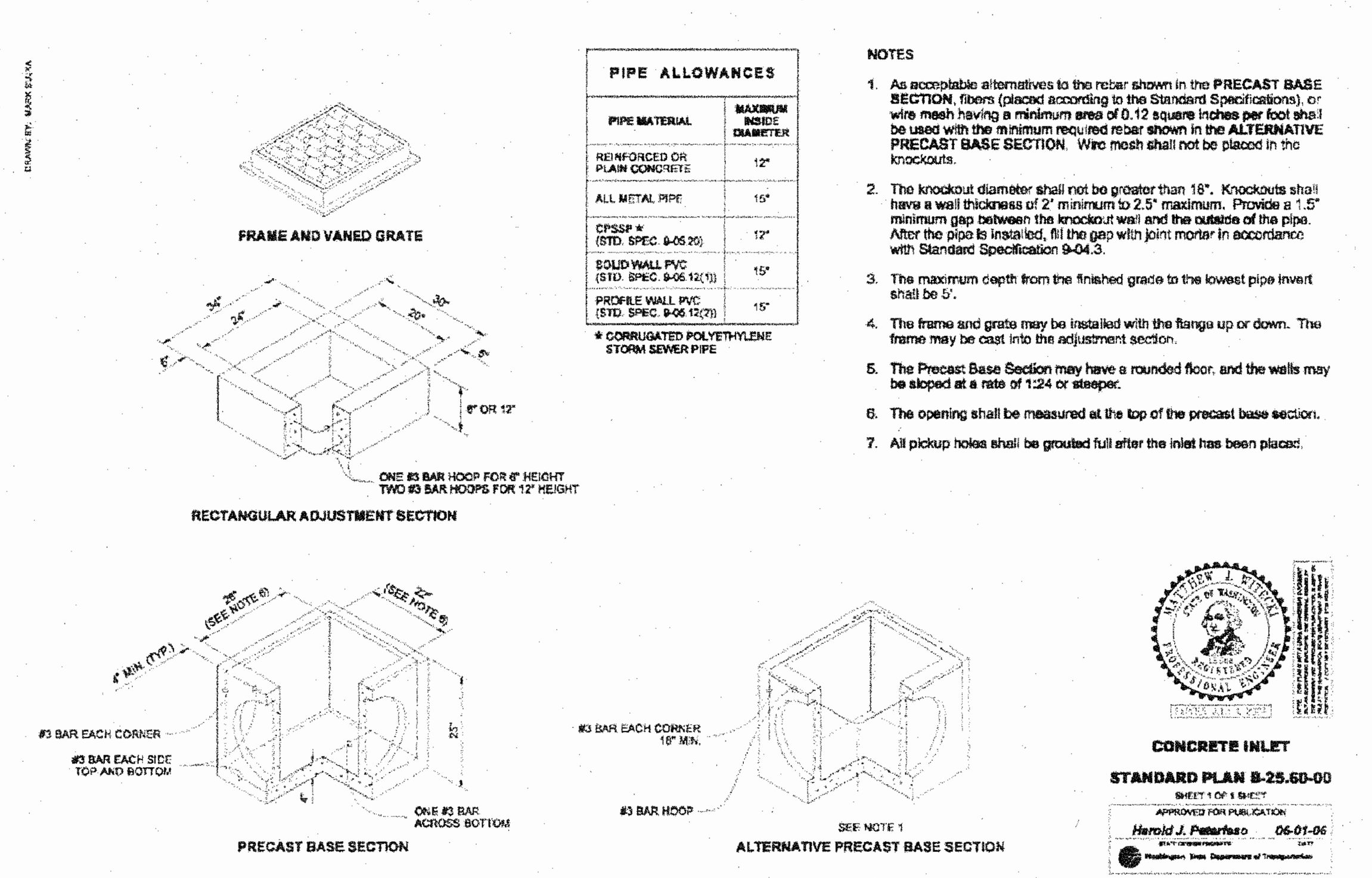
POND CROSS SECTION
GATEWAY CHRISTIAN CENTER
LACEY WASHINGTON

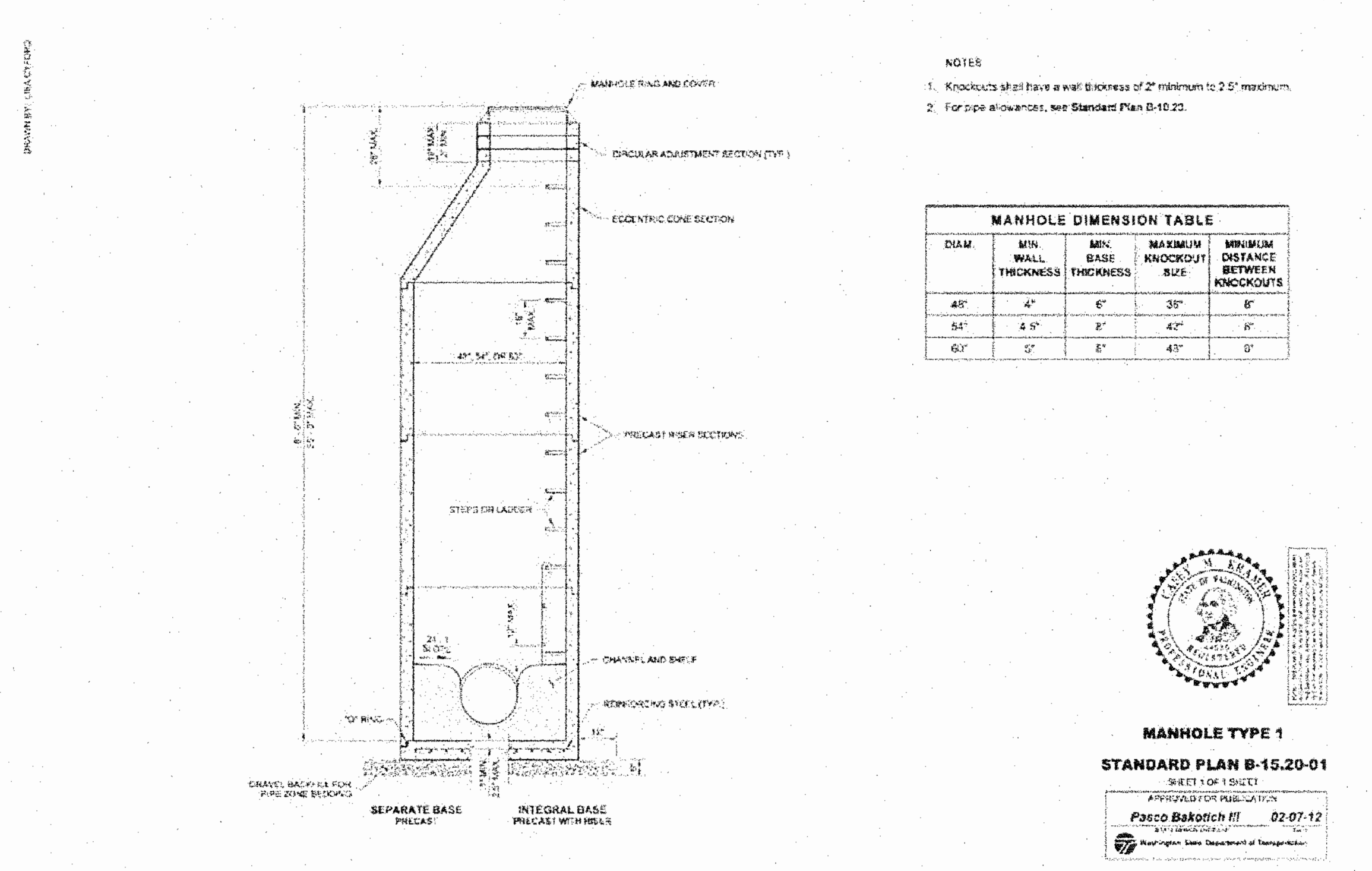
SHEET TITLE
POND CROSS SECTION

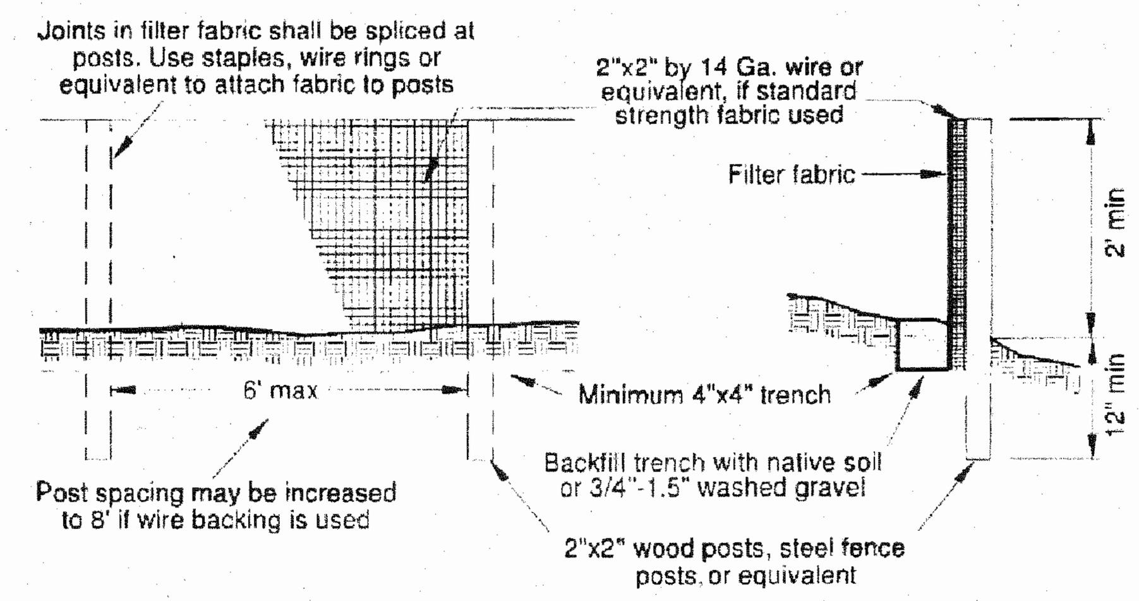
D-14-05/8

NW 1/4, NW 1/4, SE 1/4, NW 1/4 & SW 1/4, NW 1/4, OF SEC. 2, TWP. 18 N., RGE. 1 W., W.M.





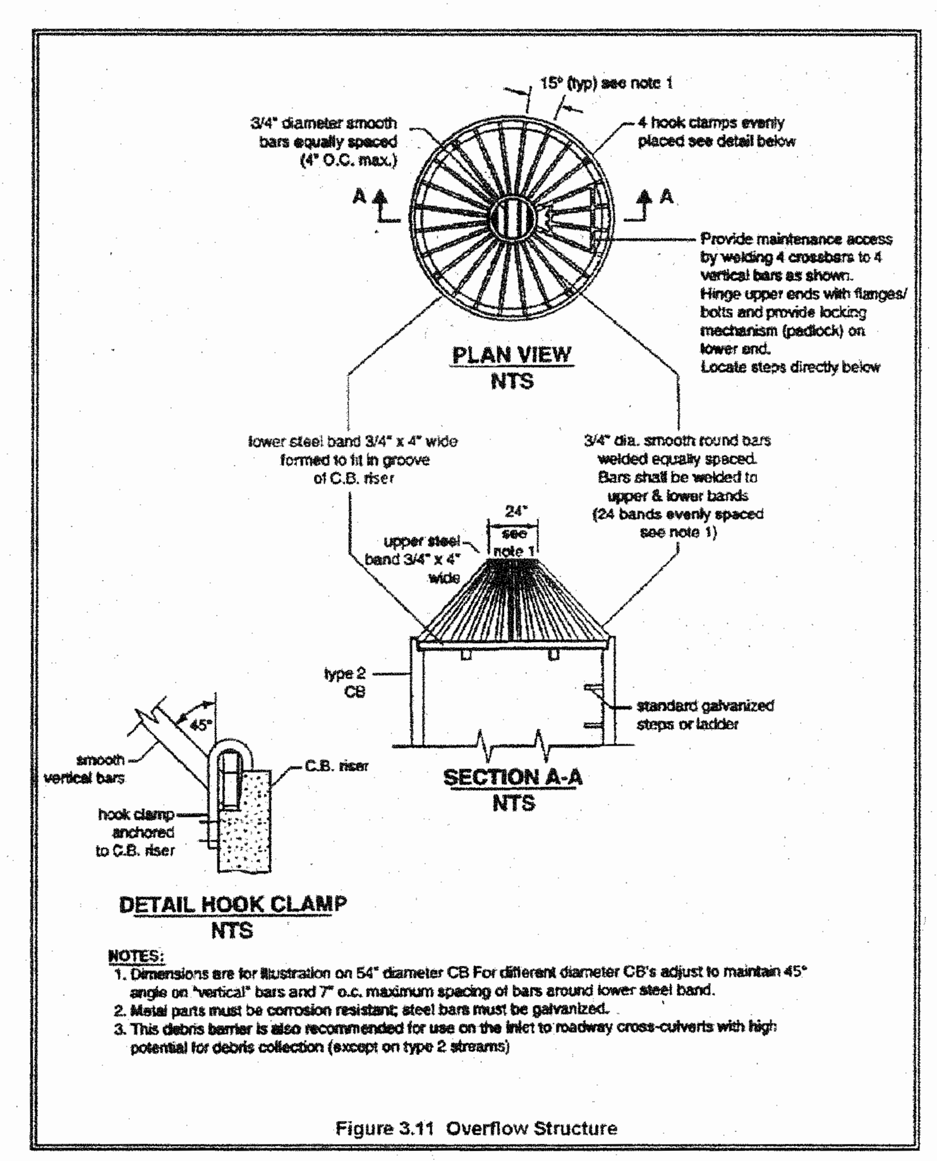




Joints in filter fabric shall be spliced at posts. Use staples, wire rings or equivalent to attach fabric to posts
2"x2" by 14 Ga. wire or equivalent, if standard strength fabric used
Filter fabric
6' max
Minimum 4"x4" trench
2' min
12" min
Post spacing may be increased to 8' if wire backing is used
Backfill trench with native soil or 3/4"-1.5" washed gravel
2"x2" wood posts, steel fence posts, or equivalent

Figure 4.15 – Silt Fence

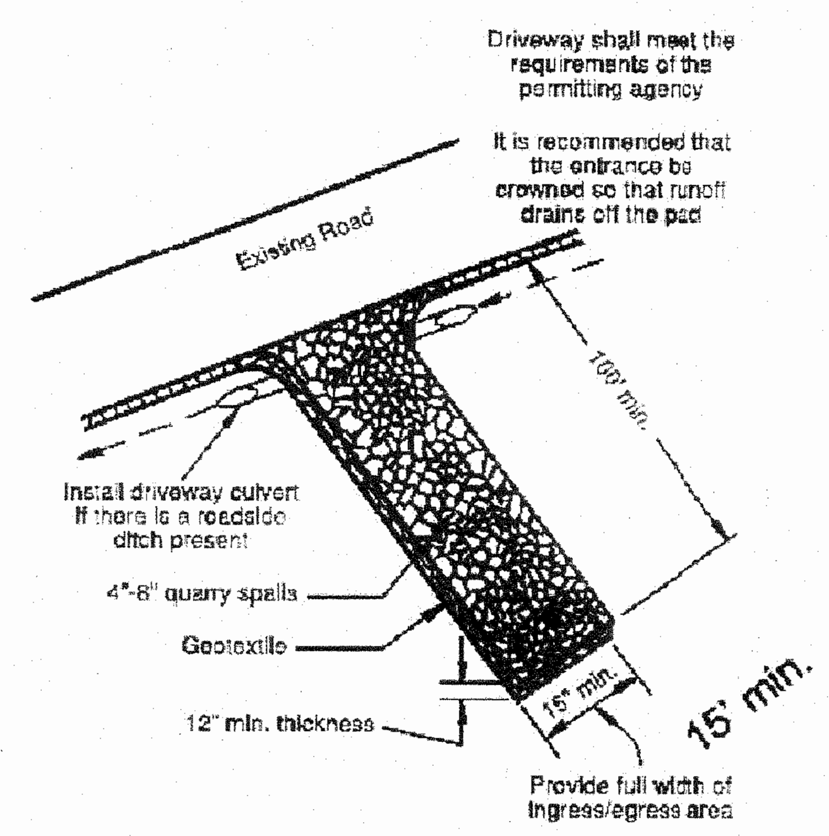
Silt Fence Notes
1. Filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid use of joints. When joints are necessary, filter cloth shall be spliced together only at a support post, with a minimum 6-inch overlap, and securely fastened at both ends to post.
2. Posts shall be spaced a maximum of 6 feet apart and driven securely into the ground (minimum of 30 inches).
3. A trench shall be excavated approximately 8 inches wide and 12 inches deep along the line of posts and upslope from the barrier.
4. When standard strength filter fabric is used, a wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy-duty wire staples at least 1 inch long, tie wires or hog rings. The wire shall extend into the trench a minimum of 4 inches and shall not extend more than 36 inches above the original ground surface. 5. The standard strength filter fabric shall be stapled or wired to the fence, and 20 inches of the fabric shall be extended into the trench. The fabric shall not extend more than 36 inches above the original ground surface. Filter fabric shall not be stapled to existing trees.
6. When extra-strength filter fabric and closer post spacing is used, the wire mesh support fence may be eliminated. In such a case, the filter fabric is stapled or wired directly to the posts with all other provisions of above notes applying.
7. Filter fabric fences shall not be removed before the upslope area has been permanently stabilized.
8. Filter fabric fences shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.



15° (typ) see note 1
3/4" diameter smooth bars equally spaced (6" O.C. max.)
4 hook clamps evenly placed see detail below
PLAN VIEW
NTS
Provide maintenance access by welding 4 crossbars to 4 vertical bars as shown. Hinge upper ends with flanges/bolts and provide locking mechanism (padlock) on lower end. Locate steps directly below
lower steel band 3/4" x 4" wide formed to fit in groove of C.B. riser
3/4" dia. smooth round bars welded equally spaced. Bars shall be welded to upper & lower bands (24 bands evenly spaced see note 1)
upper steel band 3/4" x 4" wide
type 2 CB
standard galvanized steps or ladder
smooth vertical bars
hook clamp anchored to C.B. riser
C.B. riser
SECTION A-A
NTS
DETAIL HOOK CLAMP
NTS
NOTES:
1. Dimensions are for illustration on 54" diameter CB For different diameter CB's adjust to maintain 45° angle on "vertical" bars and 7" o.c. maximum spacing of bars around lower steel band.
2. Metal parts must be corrosion resistant; steel bars must be galvanized.
3. This debris barrier is also recommended for use on the inlet to roadway cross-culverts with high potential for debris collection (except on type 2 stream)

Figure 3.11 Overflow Structure

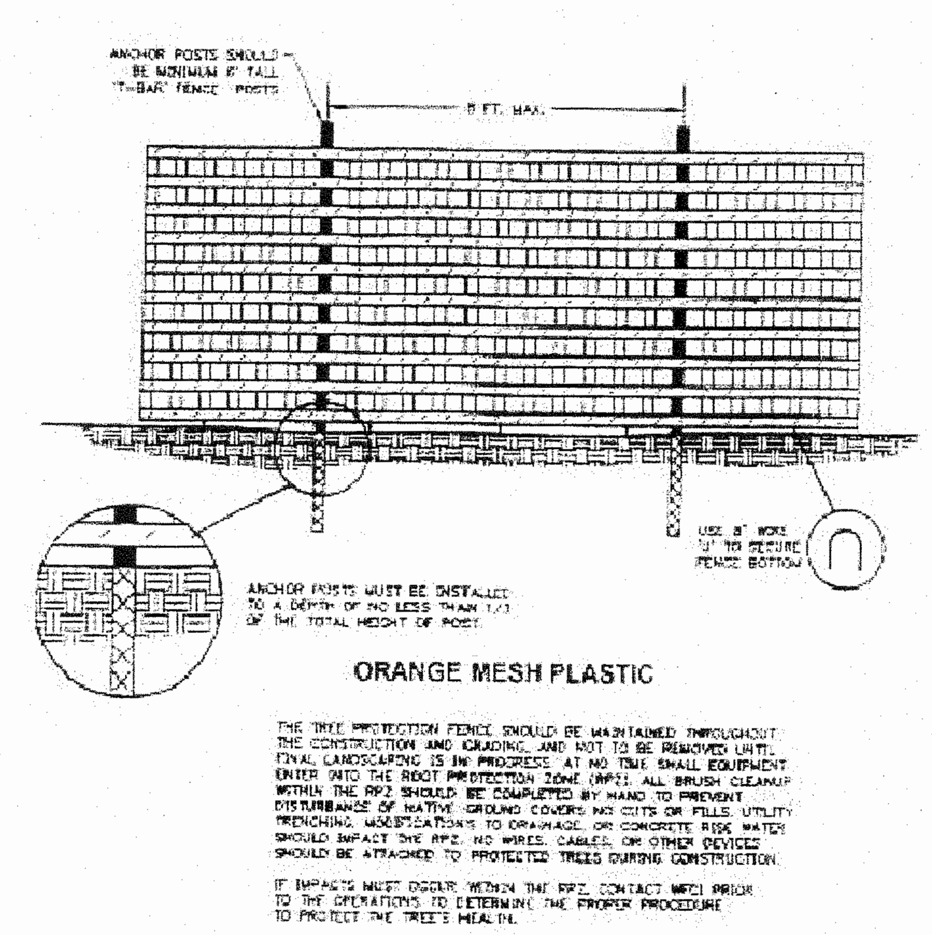
February 2005 Volume III – Hydrologic Analysis and Flow Control BMPs 3-33



Driveway shall meet the requirements of the permitting agency
It is recommended that the entrance be crowned so that runoff drains off the pad
Existing Road
100' min.
Install driveway culvert if there is a roadside ditch present
4"-8" quarry spalls
Geotextile
12" min. thickness
15' min.
15' min.
Provide full width of ingress/egress area

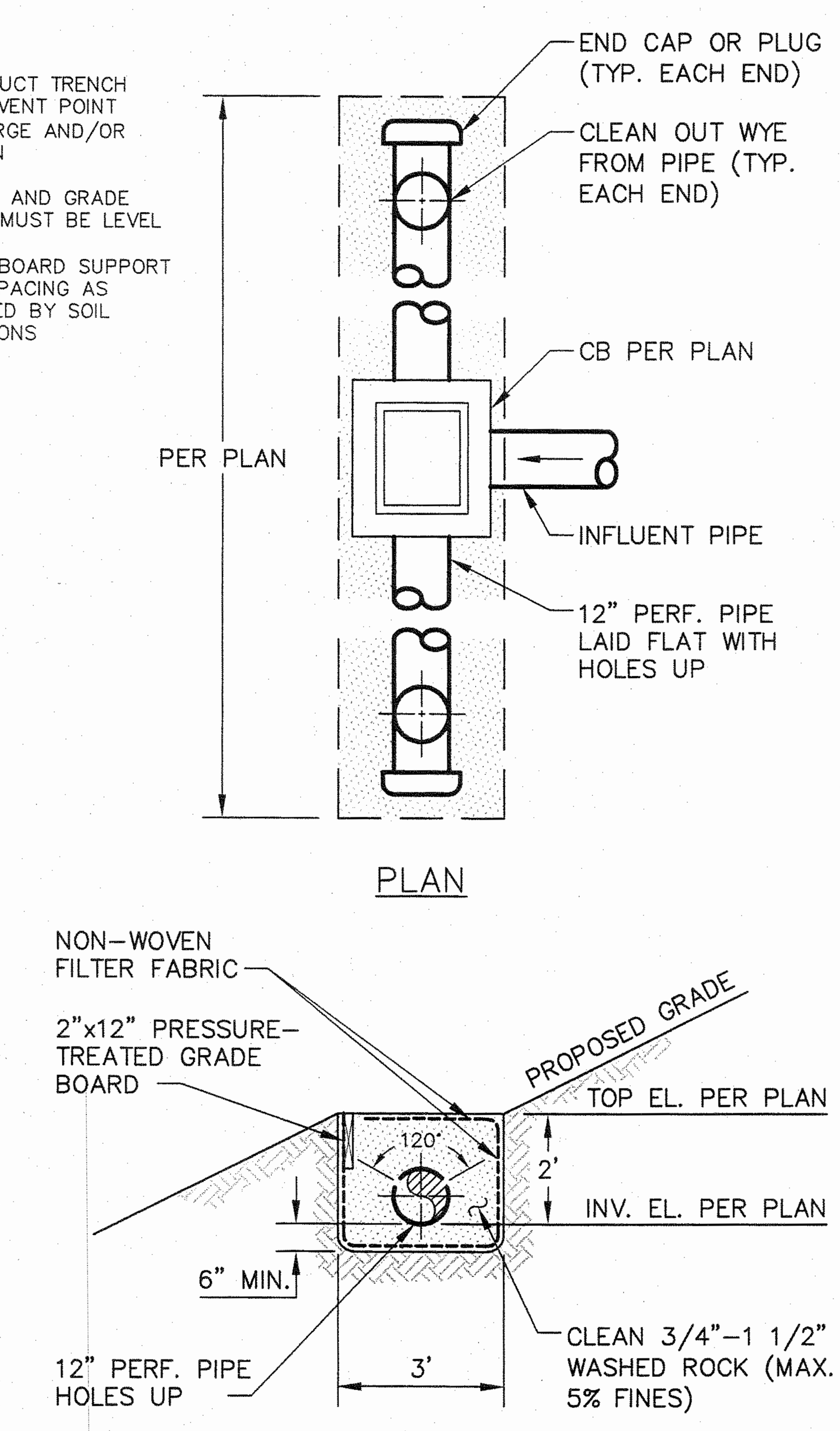
Figure 4.2 - Stabilized Construction Entrance

Construction Entrance Notes
1. Material shall be 4" to 6" quarry spalls and may be top-dressed with 1" to 3" rock.
2. The rock pad shall be at least 12 inches thick and 100 feet long. Width shall be the full width of the vehicle ingress and egress area. Smaller pads may be approved for single-family residential and small commercial sites.
3. Additional rock shall be added periodically to maintain proper function of the pad.
4. If the pad does not adequately remove the mud from the vehicle wheels, the wheels shall be hosed off before the vehicle enters a paved street. The washing shall be done on an area covered with crushed rock and wash water shall drain to a sediment retention facility or through silt fence.



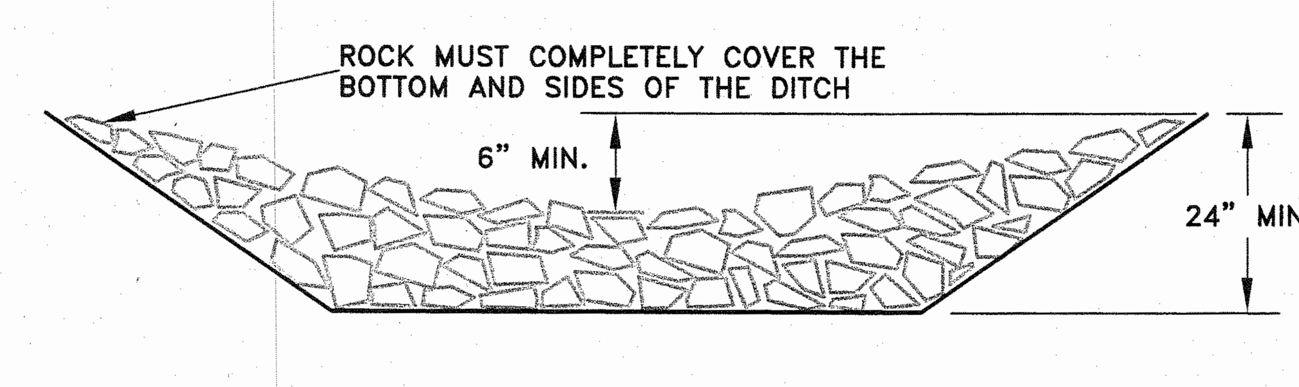
TREE PROTECTION FENCE DETAIL

NOTES:
1. CONSTRUCT TRENCH TO PREVENT POINT DISCHARGE AND/OR EROSION
2. TRENCH AND GRADE BOARD MUST BE LEVEL
3. GRADE BOARD SUPPORT POST SPACING AS REQUIRED BY SOIL CONDITIONS



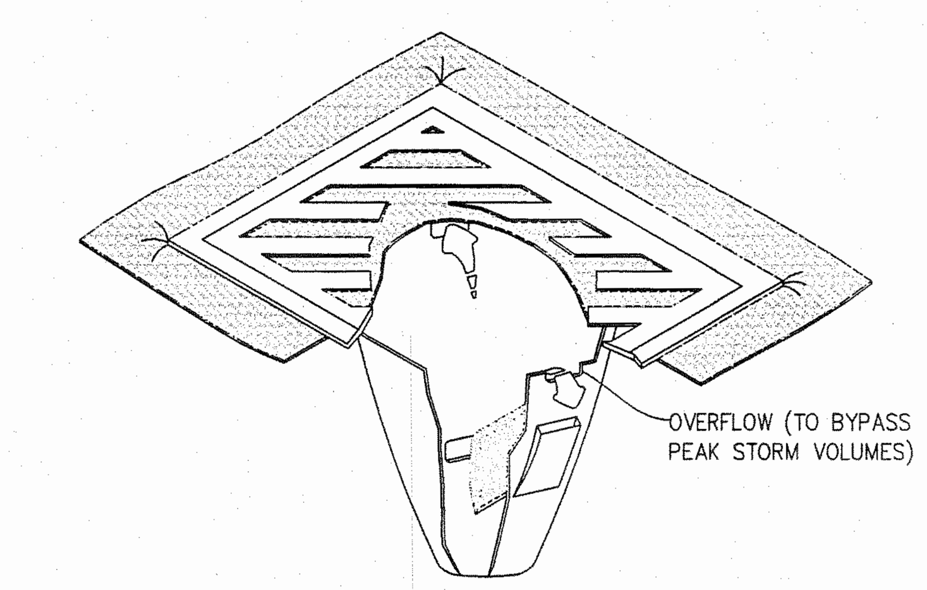
END CAP OR PLUG (TYP. EACH END)
CLEAN OUT WYE FROM PIPE (TYP. EACH END)
CB PER PLAN
PER PLAN
INFLUENT PIPE
12" PERF. PIPE LAID FLAT WITH HOLES UP
PLAN
NON-WOVEN FILTER FABRIC
2"x12" PRESSURE-TREATED GRADE BOARD
PROPOSED GRADE
TOP EL. PER PLAN
120°
2'
INV. EL. PER PLAN
6" MIN.
12" PERF. PIPE HOLES UP
3'
CLEAN 3/4"-1 1/2" WASHED ROCK (MAX. 5% FINES)
SECTION

LEVEL SPREADER
NO SCALE



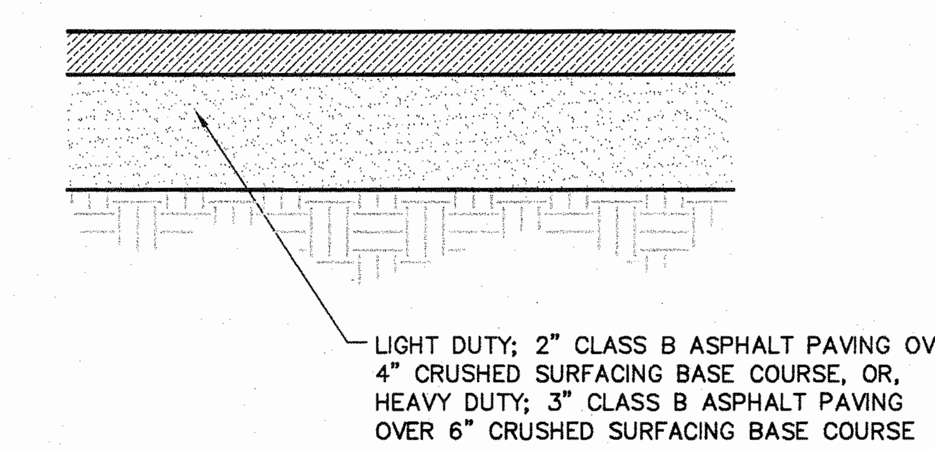
ROCK CHECK DAM CROSS SECTION
NO SCALE

Check Dam Notes
1. The maximum spacing between the dams shall be such that the toe of the upstream dam is at the same elevation as the top of the downstream dom. 2. Rock check dams shall be constructed of 2-to 4-inch diometer rock. The rock must be placed by hand or mechanical placement (no dumping of rock to form dam) to achieve complete coverage of the ditch or swale and to insure that the center of the dam is lower than the edges.
3. Log check dams shall be constructed of 4- to 6-inch diometer logs. The logs shall be embedded into the soil at least 18 inches.
4. In the case of grass-lined ditches and swales, check doms shall be removed when the grass has matured sufficiently to protect the ditch or swale. The orea beneath the check dams shall be seeded and mulched immediately after dam removal.
5. Check dams shall be checked for sediment accumulation after each significant rainfall. Sediment shall be removed when it reaches one half of the original dam height or before.



STORM DRAIN CB (INSERT)
NO SCALE

Inlet Protection Notes
1. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks shall abut. The height of the barrier con be varied, depending on design needs, by stacking combinations of blocks that ore 4 inches, and 12 inches wide. The row of blocks sholl be at least 12 inches but no greater than 24 inches high.
2. Place wire mesh over the outside verticol face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 1/2-inch openings.
3. Pile stone against the wire mesh to the top of the blocks. Use 3/4-to 3-inch gravel.
4. Place wire mesh over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. Use hordware cloth or comparoble wire mesh with 1/2-inch openings. If more than one strip of mesh is necessary, overlap the strips. Ploce filter fabric over wire mesh.
5. Place 3/4-Inch gravel over the wire mesh. The depth of stone shall be at least 12 inches over the entire inlet opening. Extend the stone beyond the inlet opening at least 18 inches on all sides.
6. If the stone filter becomes clogged with sediment, the stones must be pulled away from the inlet and cleaned or replaced.



(SEE GEOTECHNICAL ENGINEERING REPORT No. 2041-001, DATED FEBRUARY 16, 2009, PREPARED BY J. KEITH CROSS, P.E., FOR COMPLETE PAVING AND SUBGRADE PREPARATION SPECIFICATIONS).

PAVEMENT SECTION
NOT TO SCALE

"AS-BUILT"

FOR THE CITY OF LACEY

BY: ______________________ DATE: __________
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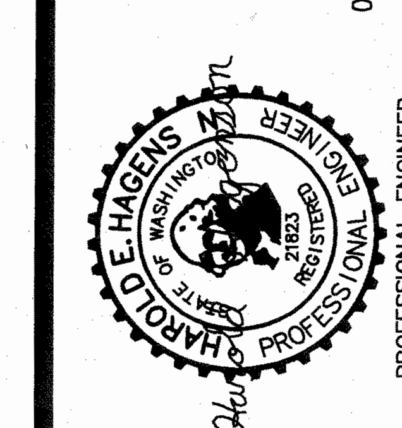

05-19-14
PROFESSIONAL ENGINEER

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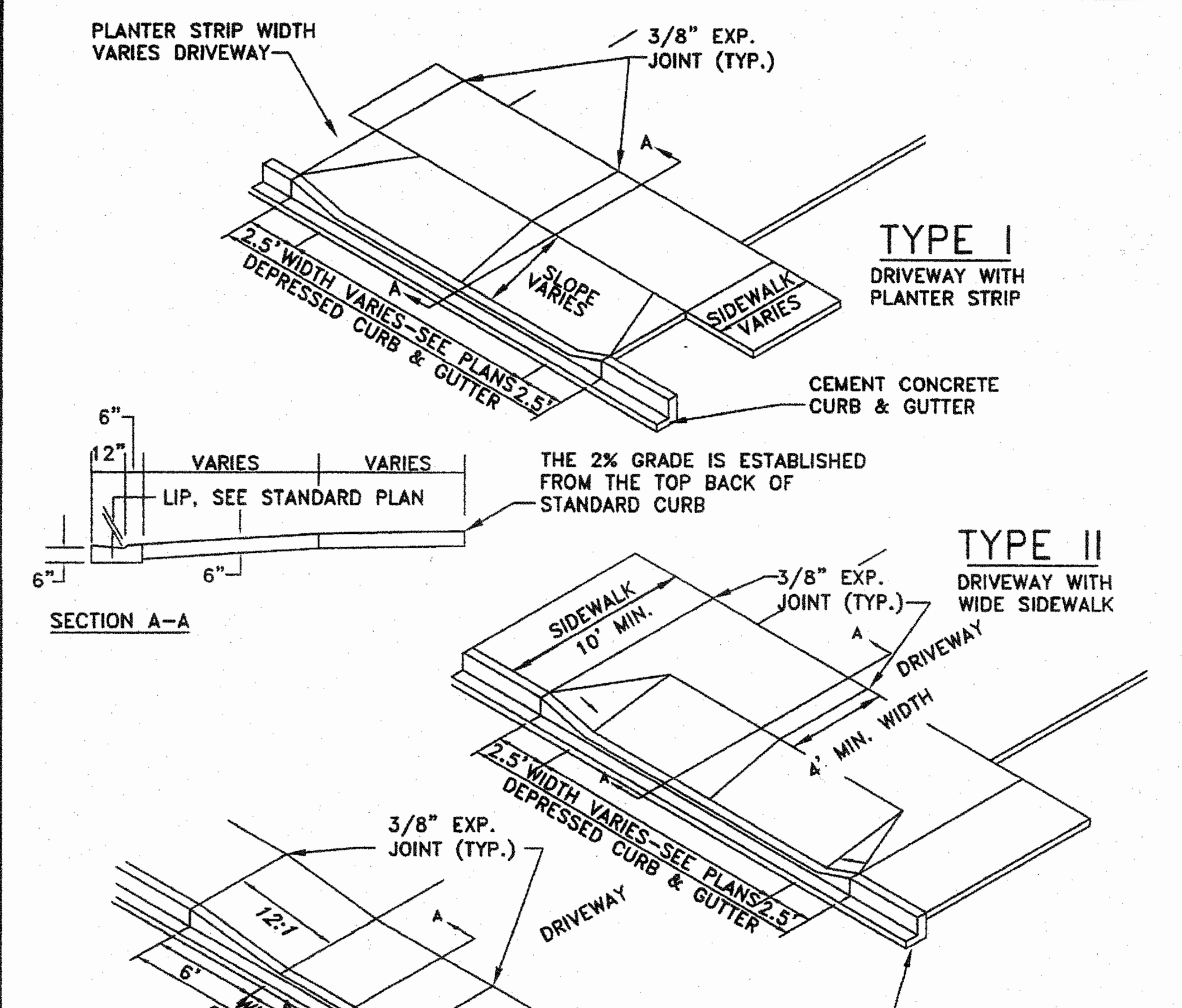
PROJECT NO. 2006022.00
DRAWN BY: JVH
CHECKED BY: HEH

MISCELLANEOUS DETAILS
GATEWAY CHRISTIAN CENTER
LACEY WASHINGTON

SHEET TITLE
MISCELLANEOUS DETAILS

D-14-05/9

NW 1/4, NW 1/4, SE 1/4, NW 1/4 & SW 1/4, NW 1/4, OF SEC. 2, TWP. 18 N., RGE. 1 W., W.M.



TYPE III
DRIVEWAY WITH DIPPED SIDEWALK (TO BE USED WHEN SIDEWALK IS 6' WIDE OR LESS)

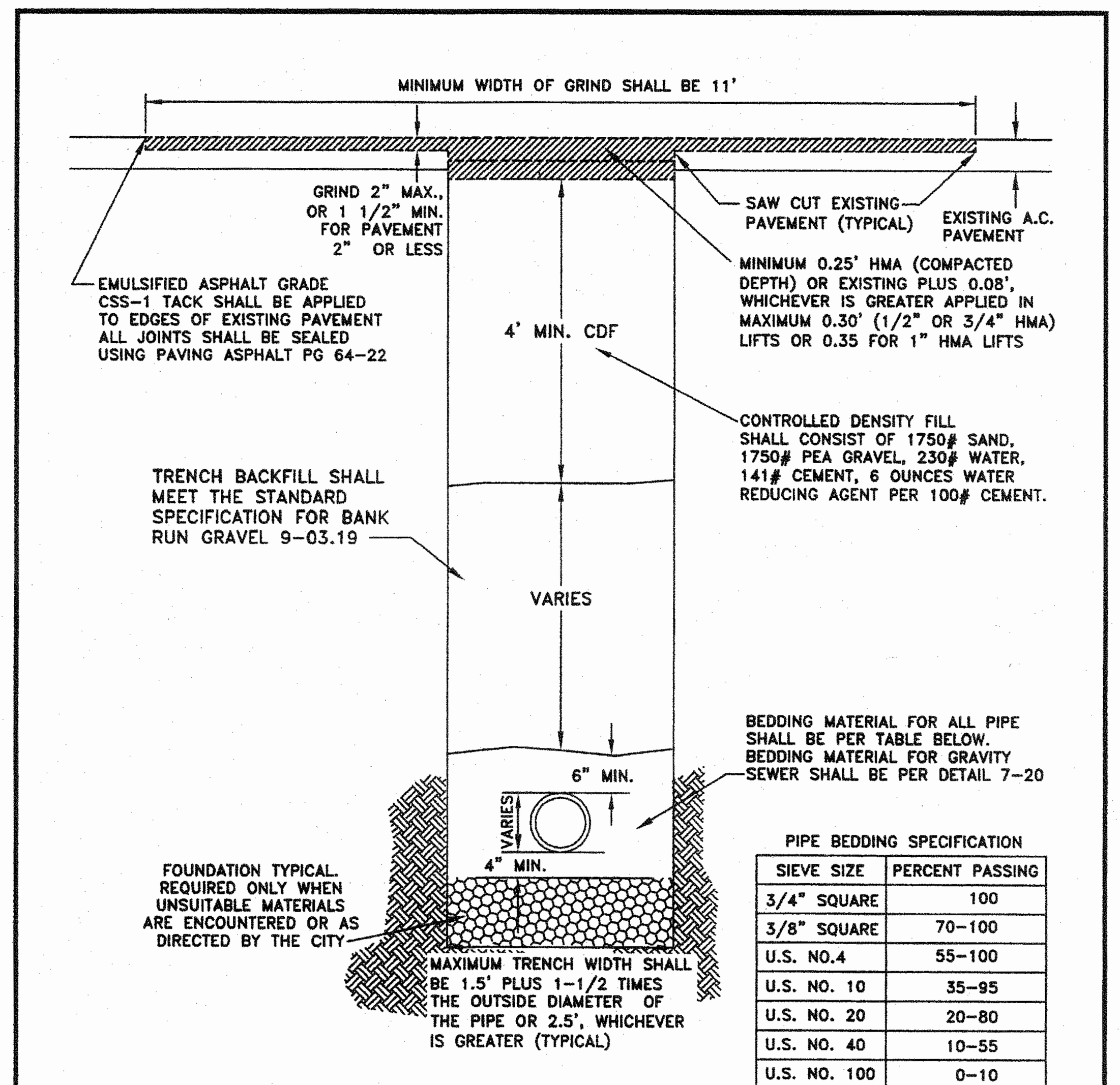
GENERAL NOTES:
1. FORMS SHALL BE OF WOOD OR METAL AND SHALL EXTEND FOR THE FULL DEPTH OF THE CONCRETE, SEE SECTION 8-14.3(2).
2. ALL FORMS SHALL BE STRAIGHT, FREE FROM WARP AND OF SUFFICIENT STRENGTH TO RESIST THE PRESSURE OF THE CONCRETE WITHOUT SPRING.
3. WHERE D/W EXCEEDS 16' WIDTH A 2" DEEP EXPANSION JOINT SHALL BE PLACED TRANSVERSLY, CENTERED IN WALK.
4. FORM AND SUBGRADE INSPECTION ARE REQUIRED BEFORE POURING CONCRETE.
5. DRIVEWAYS SHALL BE 6" THICK. MIN. SIDEWALK AND DRIVEWAY APRON SHALL BE 6" THICK MIN. THROUGH DRIVEWAY SECTION.
6. SIDEWALK CROSS SLOPE 1% MIN. TO MAX. 2%.

DG4-7.DWG

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

CEMENT CONCRETE DRIVEWAY

APPROVED / CITY ENGINEER	DWG. NO. 4-7
DES. WHO	DWN. WHO
CKD. MAH	DATE 8/27/09



PIPE BEDDING SPECIFICATION

SIEVE SIZE	PERCENT PASSING
3/4" SQUARE	100
3/8" SQUARE	70-100
U.S. NO.4	55-100
U.S. NO. 10	35-95
U.S. NO. 20	20-80
U.S. NO. 40	10-55
U.S. NO. 100	0-10
U.S. NO. 200	0-03

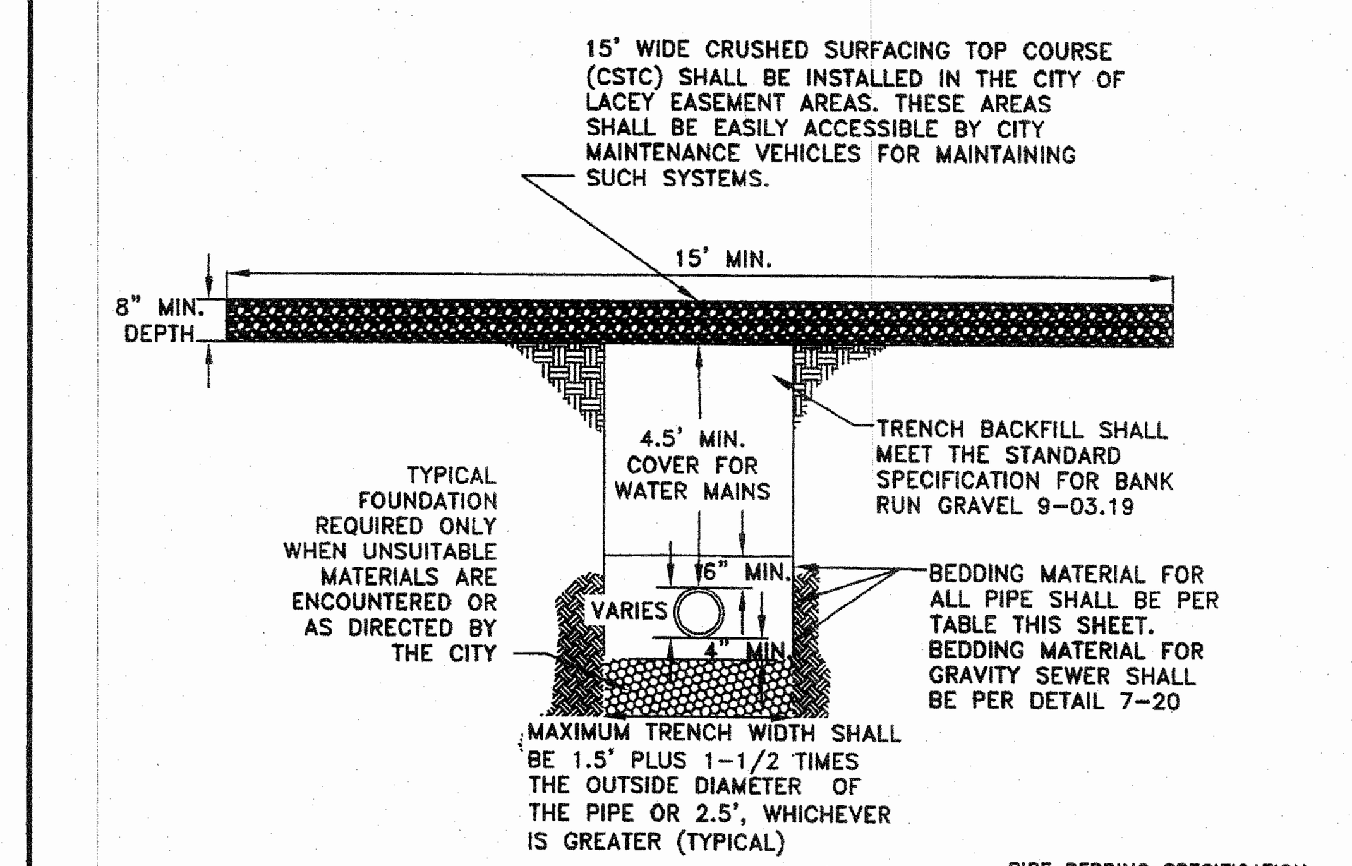
GENERAL NOTES:
1. ALL MATERIALS EXCEPT H.M.A. SHALL BE COMPACTED IN 6-INCH MAXIMUM LIFTS TO 95% DENSITY AS DETERMINED BY ASTM D1557.
2. ALL MATERIALS, WORKMANSHIP, AND INSTALLATION SHALL BE IN CONFORMANCE WITH THE WSDOT STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION AS AMENDED BY CITY OF LACEY STANDARDS.
3. KEEP TRENCH BOTTOM COMPACTED WITH UNIFORM GRADE. NO TEMPORARY SUPPORTS, I.E. BLOCKS, WILL BE ALLOWED TO SUPPORT PIPE. TRENCH BOTTOM SHALL BE TO GRADE PRIOR TO PIPE INSTALLATION.
4. SAW CUT PAVEMENT TO MAX. TRENCH WIDTH. BACKFILL AND PAVE TO TOP OF EXISTING PAVEMENT FOR TRENCH WIDTH. ALLOW 24 HOURS MINIMUM FOR TRENCH PATCH TO CURE. GRIND AND PAVE FINAL PATCH AS SHOWN.

DG4-8.1.DWG

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

PERPENDICULAR TRENCH RESTORATION
ARTERIALS, BLVDS. & COLLECTORS

APPROVED / CITY ENGINEER	DWG. NO. 4-8.1
DES WHO	DWN WHO
CKD RAS	DATE 8/27/09



PIPE BEDDING SPECIFICATION

SIEVE SIZE	PERCENT PASSING
3/4" SQUARE	100
3/8" SQUARE	70-100
U.S. NO.4	55-100
U.S. NO. 10	35-95
U.S. NO. 20	20-80
U.S. NO. 40	10-55
U.S. NO. 100	0-10
U.S. NO. 200	0-03

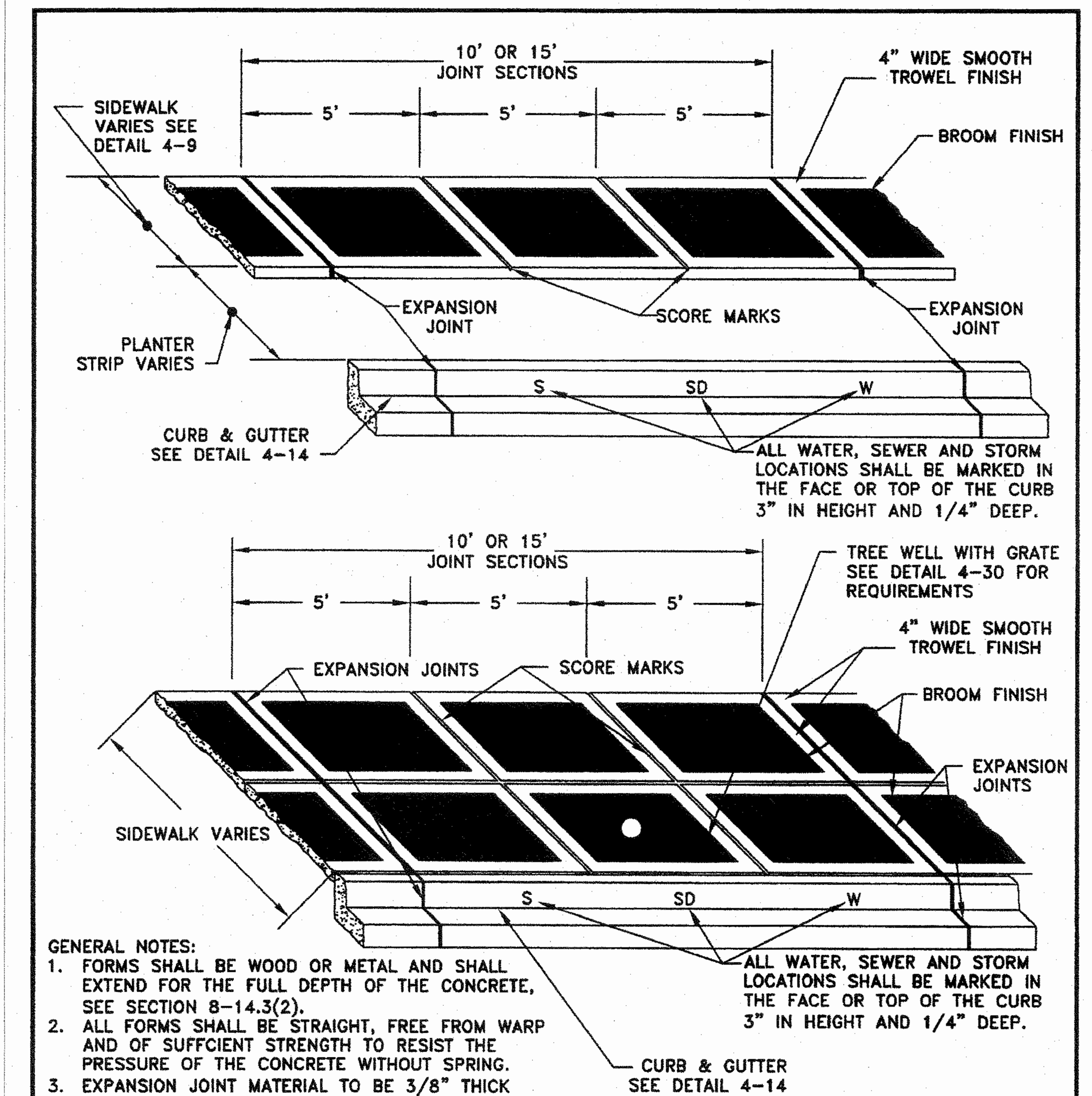
GENERAL NOTES:
1. BEDDING MATERIAL SHALL BE PER THE CHART ON THIS SHEET.
2. COMPACTION: BEDDING SHALL BE COMPACTED TO 95% MIN. AS DETERMINED BY ASTM D1557. BACKFILL SHALL BE COMPACTED TO 90% MIN. IN UNPAVED AREAS AND 95% MIN. IN PAVED OR SHOULDER AREAS AS DETERMINED BY ASTMD 1557.
3. ALL MATERIALS, WORKMANSHIP AND INSTALLATION SHALL BE IN CONFORMANCE WITH THE WSDOT STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION AS AMENDED BY THE CITY OF LACEY STANDARDS.
4. KEEP TRENCH BOTTOM COMPACTED WITH UNIFORM GRADE. A BELL JOINT SHALL BE REQUIRED AT EACH JOINT FOR PROPER SUPPORT. NO TEMPORARY SUPPORTS, I.E. BLOCKS, WILL BE ALLOWED TO SUPPORT PIPE. TRENCH BOTTOM SHALL BE TO GRADE PRIOR TO PIPE INSTALLATION.

DG4-8.4.DWG

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

TRENCH RESTORATION FOR UNPAVED AREAS

APPROVED / CITY ENGINEER	DWG. NO. 4-8.4
DES WHO	DWN WHO
CKD RAS	DATE 8/27/09



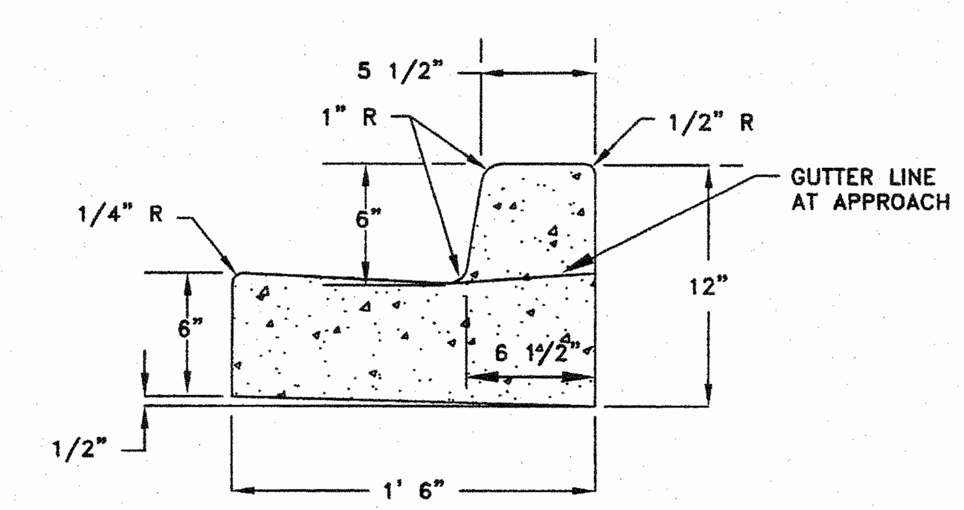
GENERAL NOTES:
1. FORMS SHALL BE WOOD OR METAL AND SHALL EXTEND FOR THE FULL DEPTH OF THE CONCRETE, SEE SECTION 8-14.3(2).
2. ALL FORMS SHALL BE STRAIGHT, FREE FROM WARP AND OF SUFFCIENT STRENGTH TO RESIST THE PRESSURE OF THE CONCRETE WITHOUT SPRING.
3. EXPANSION JOINT MATERIAL TO BE 3/8" THICK PREMOLDED JOINT FILLER FULL THICKNESS OF CONCRETE AND INSTALLED FLUSH OR 1/4" BELOW FINISH GRADE.
4. FORM AND SUBGRADE INSPECTION ARE REQUIRED BEFORE POURING CONCRETE.
5. PLACEMENT OF STREET LIGHTING, TREES, HYDRANTS AND WATER METERS SHALL BE PER THE DETAILS OF ITS PERSPECTIVE SECTIONS.
6. SCORE MARKS SHALL BE 1/8" TO 1/4" WIDE AND A MINIMUM OF 1" DEEP.
7. EXPANSION JOINTS SHALL BE INSTALLED IN THE CURB & GUTTER AND SIDEWALK AT THE PC AND PT FOR ALL CURB RETURNS. EXPANSION JOINTS SHALL BE PLACED IN THE SIDEWALK AT THE SAME LOCATIONS AS THOSE IN THE CURB & GUTTER WHEN THE SIDEWALK IS ADJACENT TO CURB & GUTTER, OR UNLESS OTHERWISE DIRECTED BY THE CITY.

DG4-10.DWG

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

SIDEWALK SPACING
EXPANSION JOINTS & SCORE MARKS

APPROVED / CITY ENGINEER	DWG. NO. 4-10
DES. EP	DWN. WHO
CKD. RAS	DATE 8/27/09



TYPE I

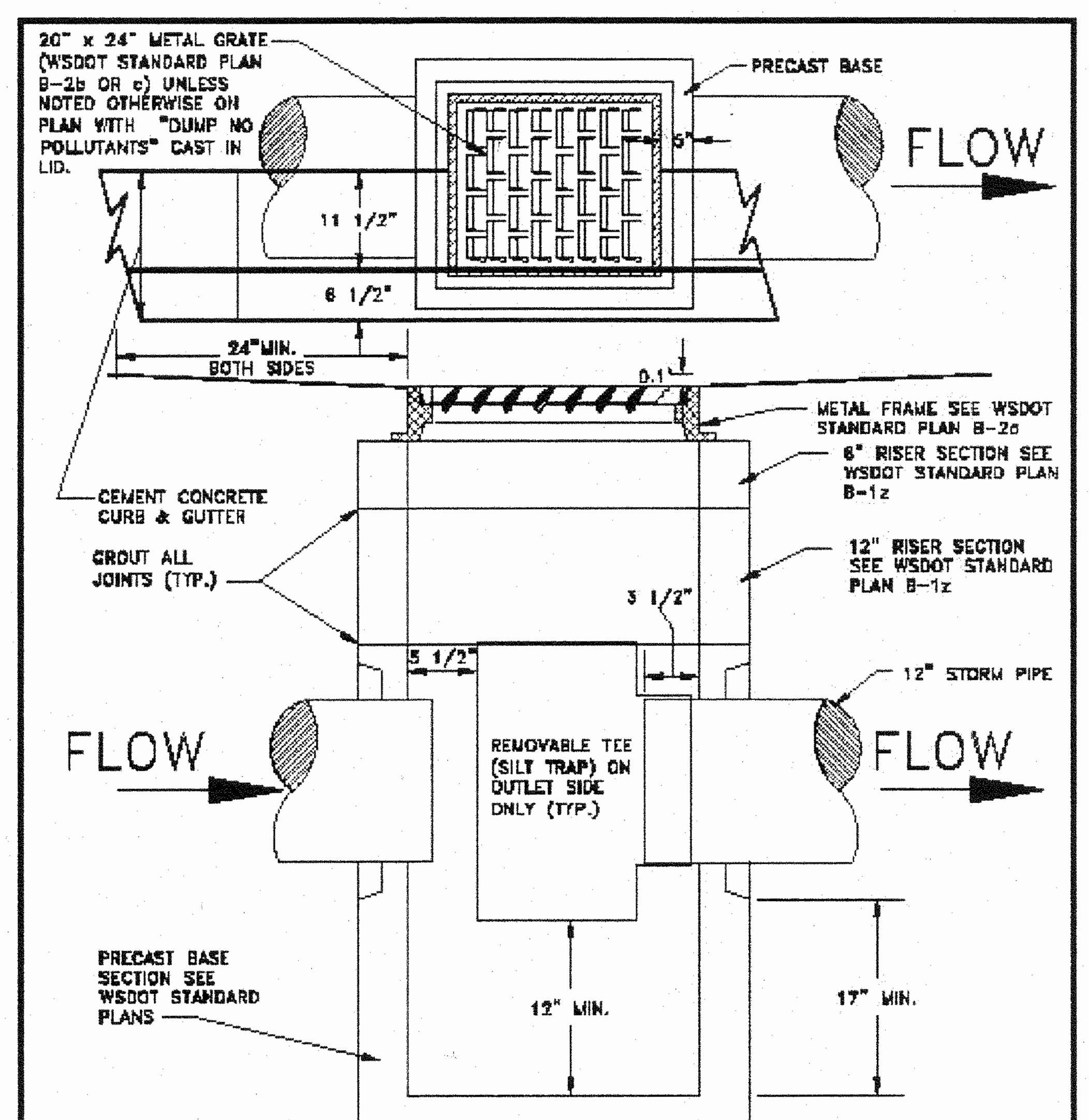
GENERAL NOTES:
1. EXPANSION JOINT MATERIAL TO BE 3/8" THICK PREMOLDED. JOINT FILLER FULL THICKNESS OF CONCRETE SPACING.
2. FORM AND SUBGRADE INSPECTION REQUIRED BEFORE POURING CONCRETE.
3. TYPE I USED ON OUTSIDE LANES.
4. TYPE II USED IN REVERSE SLOPE AREAS.
5. SEE 4B.025 FOR SPECIFICATIONS FOR CURBS AT MEDIANS.

DG4-14.DWG

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

CEMENT CONCRETE CURB & GUTTER

APPROVED / CITY ENGINEER	DWG. NO. 4-14
DES. WHO	DWN. WHO
CKD. MAH	DATE 8/27/09

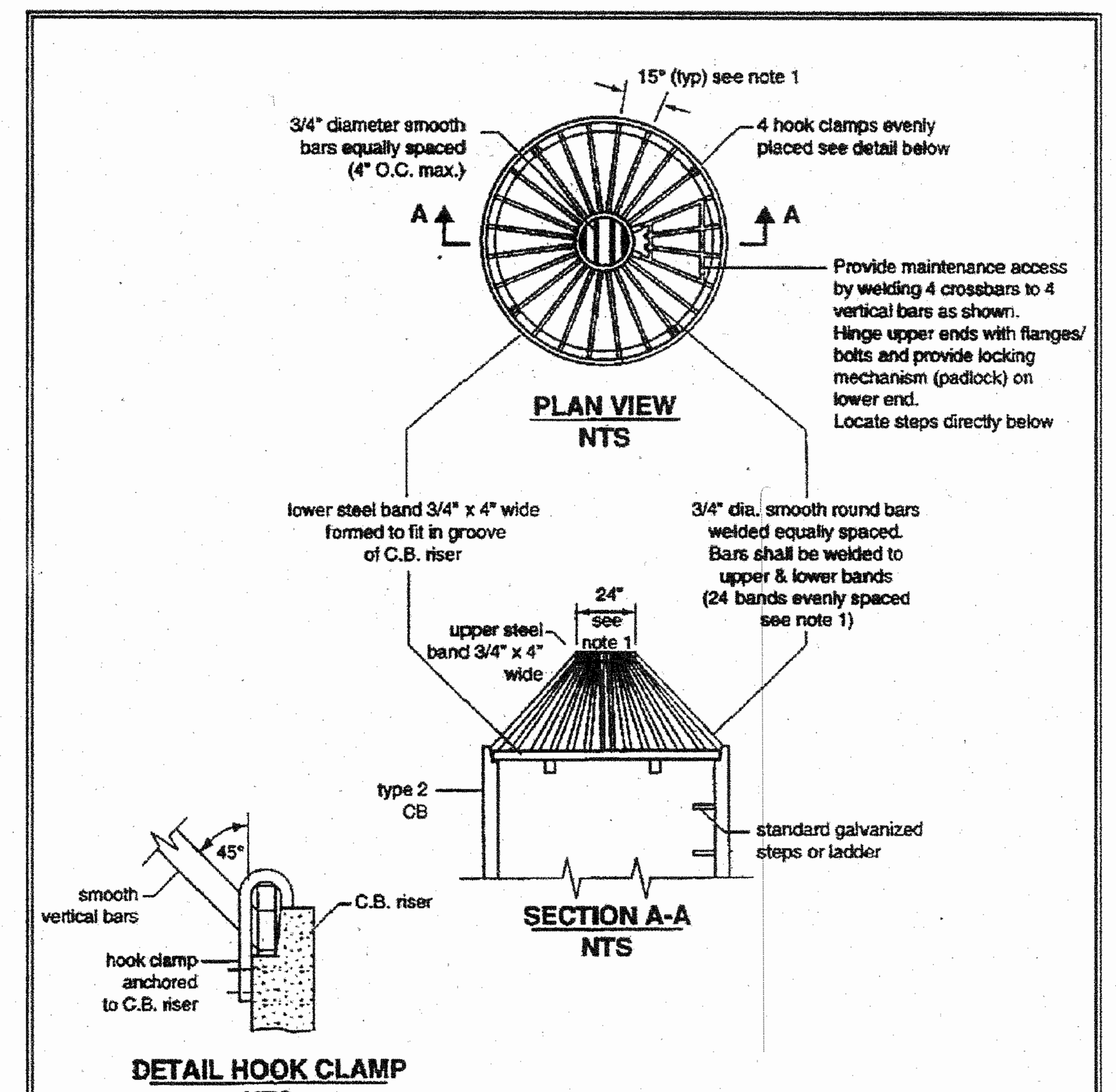


GENERAL NOTES:
1. CATCH BASIN SHALL BE CONSTRUCTED IN ACCORDANCE WITH SPECIFICATIONS IN WSDOT STANDARD PLANS.
2. SEE DETAIL 5-5 FOR PAD REQUIREMENTS.
3. W.S.D.O.T. GRATE B-2C IS FOR BI-DIRECTIONAL FLOWS.
4. REMOVABLE SILT TRAP TEES SHALL BE INSTALLED IN ALL CATCH BASINS.
5. WHEN REMOVABLE SILT TRAP TEES ARE NOT APPLICABLE THE BAFFLE SYSTEM SHALL BE USED SEE DETAILS 5-8 AND 5-8.1.
6. WHEN THE ANGLE OF THE STORM PIPE DOES NOT FIT THE KNOCK-OUT THE BASIN SHALL BE UPGRADED. THE CORNERS OF THE BASIN SHALL NOT BE ALTERED OR BROKEN.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

SILT TRAP TEE & DEPRESSION DETAIL FOR CATCH BASINS

APPROVED / CITY ENGINEER	DWG. NO. 5-4
DES WHO	DWN WHO
CKD RAS	DATE 8/27/09



NOTES:
1. Dimensions are for illustration on 54" diameter CB For different diameter CB's adjust to maintain 45° angle on "vertical" bars and 7" o.c. maximum spacing of bars around lower steel band.
2. Metal parts must be corrosion resistant; steel bars must be galvanized.
3. This debris barrier is also recommended for use on the inlet to roadway cross-culverts with high potential for debris collection (except on type 2 streams)

Figure 3.11 Overflow Structure

February 2005 Volume III – Hydrologic Analysis and Flow Control BMPs 3-33

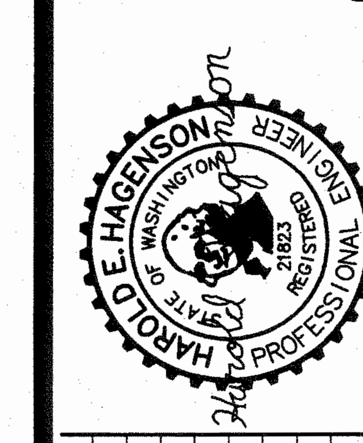
"AS-BUILT"

FOR THE CITY OF LACEY

BY: ____________ DATE: ________
PUBLIC WORKS REVIEWER

PLANS EXPIRE TWO YEARS FROM ABOVE DATE

Call 2 Working Days Before You Dig
811
Utilities Underground Location Center
(ID,MT,ND,OR,WA)



05-19-14

NO	REVISION	DATE
3	AS-BUILTS	05-19-14
2	REVISIONS PERMIT PER CITY COMMENTS	01-17-14
1	REVISIONS FOR GRADING PERMIT PER CITY COMMENTS	12-10-13
-	PERMIT SUBMITTAL	08-22-13

SOUND CONSULTANTS, LLC
LAND DEVELOPMENT CONSULTANTS
10509 NE 120th PLACE, KIRKLAND, WA 98034
phone 425-765-5053 fax 425-242-0894
email j.jvh@comcast.net

PROJECT NO. 2006022.00
DRAWN BY: JVH
CHECKED BY: HEH

STANDARD DETAILS
GATEWAY CHRISTIAN CENTER
LACEY WASHINGTON

SHEET TITLE
STANDARD DETAILS I

SHEET NO.
9 of 11

APPENDIX 2

Regional Stormwater Management Contributing Areas & Design

DRAINAGE IMPROVEMENTS

Raili May – Jay Lee Homeowner's Association Storm Pond (formerly Meridian Group I Storm Pond)

Lacey, Washington

Prepared for:

Aho Construction
5512 NE 109TH Ct., Suite 101
Vancouver, WA 98662
(360) 254-0493

Prepared by:

Hopper Dennis Jellison, P.L.L.C.
314 W. 15th Street
Vancouver, WA 98660
(360) 695-3488

Revised April 18, 2006
March 30, 2006

CERTIFICATE OF ENGINEER

Jay Lee- Raili May Homeowner's Storm Pond

Drainage Improvements Report

The technical information and data contained in this report was prepared under the direction and supervision of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

This document was:

Prepared by:

George M. Embleton

4/20/06

Approved by:

Andrew J. Gunther, P.E.

EXPIRES: NOV. 10, 2007

Reason for Improvements

The existing facility was 'overwhelmed' in January of this year. Overflow of the facility occurred when the drainage areas that were designed to be managed by the facility were not yet 'connected' or fully developed.

The design of the facility was for 142.54 acres of drainage area. This area was represented in "Drainage and Erosion Control Report" by Patrick Harron & Associates, LLC to include the following properties.

Summary of Developed Conditions (Areas per Report by Patrick Harron & Associates, LLC, page 9, revised June 2005)

Tributary Areas	Area (acres)	Impervious (acres)	Pervious (acres)	Comments
Area at pond and south of pond (see Basin Map)	64.76	38.86	25.90	Future development (listed as 64.78 acres on Basin Map)
Target Site (west)	5.76	4.03	1.73	
Parcel 11803100000	40.0	25.0	15.0	Jay Lee & Commercial Site
Parcel 11934440000	32.0	20.2	11.8	Raili May
Sub-Total	**142.52**	**88.09**	**54.43**	

During the 'overflow' condition in January, the area south of the pond was undeveloped, the Jay Lee and the Commercial site parcel were undeveloped and had no drainage connection to the facility, and Raili May was connected to the facility, but not fully developed.

However, runoff from the majority of the Target site (116.52 acres per report by Patrick Harron & Associates, LLC, page 9, revised June 2005) and the area north of the Target site (another 137 ± acres), were contributory areas to the facility.

The design addressed in this report is intended to serve approximately 143 acres of property. Flows from the majority of the Target site and upstream tributary areas draining to or bypassing the Target site are not addressed in the drainage analysis included with this report. These flows are assumed to be "pass-through" flows in the stormwater facility modeling. The effect of these "pass-through" flows may result in additional ponding in the stormwater facilities and additional flows through the Marvin Road culverts from what is represented herein.

Design Objective

Determine the modification(s) necessary at the existing facility to manage stormwater runoff from the designated properties (See Table 3).

Approach

Analysis

Since the initial analysis, field excavations and infiltration testing were performed by GeoDesign, Inc. to further analyze soil conditions in the pond area. The investigations indicated a substantial area on the west side of the facility where minimal infiltration would occur, even at 5 or more feet of excavation below existing grades in this area. However, along the east side of the facility, an area of sands and some gravel was observed at relatively shallow depths below current grades. The tested infiltration rates varied, but were generally within a close range. The design rate of 4 in/hr is less than one-half of the average tested rate found in the investigations by GeoDesign. This infiltration rate has been applied over an area representing less than 25% of the pond surface area in the main portion of the facility. The permeable area used in analysis of the pond performance was based on the parts of the pond base we anticipate will be excavated to the permeable sand layer found at approximately 5 feet below the lowest existing grades in the east part of the pond.

The total contributory area that the facility was designed for (142 acres±) has been routed to the facility in the stormwater modeling. All these areas have been modeled as fully developed. Fully developed conditions for the "Area at pond and south of pond" and "Target (west)" basins (See Table 2) were based on assumptions and estimates previously made in the Patrick Harron and Associates report, except as noted. Fully developed conditions for the Raili May and Jay Lee projects were developed from the known planned residential development intensity for these properties.

The pond area was 'contoured' (excavation required) to an elevation of 185 (five feet below the present low elevation) to provide additional storage and to reach more permeable soils in the east part of the pond to increase infiltration potential.

To allow the pond to manage release rates more efficiently and to reduce drain down time, a control manhole was added with an inflow/outflow elevation approximately 5' lower than the existing overflow device located in the berm between the pond area and the adjacent Community College property next to Marvin Road.

Assumptions

Impervious and pervious acreages were estimated for the yet to be developed parcels. It was also assumed that the undeveloped areas of the contributory 142± acres would have direct runoff to the stormwater facility when developed (no storage attenuation or infiltration facilities prior to entering the pond).

The assumed allowable release rate from the 142± acres to the downstream system through the existing 18" culverts at Marvin Road NE is 8 cfs or less in a 100-year, 24-hour storm event (ignoring potential impacts from the Target distribution center and additional property adjacent to Target).

Note: The design proposes adding a control structure at the two existing 18 inch culverts at Marvin Road NE. This reduces the peak discharge to the downstream system significantly. Another benefit is the added delay time to the peak release rate (about 12 hours).

Data Used for Model

The following tabulated summaries show the contributory areas and impervious/pervious area relationships used in modeling. The information from the Patrick Harron & Associates, LLC report has been included (tabulated) in a manner to more clearly show how these areas relate.

Table 1 - Summary as depicted on Tributary Basin Map (Sheet 1/1, Patrick Harron & Associates Map)

Tributary Areas	Area (acres)	Impervious (acres)	Pervious (acres)	Comments
North Basin	318.66	?	?	Bypass flow not accommodated by design
East Basin	11.34	0	11.34	Bypass flow not accommodated by design
Target Site (west)	5.76	4.03	1.73	
Parcel 11803100000	40.0	25.0*	15.0*	Jay Lee & Commercial Site
Parcel 11934440000	32.0	20.2*	11.8*	Raili May
Sub-Total	**407.76**			

*** Some of the site drains westerly (separate discharge)**

Table 2 -Summary of Developed Conditions (Areas per Report by Patrick Harron & Associates, LLC, page 9, revised June 2005)

Tributary Areas	Area (acres)	Impervious (acres)	Pervious (acres)	Comments
Area at Pond and south of Pond (see Basin Map)	64.76	38.86	25.90	Future (listed as 64.78 acres on Basin Map)
Target Site (west)	5.76	4.03	1.73	
Parcel 11803100000	40.0	25.0*	15.0*	Jay Lee & Commercial Site
Parcel 11934440000	32.0	20.2*	11.8*	Raili May
Sub-Total	**142.52 ****	**88.09**	**54.43**	

**** This is the area modeled in the Patrick Harron & Associates, LLC Report (Revised June 2005)**

Table 3 - Revised Summary (HDJ) - Full Development

Tributary Areas	Area (acres)	Impervious (acres)	Pervious (acres)	Comments
Pond	5.9	1.0	4.9	Used composite value of CN 92
Remaining areas: Church Site Community College	 8.778 48.522	 7.461 30.464	 1.317 18.058	 Assumed Impervious/pervious Assumed Impervious/pervious
East Basin	11.34	0	11.34	Assumed runoff directly to pond (Assumed as undeveloped)
Target Site (west)	5.76	4.03	1.73	Assumed runoff directly to pond (will actually be through church site)
Parcel 11803100000	28.38	16.48	11.90	Jay Lee
Parcel 11803100000	9.52	8.09	1.43	Commercial Site
Parcel 11934440000	26.98	13.82	13.16	Raili May
Sub-Total	**145.176***	**81.345**	**63.835**	

*** This area differs from previous subtotal of 142.52 acres**

- **Jay Lee, Raili May, and the Commercial site total 64.88 rather than 72 acres (7.12 acres less) based on more accurate calculations.**
- **The area referenced as Project Site (pond and future Meridian Group site) is less since the Pond does not extend to the road (Marvin Rd NE). The Community College area may be estimated larger than the actual acreage.**

Results of Analysis

Table 4- Summary of Flows (100-yr Event)

HydroCAD Symbol	Flow Represented	Drainage Data		Peak Discharge (cfs)
		Area (acres)	Volume (ac-ft)	
1R	Flow from Jay Lee	28.375	12.840	47.61 cfs from site
2R	Flow to Pond from Raili May and Jay Lee Subdivisions	26.982 plus 28.375 = 55.357	24.882	73.19 cfs from site and 70.29 cfs at pond
3R	Flow from Commercial Site (Raili May)	9.519	4.503	18.19 from site (less if account for hydrograph timing to reach pond)
TW	Target (W)	5.760	2.725	10.11 cfs
PP	Area at and around Pond	5.900	2.621	10.37 cfs
CC	Future Community College (remaining area)	48.522	22.484	80.52 cfs
C	Future Church	8.778	4.238	14.98 cfs
EPB	East Basin	11.34	3.317	6.49 cfs

Summary of Pond Data (100-yr Event) – Release from Main Pond

HydroCAD Symbol	Flow Represented	Drainage Area (acres)	Peak Inflow (cfs)	Peak Runoff Volume (ac-ft)	Peak Release Rate (cfs)	Peak Runoff Volume (released) (ac-ft)
1P	Developed Condition (145 acres) See Table 3	145.176	197.28	64.770	5.72 (infiltration) 26.80 (to downstream)	29.810 (infiltration) 34.960 (to downstream)

Summary (100-yr Event) – Release at (Marvin Road NE (Retrofitted 18 inch Culverts)

HydroCAD Symbol	Flow Represented	Drainage Area (acres)	Peak Inflow (cfs)	Peak Runoff Volume (ac-ft)	Peak Release Rate (cfs)	Peak Runoff Volume (released) (ac-ft)
4P	Developed Condition (145 acres) See Table 3	146.913	27.18	35.572	5.72 (infiltration) **7.74 (to downstream)**	15.473 (infiltration) **20.099 (to downstream)**

The peak calculated water level elevation for the 100-yr, 24–hr storm event is 203.23, approximately 2.5 feet below the centerline of Marvin Road at its low point.

control MH rim = 201.0

1/3

DRAINAGE AND EROSION CONTROL REPORT
FOR
MERIDIAN GROUP I STORM POND

Project Proponent:
Meridian Group I
1800 43rd Ave. E.
Apartment 105
Seattle, WA 98112
Clifford Mulberg
206.324.0424

Site Location:
NE of Marvin Road SE & 32nd Ave. NE
Lacey, Washington 985XX

Prepared by:
Patrick Harron & Associates, LLC
8270 28th Ct. NE. Suite #201
Lacey, WA 98516
360.459.1102
360.459.1013 Fax

Job No: 02508
September 2003
Revised: Sept 2004
Revised: June 2005

Tributary Areas

North Basin (Varies)	13,880,907 S.F.	318.66 AC	(Bypass)
East Basin (Pervious)	493,034 S.F.	11.34 AC	(Bypass)
Target Site West Parcels (Imp.)	175,634 S.F.	4.03 AC	
Target Site West Parcels (Perv.)	75,272 S.F.	1.73 AC	
Parcel 11803100000 (Imp.)	1,045,440 S.F.	25.00 AC	
Parcel 11803100000 (Perv.)	696,960 S.F.	15.00 AC	
Parcel 11934440000 (Imp.)	836,352 S.F.	20.20 AC	
Parcel 11934440000 (Perv.)	557,568 S.F.	11.80 AC	
Sub-Total		**407.76 AC**	

(Refer to Developed Site Map for Delineation of Offsite Areas)

Developed

On-Site

Impervious (60%)	1,692,567 S.F.	38.86 AC
Pervious (40%)	1,128,378 S.F.	25.90 AC
Sub-Total		**64.76 AC**

Total Impervious to Ponds

On-Site	1,692,567 S.F.	38.86 AC
Off-Site	1,881,792 S.F.	49.23 AC
Total		**88.09 AC**

Total Pervious to Ponds

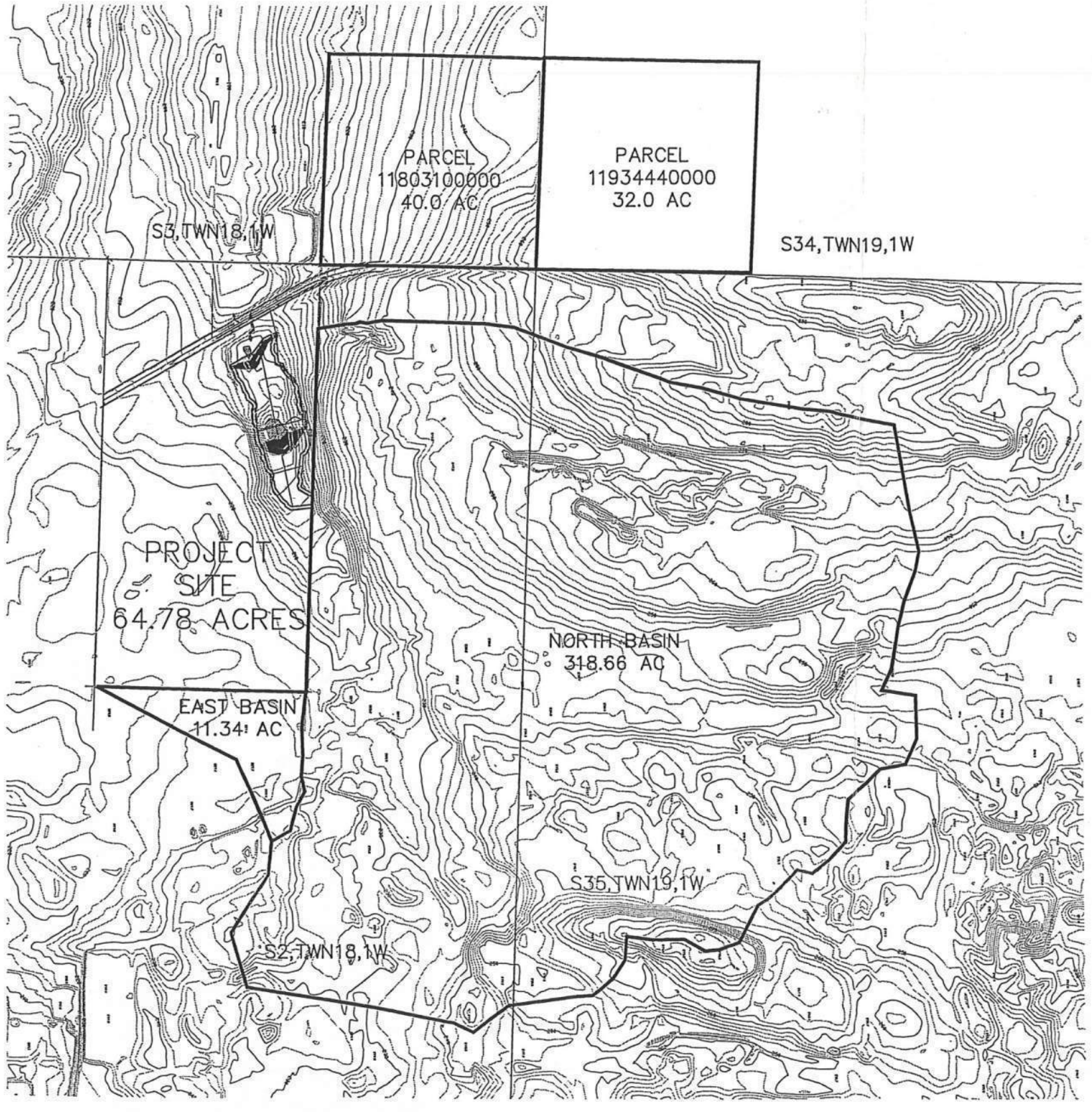
On-Site	1,128,378 S.F.	25.90 AC
Off-Site	1,254,528 S.F.	28.53 AC
Total		**54.43 AC**

Additional Area from Target Site (Detained)

Impervious	4,274,978 S.F.	98.14 AC
Pervious	800,633 S.F.	18.38 AC
Total		**116.52 AC**

Since the runoff from the Target site is collected and detained in ponds on that site it will be necessary to model all parcels using the SBUH method and then adding the Target hydrograph to the 142.5 acres, including this parcel, Parcels 11803100000 & 1193444000 and the Target Site West Parcel. This will be discussed in more detail later in this section since these areas will be infiltrated completely up to the 100-year events.

Note: This pond has been designed to infiltrate completely the runoff from this parcel, Parcels 11803100000 & 1193444000 and the Target Site West Parcel for the 100-year, 24-hour and 7-day event. This design area totals approximately 142.5 acres. In addition, runoff from the offsite bypass areas will be infiltrated in the smaller storm events but some runoff from the bypass areas will be released to the downstream system during the 100-year events. As allowed for offsite flows tributary to this parcel. These bypass flows will be release near two



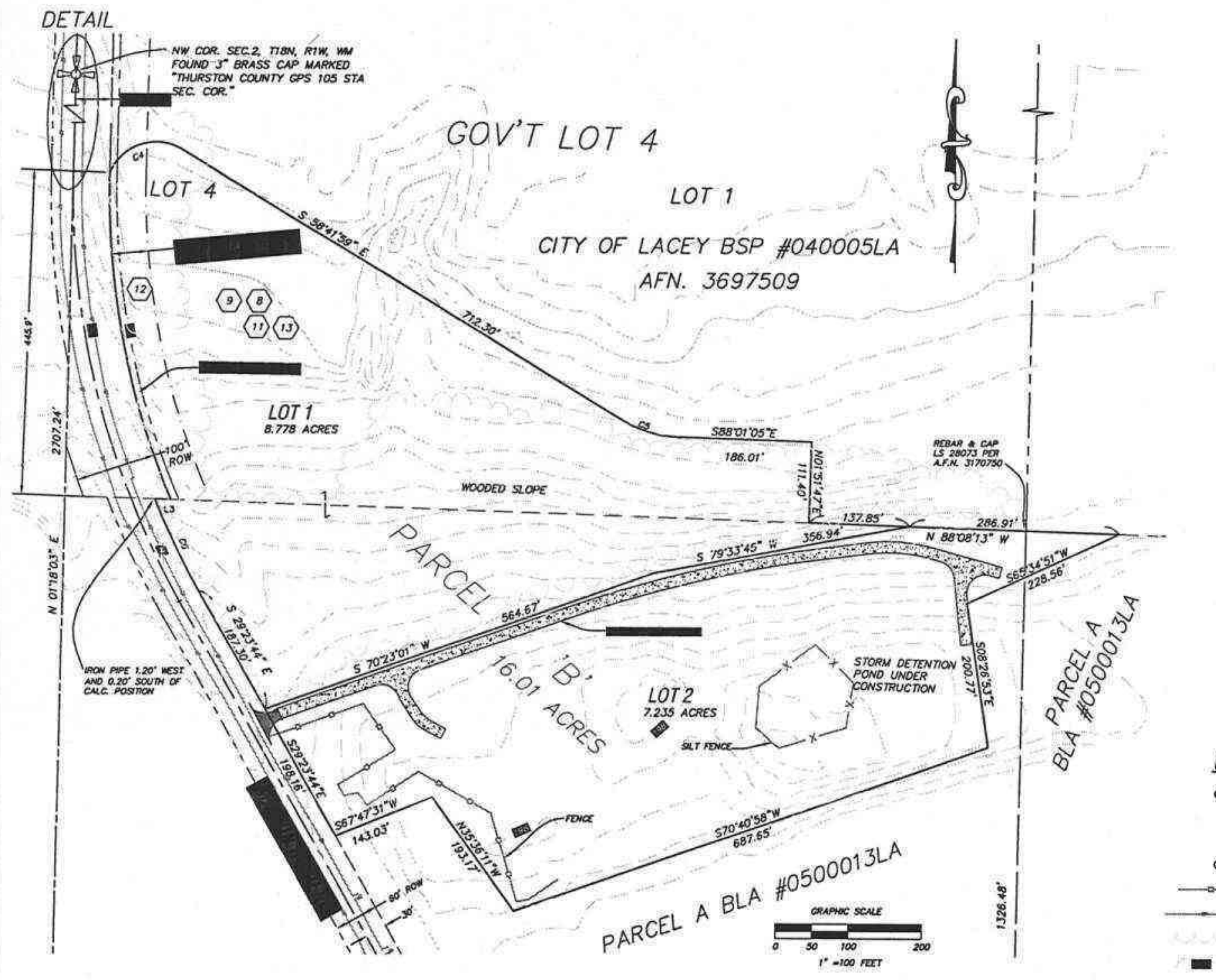
TRIBUTARY BASIN MAP
MERIDIAN GROUP I – STORM POND

PATRICK HARRON & ASSOCIATES, LLC

Patrick Harron & Associates, LLC
14900 Interurban Ave. S., #279
Seattle, WA 98168
T 206.674.4659
F 206.674.4660

DWN. BY	DATE	JOB NO.
JMS	10/7/03	02508
CHKD. BY	SCALE	SHEET
JMS	1" = 800'	1 OF 1

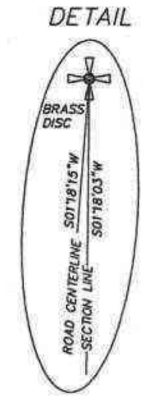
CITY OF LACEY BSP # 05XXXXLA


DETAIL
NW COR. SEC.2, T18N, R1W, WM FOUND 3" BRASS CAP MARKED "THURSTON COUNTY GPS 105 STA SEC. COR."
GOV'T LOT 4
LOT 4
LOT 1
CITY OF LACEY BSP #040005LA
AFN. 3697509
S 58°41'59" E
712.30'
LOT 1
8.778 ACRES
100' ROW
S88°01'05"E
186.01'
N01°51'47"E
111.40'
REBAR & CAP LS 28073 PER A.F.N. 3170750
WOODED SLOPE
137.85'
N 88°08'13" W
286.91'
S 79°33'45" W
356.94'
PARCEL 'B'
16.01 ACRES
564.67'
S 70°23'01" W
S 29°23'44" E
187.30'
N 01°18'03" E
2707.24'
445.9'
IRON PIPE 1.20' WEST AND 0.20' SOUTH OF CALC. POSITION
STORM DETENTION POND UNDER CONSTRUCTION
LOT 2
7.235 ACRES
SILT FENCE
S08°26'53"E
200.77'
S65°34'51"W
228.56'
PARCEL A
BLA #0500013LA
S29°23'44"E
198.16'
S67°47'31"W
143.03'
FENCE
N35°36'11"W
193.17
S70°40'58"W
687.65'
PARCEL A BLA #0500013LA
60' ROW
1326.48'
GRAPHIC SCALE
0 50 100 200
1" =100 FEET
LEGEND
BRASS CAP
FOUND MONUMENT AS NOTED
FOUND REBAR AND CAP "MABRY LS 41036"
SET 5/8" REBAR AND CAP "LAURITZEN LS 24288"
FENCE
EDGE OF PAVEMENT
EDGE OF TREES
CONTOURS FROM THURSTON COUNTY AERIAL MAPPING 2003

CURVE TABLE			
CURVE	LENGTH	RADIUS	DELTA
C1	155.80	1146.00	7°47'23"
C2	458.24	1146.00	22°54'36"
C3	460.05	1096.00	24°03'00"
C4	117.87	68.82	98°08'10"
C5	74.45	145.50	29°19'06"
C6	138.67	1116.00	7°07'09"

LINE TABLE		
LINE	LENGTH	BEARING
L3	21.96	N88°08'13"W

DETAIL



ROAD ALIGNMENT FOR MARVIN ROAD N.E. WAS CALCULATED PER ROS RECORDED UNDER A.F.N. #3235138, THIS ALIGNMENT BEGINS AT THE NORTHWEST CORNER OF SECTION 2 AND DIVERGES TO THE WEST. THE SECTION LINE BEARS SOUTH 1°18'03" WEST, THE CENTERLINE OF MARVIN BEARS SOUTH 1°18'15" WEST.

ASSESSOR'S PARCEL NO. 37560000400

MERIDIAN GROUP NO.1
1800 43RD AVE. E. APT.105
SEATTLE, WA. 98112
CONTACT: CLIFFORD R. MULBERG

JOHN M. LAURITZEN, STATE OF WASHINGTON, 24288, REGISTERED PROFESSIONAL LAND SURVEYOR, EXPIRES MAY 2, 2007

HUITT-ZOLLARS
302 South 9th Street, Suite 101
Tacoma, Washington 98402
Phone (253) 627-9131 Fax (253) 627-4730

DRAFTED: YS	CHECKED: JL
DATE: 8-10-05	JOB NO.: 15-0761-02
SCALE: 1"=100'	FIELD CREW:

INDEX DATA: NW1/4 NW1/4, SE1/4 NW1/4 & SW1/4 NW1/4 SEC.2, T.18 N., R1W W.M.

FOR: BINDING SITE PLAN
MERIDIAN GROUP NO.1

CITY OF LACEY, THURSTON COUNTY, WASHINGTON

SHT. 2 OF 2

Analyisis

- Analyze the potential flow through the existing 18 inch concrete culverts at Marvin Road NE.

  Find the maximum flow if the culvert openings are free of debris and the water ponds to the overflow elevation (i.e., the centerline elevation of Marvin Road at the low point in the profile). This elevation appears to be close to El. 206 per the contour map for the site.

  CulvertMaster software by Haestad Methods was used to perform the culvert flow analysis. This software procedure follows the HY-8 procedure developed by the Corps of Engineers.

  The maximum flow rate is nearly 52 cfs (the rate varies some due to the effect of tailwater, since the culverts operate in the 'outlet control' condition). This differs from the rate of 16 cfs as stated in the Patrick Harron & Assoc. Drainage and Erosion Control Report. Apparently, the 16 cfs rate relates to full pipe flow per Manning's equation rather than a culvert analysis based on head and on tailwater conditions.

Design

During the design process, the modeling effort determined that placing a control structure at the upstream end of these two culverts would greatly reduce the potential of flooding area(s) downstream due to "overflow" from the storm pond facility. Basically, for all overflow conditions, the flows to downstream can be reduced by 50%, or more, depending on the overflow rate and volume.

Therefore, a structure has been designed for the purpose of taking "full advantage" of hydraulic and topographic conditions at the site.

Culvert Calculator Report
Extg 18 inch Culverts (2) at Marvin Rd

Solve For: Discharge

Culvert Summary			
Allowable HW Elevation	205.75 ft	Headwater Depth/ Height	6.93
Computed Headwater Elevation	205.75 ft	Discharge	53.75 cfs
Inlet Control HW Elev	203.71 ft	Tailwater Elevation	196.00 ft — ASSUMED
Outlet Control HW Elev	205.75 ft	Control Type	Outlet Control

Grades			
Upstream Invert	195.35 ft	Downstream Invert	194.90 ft
Length	77.00 ft	Constructed Slope	0.005844 ft/ft

Hydraulic Profile			
Profile	CompositeM2Pressure	Depth, Downstream	1.49 ft
Slope Type	Mild	Normal Depth	N/A ft
Flow Regime	Subcritical	Critical Depth	1.49 ft
Velocity Downstream	15.22 ft/s	Critical Slope	0.061126 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	1.50 ft
Section Size	18 inch	Rise	1.50 ft
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev	205.75 ft	Upstream Velocity Head	3.59 ft
Ke	0.20	Entrance Loss	0.72 ft

Inlet Control Properties			
Inlet Control HW Elev	203.71 ft	Flow Control	Submerged
Inlet Type	Groove end projecting	Area Full	3.5 ft²
K	0.00450	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	3
C	0.03170	Equation Form	1
Y	0.69000		

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Culvert Calculator Report
Extg 18 inch Culverts (2) at Marvin Rd

Solve For: Discharge

Culvert Summary			
Allowable HW Elevation	205.75 ft	Headwater Depth/ Height	6.93
Computed Headwater Elevation	205.75 ft	Discharge	51.99 cfs
Inlet Control HW Elev	203.24 ft	Tailwater Elevation	197.00 ft ← ASSUMED
Outlet Control HW Elev	205.75 ft	Control Type	Outlet Control

Grades			
Upstream Invert	195.35 ft	Downstream Invert	194.90 ft
Length	77.00 ft	Constructed Slope	0.005844 ft/ft

Hydraulic Profile			
Profile	Pressure	Depth, Downstream	2.10 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	1.49 ft
Velocity Downstream	14.71 ft/s	Critical Slope	0.056932 ft/ft

Section			
Section Shape	Circular	Mannings Coefficient	0.013
Section Material	Concrete	Span	1.50 ft
Section Size	18 inch	Rise	1.50 ft
Number Sections	2		

Outlet Control Properties			
Outlet Control HW Elev	205.75 ft	Upstream Velocity Head	3.36 ft
Ke	0.20	Entrance Loss	0.67 ft

Inlet Control Properties			
Inlet Control HW Elev	203.24 ft	Flow Control	Submerged
Inlet Type	Groove end projecting	Area Full	3.5 ft²
K	0.00450	HDS 5 Chart	1
M	2.00000	HDS 5 Scale	3
C	0.03170	Equation Form	1
Y	0.69000		

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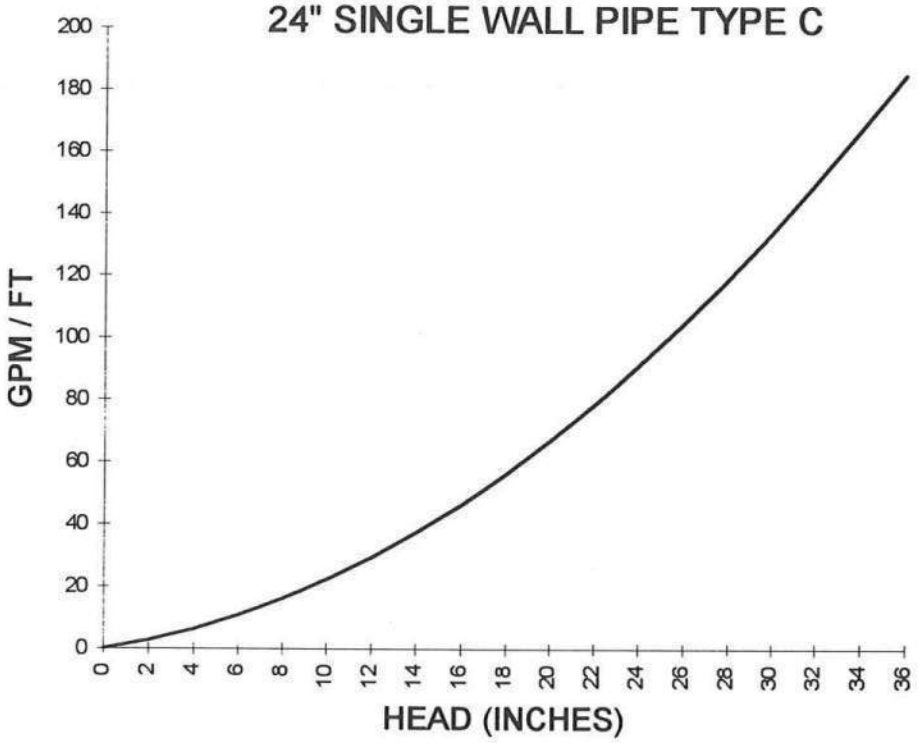
37 Brookside Road Waterbury, CT 06708 USA (203) 755-1666

OUTFLOWS - ADS PIPE
24" N-12 PIPE TYPE S &
24" SINGLE WALL PIPE TYPE C



FACTORS FOR OUTFLOW CALCULATIONS
ADS 24" N-12 PIPE TYPE S & 24" SINGLE WALL PIPE TYPE C

OPEN AREA	AO	A1	A2	H2	H	Q=GPM/FT
1.5	0.04	1.1	0.112	0	0	0.04
1.5	0.04	1.1	0.112	4	2	2.69
1.5	0.04	1.1	0.112	16	4	6.23
1.5	0.04	1.1	0.112	36	6	10.67
1.5	0.04	1.1	0.112	64	8	16.01
1.5	0.04	1.1	0.112	100	10	22.24
1.5	0.04	1.1	0.112	144	12	29.37
1.5	0.04	1.1	0.112	196	14	37.39
1.5	0.04	1.1	0.112	256	16	46.31
1.5	0.04	1.1	0.112	324	18	56.13
1.5	0.04	1.1	0.112	400	20	66.84
1.5	0.04	1.1	0.112	484	22	78.45
1.5	0.04	1.1	0.112	576	24	90.95
1.5	0.04	1.1	0.112	676	26	104.35
1.5	0.04	1.1	0.112	784	28	118.65
1.5	0.04	1.1	0.112	900	30	133.84
1.5	0.04	1.1	0.112	1024	32	149.93
1.5	0.04	1.1	0.112	1156	34	166.91
1.5	0.04	1.1	0.112	1296	36	184.79

NOTE: Q = AO + (A1*H) + (A2*H2)

0.41 cfs / LF

16.5 cfs in 40 LF

Infiltration

The Stormwater Management Manual for the Puget Sound presents a formula that can be used in the evaluation of infiltration rates as head increases. This information is presented on the following pages and is followed by spreadsheets that apply this formula to the site of this report.

Another author presents information relating to the practice of allotting a reduced rate (0.7) factor to the flow that leaves through the sides of the pond. This same author also presents a representation of infiltration plots for a 'straightline' (constant infiltration rate with a gradient of 1.0) plot and a plot for the same analysis developed from a Green-Ampt analysis. For this particular example, the rate from the Green-Ampt analysis varies from the constant gradient approach, by a factor of as much as 1.79 for the flow through the pond floor.

Therefore, our approach, which is the 'straightline' type (gradient = 1.0), is likely conservative. A stage/discharge curve has been developed in a separate symbol in a HydroCAD model and this information was then entered as a 'special user input file' in the model that evaluates routing at the pond. This is done separately because all of the pond surface area does not allow for infiltration at a rate of 4 in/hr.

In summary, the following procedure may be used for investigating the feasibility of using infiltration BMPs:

Preliminary Screening - Investigate soil characteristics and General Limitations based on published soil surveys, local studies, and field investigations of site. If the soil infiltration rate is less than 0.5 inches per hour, the site is not feasible for infiltration. If the soil infiltration rate is greater than 2.4 inches per hour it may be acceptable for streambank erosion control purposes but not runoff treatment.

Soil Borings - Soil borings will be required for two purposes:

(1) Collect soil samples so that a textural analysis can be conducted. The textural analysis is to be used to determine the following variables:

- infiltration rate, f
- cation exchange capacity, CEC
- percent clay content

Soils identified by the textural analysis as Hydrologic Soil Group B are the most appropriate ones for providing *runoff treatment*; those which are Hydrologic Soil Group A are most appropriate for providing *streambank erosion control*.

If this analysis indicates that any of the conditions in General Limitation #1 are violated, then infiltration should not be pursued.

(2) Determine location and depth to the seasonal high water table, bedrock, impermeable layer, and/or dissimilar soil layers.

If this analysis indicates that any of the conditions in General Limitation #2 are violated, then infiltration should not be pursued.

At this point, the feasibility of infiltration should be clearly established. If feasible, the applicant may proceed to size and design the BMP as described in Sections III-3.4, III-3.6, and III-3.7 subject to meeting all other General Limitations.

III-3.4 GENERAL DESIGN CRITERIA FOR INFILTRATION AND FILTRATION BMPs

A Darcy's Law approach is recommended for sizing both infiltration and filtration BMPs. Stage-storage and stage-discharge relationships can be developed and, through an iterative process, the final BMP size and geometry can then be determined by routing the appropriate design storm(s) through the facility. See Section III-1.4.3 for guidance on developing storage-discharge relationships.

Darcy's Law of ground water movement can be used to develop the stage-discharge relationship (Figure III-3.6 illustrates Darcy's Law):

$$Q = f * i * A_s, \text{ where}$$

Q = flowrate at which runoff is infiltrated/filtrated by BMP
f = infiltration rate of soil or filtration media
i = hydraulic gradient
A_s = Surface area of the infiltration or filtration BMP

Conservative values of "f" should be used. For infiltration BMPs, a factor of safety of two should be applied to the infiltration rate determined from the textural analysis and, hereafter, the design infiltration rate will be labeled "f_d" where $f_d = 0.5 * f$. For sand filtration BMPs an "f" value of about 2 inches per

hour is recommended for design purposes. This appears to be a low value but reflects actual rates achieved by operating sand filtration systems treating urban runoff.

NOTE: A_s **is not** the cross-sectional area of the BMP, e.g., for a trench with length L_t, width W, and depth D, the bottom area of the trench is $A_s = L_t * W$ while the cross-sectional area is W * D. The surface area A_s is determined from the basin geometry; it may be necessary to planimeter or otherwise compute the area (see Section III-1.4.4 for an example).

The hydraulic gradient is given by the equation:

$$i = \frac{h + L}{L}$$

where h is the height of the water column over the infiltration/filtration media and L is the distance from the top surface of the BMP to the water table, bedrock, impermeable layer, or soil layer of different infiltration rate (for latter applied to sand filtration BMPs it is the bottom of the filtration bed = 18").

If the approximate area available for the BMP is known then a preliminary stage-discharge relationship can be developed, i.e.,

$$Q = f_d * \frac{h + L}{L} * A_s$$

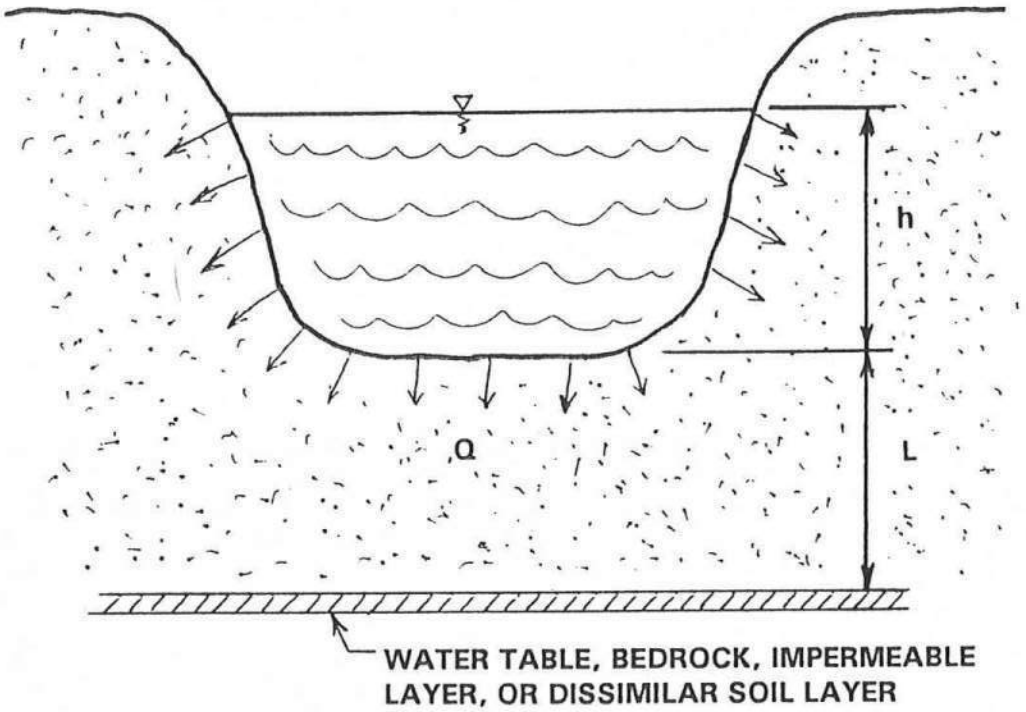
If the approximate depth available for the BMP is known then a stage-storage relationship can also be developed (see Section III-1.4). A minimum of one foot of freeboard is recommended when establishing the BMP depth.

The appropriate design storms can then be routed through the BMP using a level pool analysis (Section III-1.4.4) to finalize the BMP size and geometry. This will be an iterative process. The analysis must demonstrate that the BMP will completely percolate the design storm within 24 hours (or 48 hours for the 100-year event). If this is not the case the surface area and or depth of the BMP will have to be increased. If the analysis indicates that the design storms can only be partially infiltrated the BMP should still be utilized but the additional runoff must be conveyed to another BMP for runoff treatment and/or streambank erosion control. *(Note: If a Water Quality Infiltration Basin or Trench (BMP RI.05 or RI.06, respectively) is preceded by a Presettling Basin (BMP RD.10) then the <u>combination</u> of both BMPs (i.e., the Presettling Basin <u>and</u> the Infiltration BMP) must be designed to drain the 6-month, 24-hour design storm within 24 hours. This is necessary to ensure that aerobic conditions are maintained in the infiltration BMP.)*

<u>Preliminary Sizing Example</u>

An infiltration trench is proposed to treat the 6-month, 24-hour design storm for a development site. Soils investigations indicate that a sandy loam soil (f = 1.5 in/hr) extends for at least 5 feet below the land surface. A BMP depth of about 3 feet is proposed. The surface area available for the BMP is approximately 100 square feet. The depth to the water table is estimated to be 75 feet. No impermeable soil layers were detected within 10 feet of the surface and none expected within at least 50 feet. For preliminary design purposes the trench is planned to be 30 feet long, 3 feet wide, and 2 feet deep. It will be filled with rocks such that the void ratio is 0.4. The following preliminary design is developed:

Figure III-3.6
Darcy's Law of Ground water Movement



Stage-discharge Relationship

*f = 1.5 inches/hour, thus f_d = 0.5 * 1.5 = 0.75 inches/hour*
= 0.0625 ft/hr

h = variable - maximum of 2 feet

L = assume 10 feet

*A_s = bottom surface area = 30 * 3 = 90 sq. ft.*

Solving for Q in Darcy's equation gives:

$$Q = f_d * \frac{h + L}{L} * A_s = 0.0625 * \frac{h + 10}{10} * 90 \quad or,$$

$$Q = (1.25 * h) + 12.5$$

Stage-storage Relationship

The stage-storage relationship would be:

$S = A_s * h * Void\ Ratio$

$= 90 * h * 0.4$, *or*

$S = 36 * h$

Results of Preliminary Sizing

The tabular form of the stage-discharge and stage-discharge relationships would be:

h (ft)	i (ft/ft)	Q (cfs)	S (cu.ft.)
0.0	1.0	5.6	0
0.5	1.05	5.9	18
1.0	1.1	6.2	36
1.5	1.15	6.5	54
2.0	1.2	6.8	72

Note that for design purposes it may be simpler to set the hydraulic gradient, i, equal to 1 thus making the discharge independent of stage.

At this point a level pool routing should be conducted to develop the final design dimensions of the BMP, ensuring, however, that the BMP will completely infiltrate the design storm(s) within 24 hours.

III-3.5 CONSTRUCTION AND MAINTENANCE

III-3.5.1 Overview

The failure of infiltration and filtration BMPs to function properly can often be traced back to construction and maintenance issues. By utilizing appropriate construction practices and conducting systematic and rigorous maintenance, infiltration/filtration BMPs should function properly.

Refer to PSM, pages III-3-16 thru III-3-19

Formula: $Q=fd(h+L/L)^{*}As$, where $i=h+L/L$ FOR, $L=10'$

For, Fd = 4 in/hr

Head h (ft)	Elevation	Hydraulic Conductivity i (for L=10) (factor)	Surface Area A (sf)	Discharge Q (cfs)
0	185	1.00	49796	4.61
1	186	1.10	51772	5.27
2	187	1.20	53419	5.94
3	188	1.30	54792	6.60
4	189	1.40	55935	7.25
5	190	1.50	56889	7.90
6	191	1.60	61654	9.13
7	192	1.70	61654	9.70
8	193	1.80	61654	10.28
9	194	1.90	61654	10.85
10	195	2.00	61654	11.42
11	196	2.10	61654	11.99
12	197	2.20	61654	12.56
13	198	2.30	61654	13.13
14	199	2.40	61654	13.70
15	200	2.50	61654	14.27
16	201	2.60	61654	14.84
17	202	2.70	61654	15.41
18	203	2.80	61654	15.98
19	204	2.90	61654	16.56
20	205	3.00	61654	17.13

* assumed surface area available for infiltration

Data for Stage/Discharge Table

Refer to PSM, pages III-3-16 thru III-3-19

Formula: $Q=fd(h+L/L)*As$, where $i=h+L/L$ For, $L=3'$

For, Fd = 4 in/hr

Head h (ft)	Elevation	Hydraulic Conductivity i (for L=3) (factor)	Surface Area A* (sf)	Discharge Q (cfs)
0	185	1.00	49796	4.61
1	186	1.33	51772	6.39
2	187	1.67	53419	8.24
3	188	2.00	54792	10.15
4	189	2.33	55935	12.08
5	190	2.67	56889	14.05
6	191	3.00	61654	17.13
7	192	3.33	61654	19.03
8	193	3.67	61654	20.93
9	194	4.00	61654	22.83
10	195	4.33	61654	24.74
11	196	4.67	61654	26.64
12	197	5.00	61654	28.54
13	198	5.33	61654	30.45
14	199	5.67	61654	32.35
15	200	6.00	61654	34.25
16	201	6.33	61654	36.16
17	202	6.67	61654	38.06
18	203	7.00	61654	39.96
19	204	7.33	61654	41.86
20	205	7.67	61654	43.77

* assumed surface area available for infiltration

Data for Stage/Discharge Table

Refer to PSM, pages III-3-16 thru III-3-19

Formula: $Q=fd(h+L/L)*As$, where $i=h+L/L$

For, Fd = 4 in/hr

However, assume hydraulic gradient is constant at 1.0

Head h (ft)	Elevation	Hydraulic Conductivity i = 1 (factor)	Surface Area A* (sf)	Discharge Q (cfs)
0	185	1.00	49796	4.61
1	186	1.00	51772	4.79
2	187	1.00	53419	4.95
3	188	1.00	54792	5.07
4	189	1.00	55935	5.18
5	190	1.00	56889	5.27
6	191	1.00	61654	5.71
7	192	1.00	61654	5.71
8	193	1.00	61654	5.71
9	194	1.00	61654	5.71
10	195	1.00	61654	5.71
11	196	1.00	61654	5.71
12	197	1.00	61654	5.71
13	198	1.00	61654	5.71
14	199	1.00	61654	5.71
15	200	1.00	61654	5.71
16	201	1.00	61654	5.71
17	202	1.00	61654	5.71
18	203	1.00	61654	5.71
19	204	1.00	61654	5.71
20	205	1.00	61654	5.71

* assumed surface area available for infiltration

STORMWATER INFILTRATION

Bruce K. Ferguson

LEWIS PUBLISHERS
Boca Raton Ann Arbor London Tokyo

INFILTRATION BASIN THROUGHFLOWS

Water that enters an infiltration basin is partitioned over time into infiltration, evaporation, overflow and change in basin storage. Thus an infiltration basin has its own water balance. Quantitative modeling of a basin's throughflows and storage is a basis for infiltration basin design, whether during individual storm events or over the seasons in the long-term water balance. It is similar in principle to any other reservoir routing.

The inflow to a basin is direct runoff from the drainage area and, if the basin is open at the surface, direct precipitation. Direct runoff (m^3) entering a basin during a storm event can be estimated using any one of a variety of documented rainfall-runoff models. They all take into account the size and condition of the drainage area and characteristics of rainfall. Some of them were discussed by Ferguson and Debo (1990), Chow, Maidment and Mays (1988) and the U.S. Soil Conservation Service (1986). Published sources of storm precipitation data to use as input to the models include the U.S. Weather Bureau's *Technical Paper 40* (Hershfield, 1961), the U.S. Soil Conservation Service's (1986) *Technical Release 55*, and local drainage manuals.

Ponding time

Ponding time is a simple summary way to characterize a basin's behavior during a storm event. If a given basin is assumed to be filled to capacity instantaneously, with no further inflows during the event, the given depth of ponded water will take a certain amount of time to infiltrate. The volume infiltrated during this time is depth of water (in a subsurface basin, total depth times void space) times basin floor area.

One approach to estimation of ponding time is to assume that the hydraulic gradient is constant at 1.0 and thus that the infiltration rate is a constant equal to the soil's hydraulic conductivity K. Thus, with all infiltration through a level floor, ponding time = depth/K. With an appropriate safety factor Sf applied to the conductivity, ponding time = depth/(KSf). In Figure 3.5, one of the curves shows cumulative infiltration through the floor of a 100-m^2 basin at a constant K of 0.68 cm/h. With an initial ponding depth of 75 cm, total ponding time by this method is 110 h.

$\frac{1076 \times .27}{3600 \times 12} = 0.0067$ cfs 1076 SF 0.27 in/hr

* 50 m³/42 hr → 1.19 m³/hr, then divide by 0.02832 → 42 cu ft/hr or 0.012 cfs

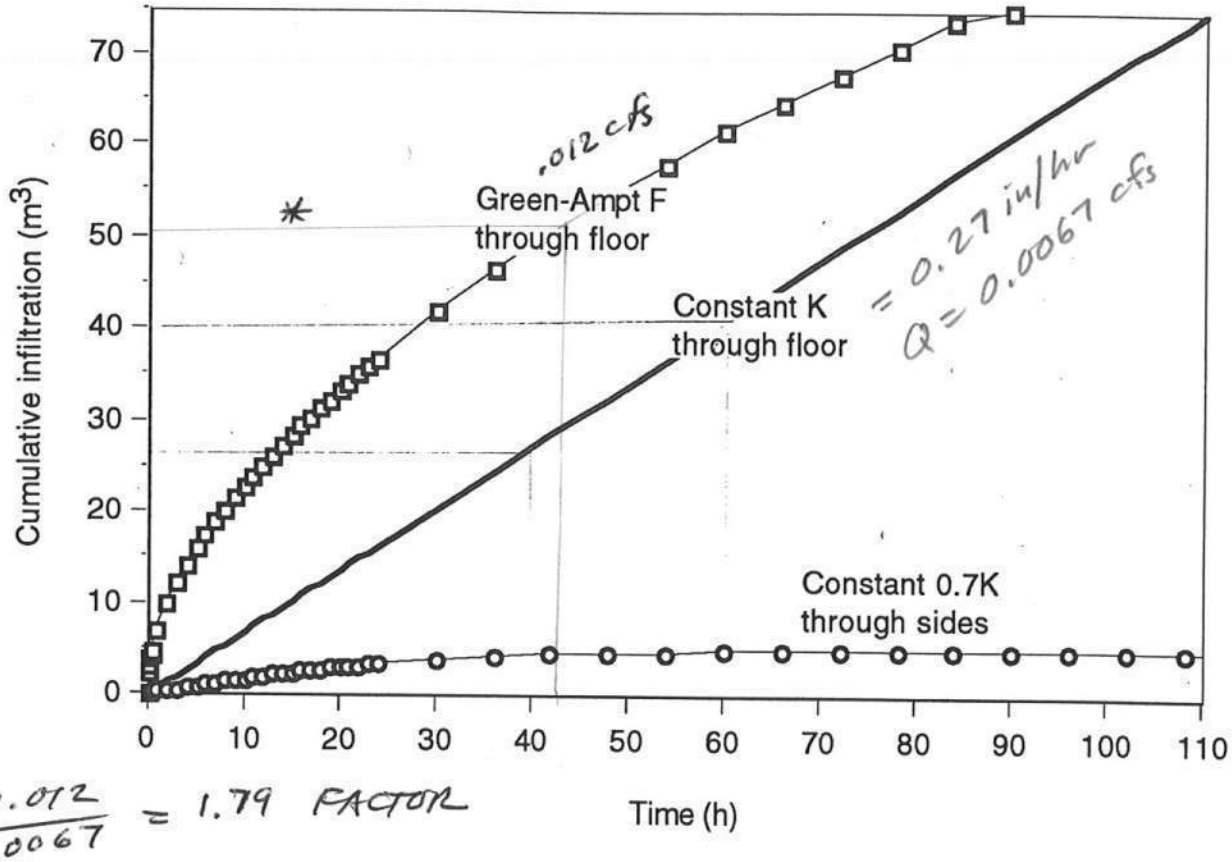


Figure 3.5 Cumulative infiltration from a hypothetical basin predicted by the constant-rate and Green-Ampt methods. The basin is initially ponded 75 cm deep; thus the initial ponded volume is 75 m^3. K is 0.68 cm/h.

An alternative approach is to apply the Green-Ampt model. The depth of ponding at the beginning of the event is the initial h_o. The Green-Ampt equation can be applied repetitively to track the gradual decline of the ponded water surface toward the basin floor. The depth of ponding in each time increment is equal to the initial depth h_o less the cumulative infiltration. The entire ponded volume has infiltrated when cumulative infiltration F equals the initial ponded depth.

One of the curves in Figure 3.5 shows ponding behavior estimated with a spreadsheet application of Green and Ampt's equation for F. Data entered for this example were $\psi = 16.68$ cm, $\theta_e = 0.486$, and $s_e = 0.3$. The initially steep slope of the F curve shows that the Green-Ampt infiltration is rapid at the beginning of the event, when total hydraulic gradient is high. The

Pond I: INFILTRATION (MODEL EFFECTIVE AREA)

Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-360.00 hrs, dt= 0.25 hrs
Peak Elev= 0.00' @ 0.00 hrs Surf.Area= 0 sf Storage= 0 cf

Plug-Flow detention time= (not calculated)
Center-of-Mass det. time= (not calculated)

Volume	Invert	Avail.Storage	Storage Description
#1	185.00'	334,350 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

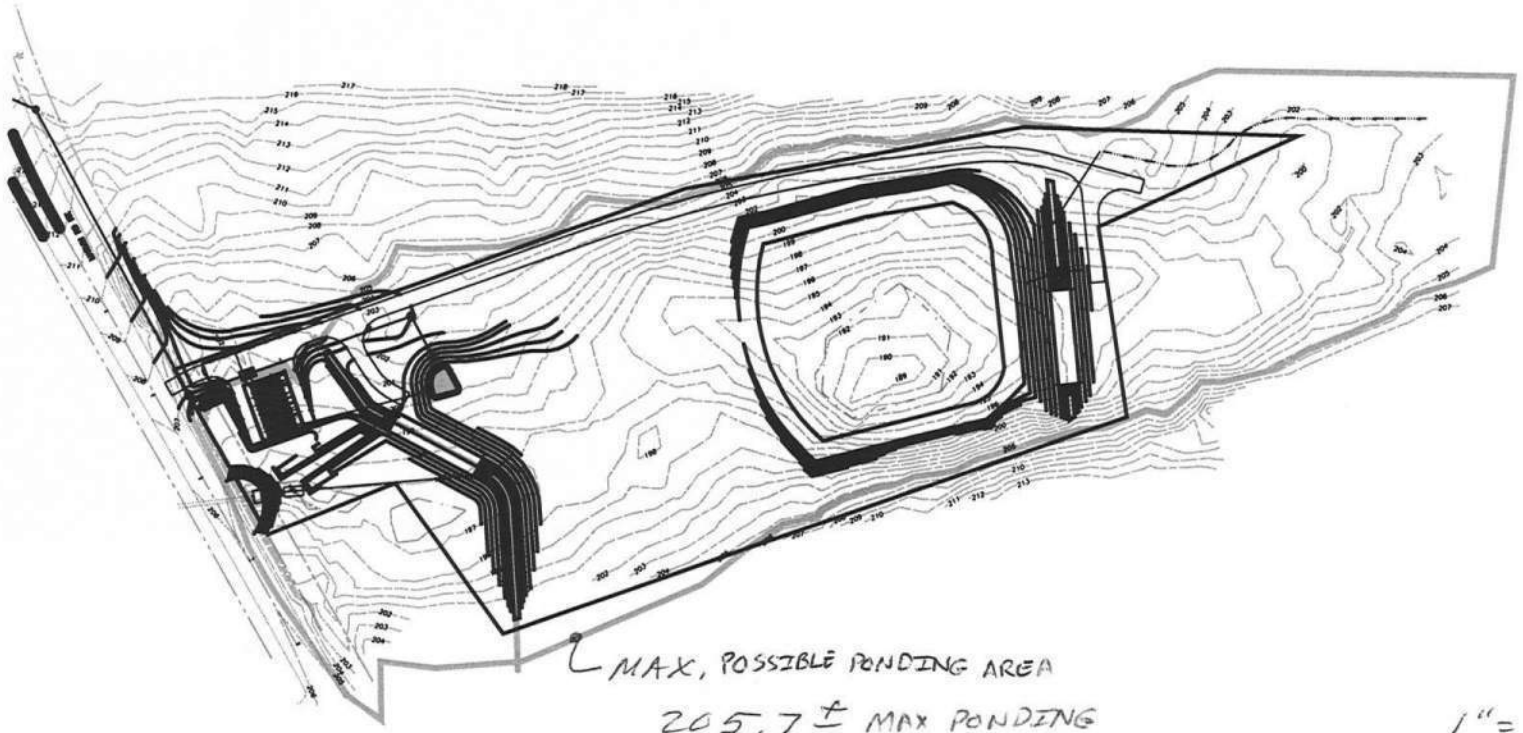
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
185.00	49,796	0	0
191.00	61,654	334,350	334,350

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**4.000 in/hr Exfiltration at 4 IN/HR over Surface area**

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
↑**1=Exfiltration at 4 IN/HR** (Controls 0.00 cfs)

Stage-Discharge for Pond I: INFILTRATION (MODEL EFFECTIVE AREA)

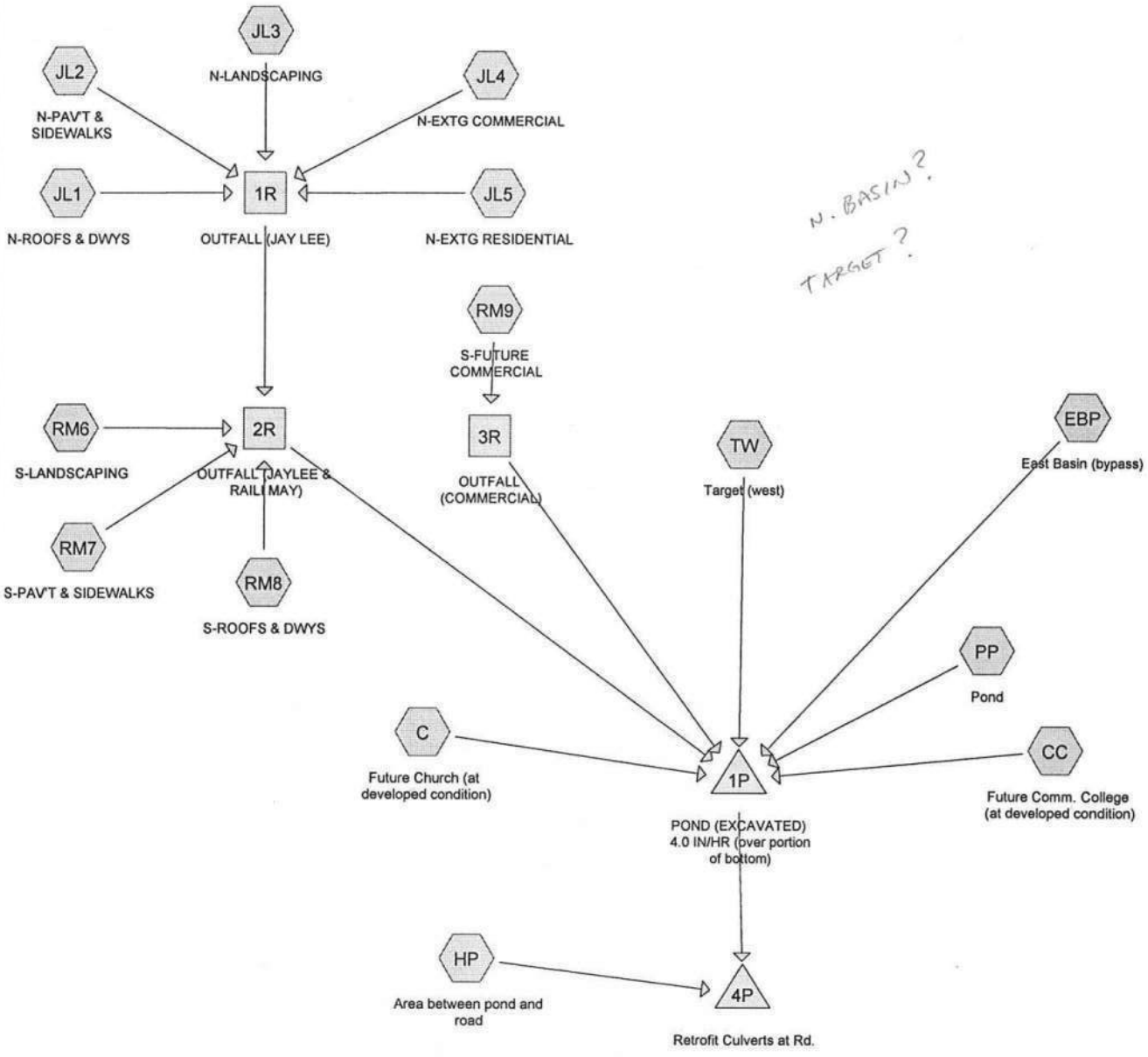
Elevation (feet)	Discarded (cfs)	Elevation (feet)	Discarded (cfs)	Elevation (feet)	Discarded (cfs)
185.00	0.00	187.08	4.99	189.16	5.37
185.04	4.62	187.12	5.00	189.20	5.38
185.08	4.63	187.16	5.01	189.24	5.39
185.12	4.63	187.20	5.01	189.28	5.39
185.16	4.64	187.24	5.02	189.32	5.40
185.20	4.65	187.28	5.03	189.36	5.41
185.24	4.65	187.32	5.04	189.40	5.42
185.28	4.66	187.36	5.04	189.44	5.42
185.32	4.67	187.40	5.05	189.48	5.43
185.36	4.68	187.44	5.06	189.52	5.44
185.40	4.68	187.48	5.06	189.56	5.45
185.44	4.69	187.52	5.07	189.60	5.45
185.48	4.70	187.56	5.08	189.64	5.46
185.52	4.71	187.60	5.09	189.68	5.47
185.56	4.71	187.64	5.09	189.72	5.47
185.60	4.72	187.68	5.10	189.76	5.48
185.64	4.73	187.72	5.11	189.80	5.49
185.68	4.74	187.76	5.12	189.84	5.50
185.72	4.74	187.80	5.12	189.88	5.50
185.76	4.75	187.84	5.13	189.92	5.51
185.80	4.76	187.88	5.14	189.96	5.52
185.84	4.76	187.92	5.15	190.00	5.53
185.88	4.77	187.96	5.15	190.04	5.53
185.92	4.78	188.00	5.16	190.08	5.54
185.96	4.79	188.04	5.17	190.12	5.55
186.00	4.79	188.08	5.17	190.16	5.55
186.04	4.80	188.12	5.18	190.20	5.56
186.08	4.81	188.16	5.19	190.24	5.57
186.12	4.82	188.20	5.20	190.28	5.58
186.16	4.82	188.24	5.20	190.32	5.58
186.20	4.83	188.28	5.21	190.36	5.59
186.24	4.84	188.32	5.22	190.40	5.60
186.28	4.84	188.36	5.23	190.44	5.61
186.32	4.85	188.40	5.23	190.48	5.61
186.36	4.86	188.44	5.24	190.52	5.62
186.40	4.87	188.48	5.25	190.56	5.63
186.44	4.87	188.52	5.25	190.60	5.64
186.48	4.88	188.56	5.26	190.64	5.64
186.52	4.89	188.60	5.27	190.68	5.65
186.56	4.90	188.64	5.28	190.72	5.66
186.60	4.90	188.68	5.28	190.76	5.66
186.64	4.91	188.72	5.29	190.80	5.67
186.68	4.92	188.76	5.30	190.84	5.68
186.72	4.93	188.80	5.31	190.88	5.69
186.76	4.93	188.84	5.31	190.92	5.69
186.80	4.94	188.88	5.32	190.96	5.70
186.84	4.95	188.92	5.33	191.00	**5.71**
186.88	4.95	188.96	5.34		
186.92	4.96	189.00	5.34		
186.96	4.97	189.04	5.35		
187.00	4.98	189.08	5.36		
187.04	4.98	189.12	5.36		



℄ MAX. POSSIBLE PONDING AREA

205.7± MAX PONDING
ELEVATION PRIOR TO FLOODING
OVER MARVIN ROAD

1" = 200'



Drainage Diagram for 2220-03 Final
Prepared by Hopper Dennis Jellison, PLLC 4/20/2006
HydroCAD® 7.14 s/n 000668 © 2006 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcats)
12.477	76	Woods (EBP,HP)
26.487	88	Landscaping (JL3,JL4,JL5,RM6,RM9)
1.730	90	Pervious (TW)
1.317	90	Pervious (15% assumed) (C)
18.058	90	Pervious (assumed) (CC)
4.900	92	Composite for gravel access and Pervious (PP)
0.300	92	Gravel (HP)
5.986	98	59 Townhomes & 85 Single family (JL1)
26.686	98	Impervious (JL4,JL5,RM7,RM8,RM9,TW)
7.461	98	Impervious (85% assumed) (C)
30.464	98	Impervious (assumed) (CC)
9.747	98	Pavement & Sidewalks (JL2)
0.300	98	Road (HP)
1.000	100	Ponded water (PP)
146.913		

Time span=0.00-72.00 hrs, dt=0.25 hrs, 289 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment C: Future Church (at developed condition) Runoff Area=8.778 ac Runoff Depth=5.79"
Tc=20.0 min CN=97 Runoff=14.98 cfs 4.238 af

Subcatchment CC: Future Comm. College (at developed con Runoff Area=48.522 ac Runoff Depth=5.56"
Tc=20.0 min CN=95 Runoff=80.52 cfs 22.484 af

Subcatchment EBP: East Basin (bypass) Runoff Area=11.340 ac Runoff Depth=3.51"
Tc=60.0 min CN=76 Runoff=6.49 cfs 3.317 af

Subcatchment HP: Area between pond and road Runoff Area=1.737 ac Runoff Depth=4.23"
Tc=60.0 min CN=83 Runoff=1.32 cfs 0.612 af

Subcatchment JL1: N-ROOFS & DWYS Runoff Area=260,750 sf Runoff Depth=5.91"
Tc=5.0 min CN=98 Runoff=11.71 cfs 2.949 af

Subcatchment JL2: N-PAV'T & SIDEWALKS Runoff Area=424,590 sf Runoff Depth=5.91"
Tc=5.0 min CN=98 Runoff=19.06 cfs 4.802 af

Subcatchment JL3: N-LANDSCAPING Runoff Area=483,500 sf Runoff Depth=4.77"
Flow Length=100' Slope=0.0200 '/' Tc=10.5 min CN=88 Runoff=16.09 cfs 4.413 af

Subcatchment JL4: N-EXTG COMMERCIAL Runoff Area=32,720 sf Runoff Depth=5.68"
Tc=5.0 min CN=96 Runoff=1.44 cfs 0.355 af

Subcatchment JL5: N-EXTG RESIDENTIAL Runoff Area=34,440 sf Runoff Depth=4.88"
Flow Length=200' Slope=0.0400 '/' Tc=13.8 min CN=89 Runoff=1.21 cfs 0.322 af

Subcatchment PP: Pond Runoff Area=5.900 ac Runoff Depth=5.33"
Tc=6.0 min CN=93 Runoff=10.37 cfs 2.621 af

Subcatchment RM6: S-LANDSCAPING Runoff Area=573,100 sf Runoff Depth=4.77"
Flow Length=100' Slope=0.0200 '/' Tc=10.5 min CN=88 Runoff=19.07 cfs 5.230 af

Subcatchment RM7: S-PAV'T & SIDEWALKS Runoff Area=324,900 sf Runoff Depth=5.91"
Tc=5.0 min CN=98 Runoff=14.59 cfs 3.674 af

Subcatchment RM8: S-ROOFS & DWYS Runoff Area=277,350 sf Runoff Depth=5.91"
Tc=5.0 min CN=98 Runoff=12.45 cfs 3.137 af

Subcatchment RM9: S-FUTURE COMMERCIAL Runoff Area=414,650 sf Runoff Depth=5.68"
Tc=5.0 min CN=96 Runoff=18.19 cfs 4.503 af

Subcatchment TW: Target (west) Runoff Area=5.760 ac Runoff Depth=5.68"
Tc=13.2 min CN=96 Runoff=10.11 cfs 2.725 af

Reach 1R: OUTFALL (JAY LEE) Avg. Depth=2.67' Max Vel=7.02 fps Inflow=47.61 cfs 12.840 af
D=32.0" n=0.013 L=2,700.0' S=0.0050 '/' Capacity=34.45 cfs Outflow=34.93 cfs 12.840 af

Reach 2R: OUTFALL (JAYLEE & RAILI M Avg. Depth=2.37' Max Vel=10.71 fps Inflow=73.19 cfs 24.882 af
D=42.0" n=0.013 L=2,500.0' S=0.0085 '/' Capacity=92.76 cfs Outflow=70.29 cfs 24.882 af

Reach 3R: OUTFALL (COMMERCIAL) Inflow=18.19 cfs 4.503 af
Outflow=18.19 cfs 4.503 af

Pond 1P: POND (EXCAVATED) 4.0 IN Peak Elev=200.88' Storage=1,344,400 cf Inflow=197.28 cfs 64.770 af
Discarded=5.72 cfs 29.810 af Primary=26.80 cfs 34.960 af Secondary=0.00 cfs 0.000 af Outflow=32.52 cfs 64.770 af

Pond 4P: Retrofit Culverts at Rd. Peak Elev=203.23' Storage=672,517 cf Inflow=27.18 cfs 35.572 af
Discarded=5.72 cfs 15.473 af Primary=7.74 cfs 20.099 af Outflow=13.46 cfs 35.572 af

Total Runoff Area = 146.913 ac Runoff Volume = 65.382 af Average Runoff Depth = 5.34"
44.43% Pervious Area = 65.269 ac 55.57% Impervious Area = 81.644 ac

Subcatchment C: Future Church (at developed condition)

Runoff = 14.98 cfs @ 8.26 hrs, Volume= 4.238 af, Depth= 5.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Thurston 24-hr 100-yr 100-yr Rainfall=6.15"

Area (ac)	CN	Description
7.461	98	Impervious (85% assumed)
1.317	90	Pervious (15% assumed)
8.778	97	Weighted Average
1.317		Pervious Area
7.461		Impervious Area

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

Subcatchment CC: Future Comm. College (at developed condition)

Runoff = 80.52 cfs @ 8.26 hrs, Volume= 22.484 af, Depth= 5.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Thurston 24-hr 100-yr 100-yr Rainfall=6.15"

Area (ac)	CN	Description
30.464	98	Impervious (assumed)
18.058	90	Pervious (assumed)
48.522	95	Weighted Average
18.058		Pervious Area
30.464		Impervious Area

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

Subcatchment EBP: East Basin (bypass)

Runoff = 6.49 cfs @ 8.80 hrs, Volume= 3.317 af, Depth= 3.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Thurston 24-hr 100-yr 100-yr Rainfall=6.15"

Area (ac)	CN	Description
11.340	76	Woods
11.340		Pervious Area

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

Subcatchment HP: Area between pond and road

Runoff = 1.32 cfs @ 8.78 hrs, Volume= 0.612 af, Depth= 4.23"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Thurston 24-hr 100-yr 100-yr Rainfall=6.15"

Area (ac)	CN	Description
1.137	76	Woods
0.300	92	Gravel
0.300	98	Road
1.737	83	Weighted Average
1.437		Pervious Area
0.300		Impervious Area

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

Subcatchment JL1: N-ROOFS & DWYS

Runoff = 11.71 cfs @ 8.03 hrs, Volume= 2.949 af, Depth= 5.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Thurston 24-hr 100-yr 100-yr Rainfall=6.15"

Area (sf)	CN	Description
260,750	98	59 Townhomes & 85 Single family
260,750		Impervious Area

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

Subcatchment JL2: N-PAV'T & SIDEWALKS

Runoff = 19.06 cfs @ 8.03 hrs, Volume= 4.802 af, Depth= 5.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Thurston 24-hr 100-yr 100-yr Rainfall=6.15"

Area (sf)	CN	Description
424,590	98	Pavement & Sidewalks
424,590		Impervious Area

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

Subcatchment JL3: N-LANDSCAPING

Runoff = 16.09 cfs @ 8.16 hrs, Volume= 4.413 af, Depth= 4.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Thurston 24-hr 100-yr 100-yr Rainfall=6.15"

Area (sf)	CN	Description
483,500	88	Landscaping
483,500		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.80"

Subcatchment JL4: N-EXTG COMMERCIAL

Runoff = 1.44 cfs @ 8.03 hrs, Volume= 0.355 af, Depth= 5.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Thurston 24-hr 100-yr 100-yr Rainfall=6.15"

Area (sf)	CN	Description
27,810	98	Impervious
4,910	88	Landscaping
32,720	96	Weighted Average
4,910		Pervious Area
27,810		Impervious Area

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

Subcatchment JL5: N-EXTG RESIDENTIAL

Runoff = 1.21 cfs @ 8.21 hrs, Volume= 0.322 af, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Thurston 24-hr 100-yr 100-yr Rainfall=6.15"

Area (sf)	CN	Description
4,400	98	Impervious
30,040	88	Landscaping
34,440	89	Weighted Average
30,040		Pervious Area

	4,400		Impervious Area		

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.8	200	0.0400	0.24		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.80"

Subcatchment PP: Pond

Runoff = 10.37 cfs @ 8.04 hrs, Volume= 2.621 af, Depth= 5.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Thurston 24-hr 100-yr 100-yr Rainfall=6.15"

Area (ac)	CN	Description
1.000	100	Ponded water
4.900	92	Composite for gravel access and Pervious
5.900	93	Weighted Average
4.900		Pervious Area
1.000		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR-55 minimum**

Subcatchment RM6: S-LANDSCAPING

Runoff = 19.07 cfs @ 8.16 hrs, Volume= 5.230 af, Depth= 4.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Thurston 24-hr 100-yr 100-yr Rainfall=6.15"

Area (sf)	CN	Description
573,100	88	Landscaping
573,100		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	100	0.0200	0.16		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.80"

Subcatchment RM7: S-PAV'T & SIDEWALKS

Runoff = 14.59 cfs @ 8.03 hrs, Volume= 3.674 af, Depth= 5.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Thurston 24-hr 100-yr 100-yr Rainfall=6.15"

Area (sf)	CN	Description
324,900	98	Impervious
324,900		Impervious Area

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

Subcatchment RM8: S-ROOFS & DWYS

Runoff = 12.45 cfs @ 8.03 hrs, Volume= 3.137 af, Depth= 5.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Thurston 24-hr 100-yr 100-yr Rainfall=6.15"

Area (sf)	CN	Description
277,350	98	Impervious
277,350		Impervious Area

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

Subcatchment RM9: S-FUTURE COMMERCIAL

Runoff = 18.19 cfs @ 8.03 hrs, Volume= 4.503 af, Depth= 5.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Thurston 24-hr 100-yr 100-yr Rainfall=6.15"

Area (sf)	CN	Description
352,430	98	Impervious
62,220	88	Landscaping
414,650	96	Weighted Average
62,220		Pervious Area
352,430		Impervious Area

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

Subcatchment TW: Target (west)

Runoff = 10.11 cfs @ 8.19 hrs, Volume= 2.725 af, Depth= 5.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Thurston 24-hr 100-yr 100-yr Rainfall=6.15"

Area (ac)	CN	Description
4.030	98	Impervious
1.730	90	Pervious
5.760	96	Weighted Average
1.730		Pervious Area
4.030		Impervious Area

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

Reach 1R: OUTFALL (JAY LEE)

Inflow Area = 28.375 ac, Inflow Depth = 5.43" for 100-yr event
Inflow = 47.61 cfs @ 8.06 hrs, Volume= 12.840 af
Outflow = 34.93 cfs @ 8.28 hrs, Volume= 12.840 af, Atten= 27%, Lag= 13.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Max. Velocity= 7.02 fps, Min. Travel Time= 6.4 min
Avg. Velocity = 3.44 fps, Avg. Travel Time= 13.1 min

Peak Storage= 15,296 cf @ 8.18 hrs
Average Depth at Peak Storage= 2.67'
Capacity at bank full= 34.45 cfs
32.0" Diameter Pipe, n= 0.013
Length= 2,700.0' Slope= 0.0050 '/'

Reach 2R: OUTFALL (JAYLEE & RAILI MAY)

Inflow Area = 55.357 ac, Inflow Depth = 5.39" for 100-yr event
Inflow = 73.19 cfs @ 8.13 hrs, Volume= 24.882 af
Outflow = 70.29 cfs @ 8.27 hrs, Volume= 24.882 af, Atten= 4%, Lag= 8.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Max. Velocity= 10.71 fps, Min. Travel Time= 3.9 min
Avg. Velocity = 4.84 fps, Avg. Travel Time= 8.6 min

Peak Storage= 17,370 cf @ 8.22 hrs
Average Depth at Peak Storage= 2.37'
Capacity at bank full= 92.76 cfs
42.0" Diameter Pipe, n= 0.013
Length= 2,500.0' Slope= 0.0085 '/'

Reach 3R: OUTFALL (COMMERCIAL)

Inflow Area = 9.519 ac, Inflow Depth = 5.68" for 100-yr event
Inflow = 18.19 cfs @ 8.03 hrs, Volume= 4.503 af
Outflow = 18.19 cfs @ 8.03 hrs, Volume= 4.503 af, Atten= 0%, Lag= 0.0 min

Pond 1P: POND (EXCAVATED) 4.0 IN/HR (over portion of bottom)

EXISTING OVERFLOW STRUCTURE AND ROCK SPILLWAY MODELED WITH PROPOSED CONTROL MH

Inflow Area =	145.176 ac,	Inflow Depth =	5.35"	for	100-yr event
Inflow =	197.28 cfs @	8.24 hrs,	Volume=	64.770 af	
Outflow =	32.52 cfs @	15.62 hrs,	Volume=	64.770 af,	Atten= 84%, Lag= 442.8 min
Discarded =	5.72 cfs @	15.62 hrs,	Volume=	29.810 af	
Primary =	26.80 cfs @	15.62 hrs,	Volume=	34.960 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.25 hrs
Peak Elev= 200.88' @ 15.62 hrs Surf.Area= 204,942 sf Storage= 1,344,400 cf

Plug-Flow detention time= 849.0 min calculated for 64.702 af (100% of inflow)
Center-of-Mass det. time= 850.9 min (1,572.6 - 721.7)

Volume	Invert	Avail.Storage	Storage Description
#1	185.00'	1,471,792 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	196.00'	133,055 cf	**Custom Stage Data (East Pond) (Prismatic)** Listed below (Recalc)
		1,604,847 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
185.00	49,796	0	0
194.00	67,913	529,691	529,691
195.00	73,535	70,724	600,415
196.00	83,203	78,369	678,784
197.00	94,419	88,811	767,595
198.00	114,516	104,468	872,062
199.00	132,955	123,736	995,798
200.00	149,145	141,050	1,136,848
201.00	164,652	156,899	1,293,746
202.00	191,440	178,046	1,471,792

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	60	0	0
197.00	1,761	911	911
198.00	5,408	3,585	4,495
199.00	17,499	11,454	15,949
200.00	28,398	22,949	38,897
201.00	43,959	36,179	75,076
202.00	72,000	57,980	133,055

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**Special & User-Defined (Infiltration)**
			Elev. (feet) 185.00 185.20 191.00 202.00
			Disch. (cfs) 0.000 4.650 5.710 5.720
#2	Primary	195.40'	**24.0" x 47.0' long Culvert** RCP, square edge headwall, Ke= 0.500
			Outlet Invert= 195.40' S= 0.0000 '/' Cc= 0.900 n= 0.012
#3	Device 2	195.40'	**18.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#4	Device 2	200.60'	**52.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#5	Secondary	201.00'	**100.0' long x 20.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=5.72 cfs @ 15.62 hrs HW=200.88' (Free Discharge)
↑—**1=Special & User-Defined (Infiltration)** (Custom Controls 5.72 cfs)

Primary OutFlow Max=26.56 cfs @ 15.62 hrs HW=200.88' (Free Discharge)
↑—**2=Culvert** (Passes 26.56 cfs of 32.02 cfs potential flow)
↑—**3=Orifice/Grate** (Orifice Controls 19.92 cfs @ 11.27 fps)
—**4=Orifice/Grate** (Weir Controls 6.64 cfs @ 1.73 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=185.00' (Free Discharge)
↑—**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Retrofit Culverts at Rd.

Inflow Area = 146.913 ac, Inflow Depth = 2.91" for 100-yr event
Inflow = 27.18 cfs @ 15.60 hrs, Volume= 35.572 af
Outflow = 13.46 cfs @ 28.76 hrs, Volume= 35.572 af, Atten= 50%, Lag= 789.4 min
Discarded = 5.72 cfs @ 28.76 hrs, Volume= 15.473 af
Primary = 7.74 cfs @ 28.76 hrs, Volume= 20.099 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.25 hrs
Peak Elev= 203.23' @ 28.76 hrs Surf.Area= 359,442 sf Storage= 672,517 cf

Plug-Flow detention time= 595.9 min calculated for 35.449 af (100% of inflow)
Center-of-Mass det. time= 598.0 min (1,737.8 - 1,139.8)

Volume	Invert	Avail.Storage	Storage Description
#1	195.40'	126,496 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	201.00'	1,426,932 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		1,553,428 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.40	50	0	0
196.00	576	188	188
197.00	11,738	6,157	6,345
198.00	22,326	17,032	23,377
199.00	32,414	27,370	50,747
201.00	43,335	75,749	126,496

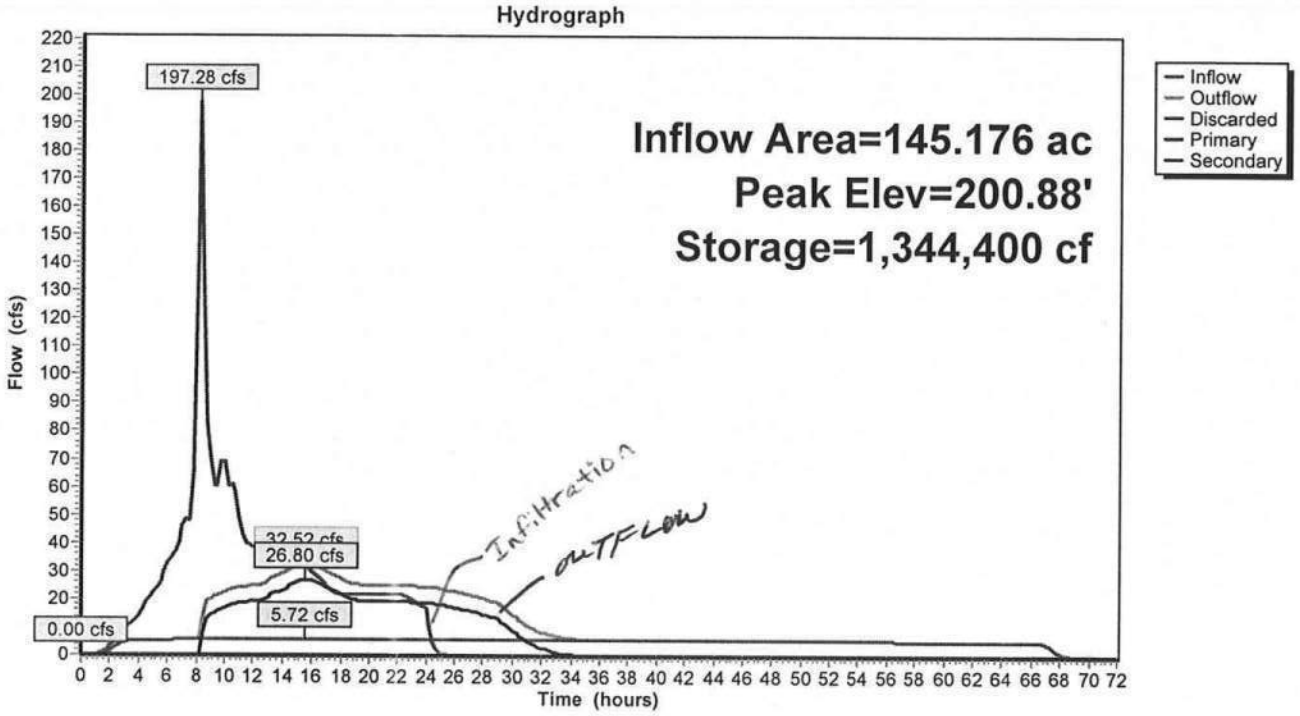
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
201.00	172,590	0	0
205.50	461,602	1,426,932	1,426,932

Device	Routing	Invert	Outlet Devices
#1	Primary	195.35'	**18.0" x 77.0' long Culvert X 2.00** RCP, groove end projecting, Ke= 0.200 Outlet Invert= 194.90' S= 0.0058 '/' Cc= 0.900 n= 0.012
#2	Device 1	195.40'	**9.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#3	Device 1	203.00'	**18.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#4	Device 1	203.50'	**54.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#5	Discarded	0.00'	**Special & User-Defined (Infiltration in Main pond)** Elev. (feet) 201.00 201.10 205.50 Disch. (cfs) 0.000 5.720 5.730

Discarded OutFlow Max=5.72 cfs @ 28.76 hrs HW=203.23' (Free Discharge)
↑—**5=Special & User-Defined (Infiltration in Main pond)** (Custom Controls 5.72 cfs)

Primary OutFlow Max=7.70 cfs @ 28.76 hrs HW=203.23' (Free Discharge)
↑—**1=Culvert** (Passes 7.70 cfs of 47.86 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 5.95 cfs @ 13.48 fps)
—**3=Orifice/Grate** (Weir Controls 1.75 cfs @ 1.58 fps)
—**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: POND (EXCAVATED) 4.0 IN/HR (over portion of bottom)

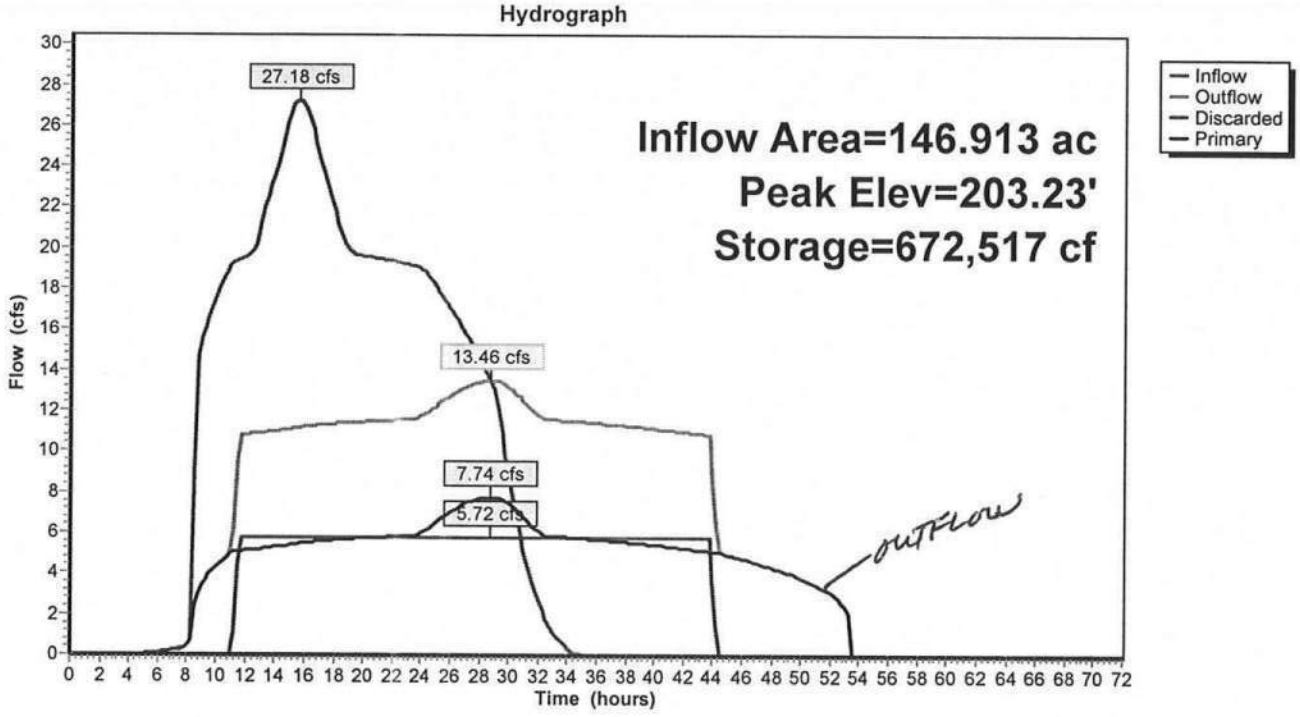


Hydrograph for Pond 1P: POND (EXCAVATED) 4.0 IN/HR (over portion of bottom)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Secondary (cfs)
0.00	0.00	0	185.00	0.00	0.00	0.00	**0.00**
2.50	5.61	6,850	185.14	3.19	3.19	0.00	0.00
5.00	22.54	86,734	186.68	4.92	4.92	0.00	0.00
7.50	**48.08**	358,513	191.38	5.71	5.71	0.00	0.00
10.00	**69.25**	1,067,372	199.36	22.64	5.72	16.93	0.00
12.50	38.42	1,282,939	200.57	25.07	5.72	19.36	0.00
15.00	34.78	**1,341,665**	**200.87**	**32.00**	**5.72**	**26.28**	0.00
17.50	22.47	**1,319,739**	**200.76**	**28.55**	**5.72**	**22.83**	0.00
20.00	21.64	1,280,148	200.56	25.05	5.72	19.33	0.00
22.50	21.26	1,250,773	200.41	24.76	5.72	19.04	0.00
25.00	0.88	1,156,737	199.89	23.75	5.72	18.03	0.00
27.50	0.01	956,192	198.62	20.97	5.72	15.26	0.00
30.00	0.00	788,494	197.20	14.54	5.72	8.82	0.00
32.50	0.00	694,525	196.19	7.53	5.71	1.81	0.00
35.00	0.00	637,493	195.49	5.73	5.71	0.02	0.00
37.50	0.00	586,055	194.80	5.71	5.71	0.00	0.00
40.00	0.00	534,637	194.07	5.71	5.71	0.00	0.00
42.50	0.00	483,225	193.31	5.71	5.71	0.00	0.00
45.00	0.00	431,819	192.53	5.71	5.71	0.00	0.00
47.50	0.00	380,420	191.73	5.71	5.71	0.00	0.00
50.00	0.00	329,038	190.90	5.69	5.69	0.00	0.00
52.50	0.00	278,490	190.07	5.54	5.54	0.00	0.00
55.00	0.00	229,309	189.24	5.39	5.39	0.00	0.00
57.50	0.00	181,496	188.41	5.24	5.24	0.00	0.00
60.00	0.00	135,051	187.58	5.08	5.08	0.00	0.00
62.50	0.00	89,974	186.75	4.93	4.93	0.00	0.00
65.00	0.00	46,268	185.91	4.78	4.78	0.00	0.00
67.50	0.00	5,510	185.11	2.56	2.56	0.00	0.00
70.00	0.00	79	185.00	0.04	0.04	0.00	0.00

POND DOWN TO ELEV. 195.40 (INVERT OF OUTLET PIPE) AT < 37.50 hrs OR < 13.5 hrs AFTER 24-HR EVENT

Pond 4P: Retrofit Culverts at Rd.



Hydrograph for Pond 4P: Retrofit Culverts at Rd.

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	195.40	0.00	0.00	0.00
2.50	0.00	0	195.40	0.00	0.00	0.00
5.00	0.03	2	195.42	0.03	0.00	0.03
7.50	0.30	15	195.53	0.30	0.00	0.30
10.00	17.61	67,790	199.50	4.31	0.00	4.31
12.50	19.78	172,281	201.25	10.87	5.72	5.15
15.00	**26.67**	281,689	201.78	11.10	5.72	5.37
17.50	**23.11**	413,631	202.33	11.32	5.72	5.60
20.00	19.57	496,846	202.64	11.45	5.72	5.72
22.50	19.28	568,210	202.89	11.55	5.72	5.82
25.00	18.10	632,931	203.11	12.21	5.72	6.49
27.50	15.26	**668,145**	**203.22**	**13.30**	**5.72**	**7.57**
30.00	8.82	**663,965**	**203.21**	**13.15**	**5.72**	**7.42**
32.50	1.81	595,786	202.99	11.58	5.72	5.86
35.00	0.02	497,719	202.65	11.45	5.72	5.73
37.50	0.00	395,371	202.26	11.29	5.72	5.57
40.00	0.00	294,486	201.84	11.12	5.72	5.40
42.50	0.00	195,284	201.37	10.92	5.72	5.20
45.00	0.00	116,675	200.77	4.93	0.00	4.93
47.50	0.00	74,597	199.69	4.41	0.00	4.41
50.00	0.00	37,616	198.57	3.78	0.00	3.78
52.50	0.00	7,544	197.10	2.77	0.00	2.77
55.00	0.00	0	195.40	0.00	0.00	0.00
57.50	0.00	0	195.40	0.00	0.00	0.00
60.00	0.00	0	195.40	0.00	0.00	0.00
62.50	0.00	0	195.40	0.00	0.00	0.00
65.00	0.00	0	195.40	0.00	0.00	0.00
67.50	0.00	0	195.40	0.00	0.00	0.00
70.00	0.00	0	195.40	0.00	0.00	0.00

← 5.4± cfs TO DOWNSTREAM WHEN PEAK IS OCCURRING THERE

DRAIN DOWN AT 18" CULVERTS A < 55 hrs OR < 31 hrs AFTER 24-HR EVENT

Pond 1P: POND (EXCAVATED) 4.0 IN/HR (over portion of bottom)

Inflow Area =	145.176 ac,	Inflow Depth =	11.14"	for 7-DAY event	
Inflow =	136.29 cfs @	78.33 hrs,	Volume=	134.738 af	
Outflow =	60.45 cfs @	81.37 hrs,	Volume=	134.738 af,	Atten= 56%, Lag= 182.2 min
Discarded =	5.72 cfs @	81.37 hrs,	Volume=	82.169 af	
Primary =	33.08 cfs @	81.37 hrs,	Volume=	49.069 af	
Secondary =	21.66 cfs @	81.37 hrs,	Volume=	3.500 af	

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.25 hrs
Peak Elev= 201.18' @ 81.37 hrs Surf.Area= 218,547 sf Storage= 1,407,527 cf

Plug-Flow detention time= 871.3 min calculated for 134.598 af (100% of inflow)
Center-of-Mass det. time= 872.4 min (6,046.7 - 5,174.3)

Volume	Invert	Avail.Storage	Storage Description
#1	185.00'	1,471,792 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	196.00'	133,055 cf	**Custom Stage Data (East Pond) (Prismatic)** Listed below (Recalc)
		1,604,847 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
185.00	49,796	0	0
194.00	67,913	529,691	529,691
195.00	73,535	70,724	600,415
196.00	83,203	78,369	678,784
197.00	94,419	88,811	767,595
198.00	114,516	104,468	872,062
199.00	132,955	123,736	995,798
200.00	149,145	141,050	1,136,848
201.00	164,652	156,899	1,293,746
202.00	191,440	178,046	1,471,792

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	60	0	0
197.00	1,761	911	911
198.00	5,408	3,585	4,495
199.00	17,499	11,454	15,949
200.00	28,398	22,949	38,897
201.00	43,959	36,179	75,076
202.00	72,000	57,980	133,055

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**Special & User-Defined (Infiltration)** Elev. (feet) 185.00 185.20 191.00 202.00 Disch. (cfs) 0.000 4.650 5.710 5.720
#2	Primary	195.40'	**24.0" x 47.0' long Culvert** RCP, square edge headwall, Ke= 0.500 Outlet Invert= 195.40' S= 0.0000 '/' Cc= 0.900 n= 0.012
#3	Device 2	195.40'	**18.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#4	Device 2	200.60'	**52.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600

#5 Secondary 201.00' **100.0' long x 20.0' breadth Broad-Crested Rectangular Weir**
Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=5.72 cfs @ 81.37 hrs HW=201.18' (Free Discharge)
└**1=Special & User-Defined (Infiltration)** (Custom Controls 5.72 cfs)

Primary OutFlow Max=33.07 cfs @ 81.37 hrs HW=201.18' (Free Discharge)
└**2=Culvert** (Inlet Controls 33.07 cfs @ 10.53 fps)
  └**3=Orifice/Grate** (Passes < 20.46 cfs potential flow)
  └**4=Orifice/Grate** (Passes < 19.64 cfs potential flow)

Secondary OutFlow Max=20.39 cfs @ 81.37 hrs HW=201.18' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Weir Controls 20.39 cfs @ 1.14 fps)

Pond 4P: Retrofit Culverts at Rd.

Inflow Area =	146.913 ac,	Inflow Depth =	4.41"	for	7-DAY event
Inflow =	55.45 cfs @	81.37 hrs,	Volume=	53.995 af	
Outflow =	21.65 cfs @	91.70 hrs,	Volume=	54.001 af,	Atten= 61%, Lag= 620.0 min
Discarded =	5.73 cfs @	91.70 hrs,	Volume=	18.737 af	
Primary =	15.92 cfs @	91.70 hrs,	Volume=	35.264 af	

FLOW THROUGH 10" CULVERTS AT 91.7 hrs (MIDDLE OF 4TH DAY)

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.25 hrs
Peak Elev= 203.66' @ 91.70 hrs Surf.Area= 386,465 sf Storage= 811,207 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 617.5 min (6,000.3 - 5,382.8)

Volume	Invert	Avail.Storage	Storage Description
#1	195.40'	126,496 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	201.00'	1,426,932 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		1,553,428 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.40	50	0	0
196.00	576	188	188
197.00	11,738	6,157	6,345
198.00	22,326	17,032	23,377
199.00	32,414	27,370	50,747
201.00	43,335	75,749	126,496

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
201.00	172,590	0	0
205.50	461,602	1,426,932	1,426,932

Device	Routing	Invert	Outlet Devices
#1	Primary	195.35'	**18.0" x 77.0' long Culvert X 2.00** RCP, groove end projecting, Ke= 0.200 Outlet Invert= 194.90' S= 0.0058 '/' Cc= 0.900 n= 0.012
#2	Device 1	195.40'	**9.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#3	Device 1	203.00'	**18.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#4	Device 1	203.50'	**54.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#5	Discarded	0.00'	**Special & User-Defined (Infiltration in Main pond)** Elev. (feet) 201.00 201.10 205.50 Disch. (cfs) 0.000 5.720 5.730

Discarded OutFlow Max=5.73 cfs @ 91.70 hrs HW=203.66' (Free Discharge)
└─**5=Special & User-Defined (Infiltration in Main pond)** (Custom Controls 5.73 cfs)

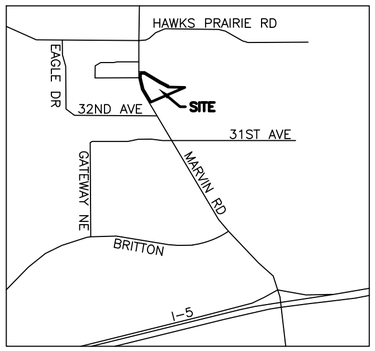
Primary OutFlow Max=15.83 cfs @ 91.70 hrs HW=203.66' (Free Discharge)
└─**1=Culvert** (Passes 15.83 cfs of 49.32 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 6.11 cfs @ 13.83 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 6.89 cfs @ 3.90 fps)
  └─**4=Orifice/Grate** (Weir Controls 2.83 cfs @ 1.29 fps)

APPENDIX 3

Preliminary Short Subdivision Map
Gateway Christian Center Drainage Plans

VICINITY MAP

N.T.S.



ORIGINAL LEGAL DESCRIPTION

PER STEWART TITLE COMMITMENT NO.1914417:
LOT 1 OF BINDING SITE PLAN NO. BSP-050004LA, AS RECORDED DECEMBER 28, 2005 UNDER AUDITOR'S FILE NO. 3796801;
EXCEPTING THAT PORTION CONVEYED TO THE CITY OF LACEY FOR MARVIN ROAD NORTHEAST UNDER AUDITOR'S FILE NO. 4403245;
IN THURSTON COUNTY, WASHINGTON.

SURVEY NOTES

1. INSTRUMENT USED: SOKKIA IX 3" TOTAL STATION.
2. THIS SURVEY MEETS OR EXCEEDS THE STANDARDS OF WAC 332-130-090.
3. SURVEY COMPLETED 08/15/2023.
4. ALL MONUMENTS SHOWN AS FOUND VISITED 8/2023.
5. MTN2COAST (M2C) WAS RETAINED BY GATEWAY CHRISTIAN CENTER TO COMPLETE A BOUNDARY SURVEY AND SHORT PLAT OF THURSTON COUNTY TAX PARCEL 3759-00-00100.
6. UTILITIES LINES SHOWN BASED ON MAPPED APPURTENANCES AND RECORD SYSTEM MAPS PROVIDED BY CLIENT.

CITY OF LACEY SHORT PLAT NO. SS XXXXXXXX

NW1/4, SW1/4 OF THE NW1/4 SECTION 18, TOWNSHIP 18N, RANGE 1W, W.M.

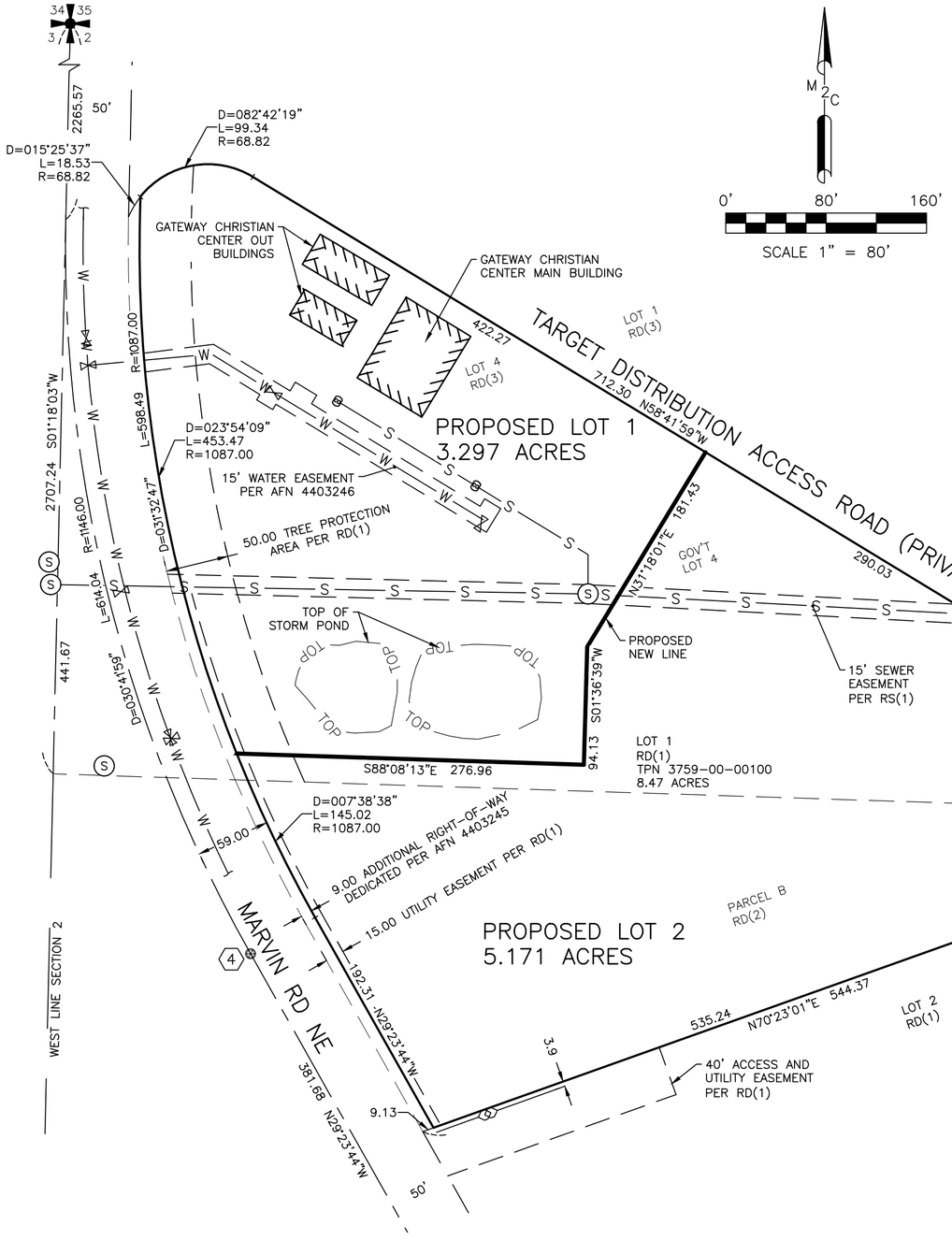
ORIGINAL TRACT ASSESSORS PARCEL NO. 3759-00-00100

RD(X) REFERENCED DOCUMENTS

1. CITY OF LACEY BSP 050004LA RECORDED 12/28/2005 UNDER AFN 3796801, RECORDS OF THURSTON COUNTY.
2. CITY OF LACEY BLA 0500013LA RECORDED 8/2/2005 UNDER AFN 3754607, RECORDS OF THURSTON COUNTY.
3. CITY OF LACEY BSP 040005LA RECORDED 1/31/2005 UNDER AFN 3697509, RECORDS OF THURSTON COUNTY.

(X) MONUMENT NOTES

1. FOUND 5/8" DIAMETER REBAR WITH PLASTIC CAP MARKED "LS 41036 MABRY" ±0.3' NORTHEAST OF CALCULATED POSITION, SET PER RS(3).
2. FOUND 5/8" DIAMETER REBAR WITH PLASTIC CAP MARKED "LS 41036 MABRY" ±0.1' NORTHEAST OF CALCULATED POSITION, SET PER RS(3).
3. FOUND 5/8" DIAMETER REBAR WITH PLASTIC CAP MARKED "LS 24288" ±0.2' EAST OF CALCULATED POSITION.
4. FOUND 3.25" DIAMETER ALUMINUM SURFACE MONUMENT WITH PUNCH IN METAL CASE BELOW ROAD SURFACE.
5. FOUND 1/2" DIAMETER REBAR WITH PLASTIC CAP MARKED "BCE 40015" ±0.4' SOUTHWEST OF CALCULATED POSITION.



LINE TYPES

- CYCLONE FENCE
- EXTERIOR BUILDING
- SEWER LINE
- WATER LINE
- EXISTING PROPERTY LINE
- PROPOSED NEW PROPERTY LINE
- EASEMENT LINE
- ROAD CENTERLINE
- ROAD RIGHT-OF-WAY
- VACATED ROAD RIGHT-OF-WAY
- SECTION LINE
- 1/16 SECTION LINE

BASIS OF BEARING

NAD 83/91 BASED ON CITY OF LACEY COORDINATE SYSTEM AS SHOWN ON ROS RECORDED UNDER AFN 3111152, HOLDING A BEARING OF NORTH 58°41'59" WEST FOR THE NORTHWEST PROPERTY LINE OF TAX PARCEL 3759-00-00100

LEGEND

- FOUND ALUMINUM CAP
- FOUND MONUMENT IN CASE
- FOUND PK NAIL
- FOUND REBAR AND CAP
- SET 5/8"X24" LONG REBAR AND YELLOW PLASTIC CAP MARKED "MTN2COAST LS 21013244 AND 29278"
- SS CLEANOUT
- SS MANHOLE
- WATER VALVE

BLAIR E. BRIGGE — STATE OF WASHINGTON — 29278 — REGISTERED PROFESSIONAL LAND SURVEYOR — RELEASED FOR REVIEW BY

WARNING:

THE CITY OF LACEY HAS NO RESPONSIBILITY TO BUILD, IMPROVE, MAINTAIN OR OTHERWISE SERVICE THE PRIVATE ROADS WITHIN OR PROVIDING ACCESS TO PROPERTY DESCRIBED ON THIS PLAT

CONDITIONS OF APPROVAL

THURSTON COUNTY TREASURER

I HEREBY CERTIFY THAT ALL TAXES ON THE LAND DESCRIBED HEREON HAVE BEEN FULLY PAID TO AND INCLUDING THE YEAR 2024.

THURSTON COUNTY TREASURER DATE

SURVEYOR'S CERTIFICATE

THIS MAP CORRECTLY REPRESENTS A SURVEY MADE BY ME OR UNDER MY DIRECTION IN CONFORMANCE WITH THE REQUIREMENTS OF THE SURVEY RECORDING ACT AT THE REQUEST OF: GATEWAY CHRISTIAN CENTER, IN JANUARY, 2024

PRELIMINARY

BLAIR E. BRIGGE, PLS #29278

AUDITOR'S CERTIFICATE

FILED FOR RECORD AT THE REQUEST OF MTN2COAST, LLC THIS _____ DAY _____ 2024, AT____MINUTES PAST _____ O'CLOCK ____M., AND RECORDED IN VOLUME _____ OF PLATS, ON PAGE _____ RECORDS OF THURSTON COUNTY, WASHINGTON.

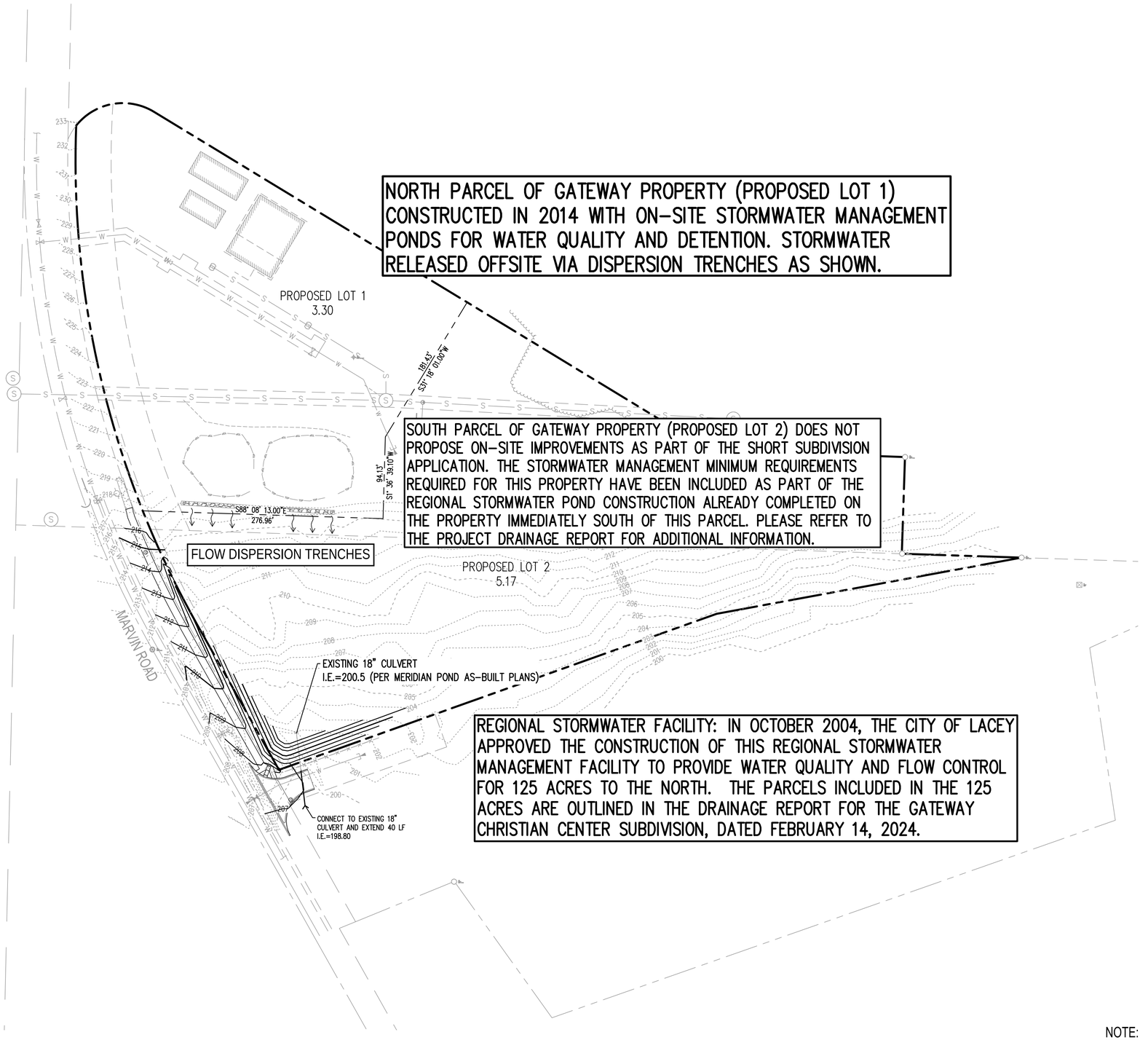
THURSTON COUNTY AUDITOR

DEPUTY AUDITOR

MTN2COAST LLC
PROFESSIONAL LAND SURVEYORS
2320 MOTTMAN RD SW, STE 106
TUMWATER, WA 98512
360.688.1949

SHEET	DATE
1 OF 1	1/25/2024
PROJECT NO. 23-146	SCALE: 1" = 80'

SEC. 18, T 18 N., R 1 W., W.M.



N

0 60 120

SCALE IN FEET

LEGEND

- EXISTING CONTOURS (MAJOR/MINOR)
- PROPOSED CONTOURS (MAJOR/MINOR)
- EXISTING STORM PIPE
- EXISTING CULVERT
- PROPOSED CULVERT
- EXISTING EASEMENT
- PROPOSED EASEMENT

GENERAL STORMWATER NOTES:

1. CONTRACTOR SHALL RECORD ANY FIELD DEVIATION FROM ENGINEERING PLAN. THESE RECORDS SHALL BE KEPT ON CONSTRUCTION DRAWINGS AND TURNED OVER TO ENGINEER UPON COMPLETION OF PROJECT.
2. IN ADDITION TO ALL FEDERAL AND STATE STORMWATER REQUIREMENTS, THIS PROJECT SHALL COMPLY WITH THE CURRENT CITY OF LACEY DEVELOPMENT GUIDELINES AND PUBLIC WORKS STANDARDS MANUAL AND THE CURRENT CITY OF LACEY STORMWATER DESIGN MANUAL (LMC 14.27). THE STORMWATER DESIGN MANUAL REQUIRES THE USE OF LOW IMPACT DEVELOPMENT (LID) TECHNIQUES TO THE MAXIMUM EXTENT POSSIBLE. STORMWATER DRAINAGE AND EROSION CONTROL SUBMITTAL SHALL BE IN CONFORMANCE WITH THE FORMATTING AND CONTENT REQUIREMENTS DESCRIBED IN CHAPTER 3 OF THE STORMWATER DESIGN MANUAL.
3. TREATMENT AND INFILTRATION FACILITIES SHALL BE CONSTRUCTED FOR STORMWATER ASSOCIATED WITH THE SITE, ADJACENT PROPERTIES CURRENTLY DISCHARGING TO THE SITE AND STORMWATER CURRENTLY DISCHARGING ONTO THE SITE FROM MARVIN ROAD. ADDITIONAL TREATMENT CANISTERS AT THE STORMWATER FACILITY TO THE SOUTH WILL BE REQUIRED FOR THE NEW ROADWAY REQUIRED WITH THE SHORT PLAT.
4. CURRENTLY THERE IS AN OVERFLOW FROM THE EXISTING STORMWATER FACILITY ON SITE DIRECTING STORMWATER TO THE SOUTH. WITH THE SHORT SUBDIVISION OF THE PROPERTY, PROVISIONS FOR THE OVERFLOW STORMWATER WILL NEED TO BE ADDRESSED.
5. IT IS BELIEVED THIS SITE IS PART OWNER OF THE STORM SYSTEM TO THE SOUTH. PRIOR TO FINAL SHORT PLAT APPROVAL, CONFIRMATION OF ALLOWABLE DISCHARGES FROM THE EXISTING LOT SHALL BE PROVIDED. ALSO, THE PROPORTIONATE SHARE OF STORMWATER FOR THE NEW CREATED LOT SHALL BE DETERMINED.
6. IN CONFORMANCE WITH THE CITY OF LACEY STORMWATER DESIGN MANUAL, POST-CONSTRUCTION SOIL QUALITY AND DEPTH (BMP T5.13) SHALL BE INCORPORATED INTO THE SITE DESIGN AND CONSTRUCTION (SDM 2.2.5 & 7.4.1).
7. STORMWATER POLLUTION PREVENTION PLAN (SWPPP) SHALL BE SUBMITTED TO AND APPROVED BY THE CITY PRIOR TO BEGINNING ANY SITE DISTURBING ACTIVITIES AT THE PROJECT. EACH OF THE 13 REQUIRED ELEMENTS AS IDENTIFIED IN SDM CHAPTER 5 MUST BE ADDRESSED AND INCLUDED IN THE CONSTRUCTION SWPPP. IF SITE CONDITIONS RENDER ANY ELEMENT UNNECESSARY, THE EXEMPTION FOR THAT ELEMENT SHALL BE CLEARLY JUSTIFIED IN THE NARRATIVE FOR THE SWPPP. THE SWPPP SHALL BE SUBMITTED TO AND APPROVED BY THE CITY PRIOR TO CIVIL PLAN APPROVAL.
8. A STORMWATER FACILITY MAINTENANCE AND SOURCE CONTROL MANUAL PER CHAPTER 3 OF THE CITY OF LACEY STORMWATER DESIGN MANUAL SHALL BE SUBMITTED TO AND APPROVED BY THE CITY OF LACEY. THE MAINTENANCE MANUAL SHALL BE INCLUDED WITH THE SUBMITTED DRAINAGE REPORT AS PART OF THE STORMWATER SITE PLAN.
9. ALSO, THE MAINTENANCE AND SOURCE CONTROL MANUAL SHALL BE PREPARED AS A STAND-ALONE DOCUMENT FOR THE POST-DEVELOPMENT FACILITY OWNER(S). THE MAINTENANCE MANUAL SHALL BE SUBMITTED TO AND APPROVED BY THE CITY PRIOR TO CIVIL DRAWING APPROVAL.

NOTE:

CONTRACTOR TO VERIFY EXISTING GRADES PRIOR TO CONTRACTOR PERFORMING WORK. COORDINATE WITH ENGINEER IF DISCREPANCIES ARE IDENTIFIED. COORDINATE TO AS-BUILT SURVEY IMPROVEMENTS AS PART OF BASE CONTRACT.

BY	DATE	REVISIONS

SCJ ALLIANCE
CONSULTING SERVICES
8730 TALLON LANE NE, SUITE 200, LACEY, WA 98516
P: 360.352.1465
SCJALLIANCE.COM

SHEET TITLE: DRAINAGE PLAN

PROJECT NAME: GATEWAY CHRISTIAN CENTER
3300 MARVIN RD NE
LACEY, WA 98516

SEAL:

DESIGNER:	D. PHILLIPS
DRAWN BY:	N. ALTHAUSER
APPROVED BY:	B. DUNNING
DATE:	FEBRUARY, 2024
JOB NO:	23-000886
DRAWING FILE NO:	23-000886 DR-01
DRAWING NO:	DR-01
SHEET NO:	7 OF 10

Feb 21, 2024 10:42:01am - User: nathan.althauser
N:\PROJECTS\6728 GATEWAY CHRISTIAN CENTER\23-000886 GATEWAY CHRISTIAN CTR PLAT INFRASTRUCTURE\CAD\23-000886 DR-01.DWG

DRAINAGE CONTROL PLAN

Attachment 1

Proposed Lot 1 and Lot 2 WWHM Calculations

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	default[1]
Site Name:	Gateway Christian Center
Site Address:	3300 Marvin Road NE
City:	Lacey
Report Date:	2/20/2024
Gage:	Fairgrounds (Kaiser)
Data Start:	1955/10/01
Data End:	2011/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/08/18
Version:	4.2.18

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1 - Parcel 1 Church

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Forest, Mod	5.17
Pervious Total	5.17

Impervious Land Use	acre
Impervious Total	0
Basin Total	5.17

Element Flows To:

Surface	Interflow	Groundwater
Channel 1	Channel 1	

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Forest, Mod	5.17
Pervious Total	5.17

Impervious Land Use	acre
Impervious Total	0
Basin Total	5.17

Element Flows To:

Surface	Interflow	Groundwater
Channel 1	Channel 1	

Routing Elements
Predeveloped Routing

Channel 1

Bottom Length: 100.00 ft.
Bottom Width: 4.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 1 To 1
Channel Left side slope 0: 1 To 1
Channel right side slope 2: 1 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Flows To:
Outlet 1 Outlet 2

Channel Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.009	0.000	0.000	0.000
0.0444	0.009	0.000	1.105	0.000
0.0889	0.009	0.000	3.503	0.000
0.1333	0.009	0.001	6.876	0.000
0.1778	0.010	0.001	11.09	0.000
0.2222	0.010	0.002	16.08	0.000
0.2667	0.010	0.002	21.78	0.000
0.3111	0.010	0.003	28.16	0.000
0.3556	0.010	0.003	35.18	0.000
0.4000	0.011	0.004	42.83	0.000
0.4444	0.011	0.004	51.08	0.000
0.4889	0.011	0.005	59.93	0.000
0.5333	0.011	0.005	69.35	0.000
0.5778	0.012	0.006	79.34	0.000
0.6222	0.012	0.006	89.90	0.000
0.6667	0.012	0.007	101.0	0.000
0.7111	0.012	0.007	112.6	0.000
0.7556	0.012	0.008	124.8	0.000
0.8000	0.013	0.008	137.6	0.000
0.8444	0.013	0.009	150.9	0.000
0.8889	0.013	0.010	164.7	0.000
0.9333	0.013	0.010	179.1	0.000
0.9778	0.013	0.011	194.0	0.000
1.0222	0.014	0.011	209.5	0.000
1.0667	0.014	0.012	225.5	0.000
1.1111	0.014	0.013	242.0	0.000
1.1556	0.014	0.013	259.1	0.000
1.2000	0.015	0.014	276.7	0.000
1.2444	0.015	0.015	294.9	0.000
1.2889	0.015	0.015	313.6	0.000
1.3333	0.015	0.016	332.8	0.000
1.3778	0.015	0.017	352.6	0.000
1.4222	0.016	0.018	373.0	0.000
1.4667	0.016	0.018	393.9	0.000
1.5111	0.016	0.019	415.4	0.000
1.5556	0.016	0.020	437.4	0.000

1.6000	0.017	0.020	460.0	0.000
1.6444	0.017	0.021	483.1	0.000
1.6889	0.017	0.022	506.8	0.000
1.7333	0.017	0.023	531.1	0.000
1.7778	0.018	0.024	555.9	0.000
1.8222	0.018	0.024	581.4	0.000
1.8667	0.018	0.025	607.4	0.000
1.9111	0.018	0.026	633.9	0.000
1.9556	0.018	0.027	661.1	0.000
2.0000	0.019	0.028	688.8	0.000
2.0444	0.019	0.029	717.2	0.000
2.0889	0.019	0.029	746.1	0.000
2.1333	0.019	0.030	775.6	0.000
2.1778	0.020	0.031	805.7	0.000
2.2222	0.020	0.032	836.5	0.000
2.2667	0.020	0.033	867.8	0.000
2.3111	0.020	0.034	899.7	0.000
2.3556	0.020	0.035	932.3	0.000
2.4000	0.021	0.036	965.5	0.000
2.4444	0.021	0.037	999.2	0.000
2.4889	0.021	0.038	1033.	0.000
2.5333	0.021	0.039	1068.	0.000
2.5778	0.022	0.040	1104.	0.000
2.6222	0.022	0.041	1140.	0.000
2.6667	0.022	0.042	1177.	0.000
2.7111	0.022	0.043	1215.	0.000
2.7556	0.023	0.044	1253.	0.000
2.8000	0.023	0.045	1292.	0.000
2.8444	0.023	0.046	1331.	0.000
2.8889	0.023	0.047	1371.	0.000
2.9333	0.024	0.048	1412.	0.000
2.9778	0.024	0.049	1454.	0.000
3.0222	0.024	0.050	1496.	0.000
3.0667	0.024	0.051	1539.	0.000
3.1111	0.024	0.052	1582.	0.000
3.1556	0.025	0.053	1626.	0.000
3.2000	0.025	0.054	1671.	0.000
3.2444	0.025	0.056	1716.	0.000
3.2889	0.025	0.057	1763.	0.000
3.3333	0.026	0.058	1810.	0.000
3.3778	0.026	0.059	1857.	0.000
3.4222	0.026	0.060	1905.	0.000
3.4667	0.026	0.061	1954.	0.000
3.5111	0.027	0.063	2004.	0.000
3.5556	0.027	0.064	2054.	0.000
3.6000	0.027	0.065	2105.	0.000
3.6444	0.027	0.066	2157.	0.000
3.6889	0.028	0.067	2210.	0.000
3.7333	0.028	0.069	2263.	0.000
3.7778	0.028	0.070	2317.	0.000
3.8222	0.028	0.071	2371.	0.000
3.8667	0.029	0.073	2427.	0.000
3.9111	0.029	0.074	2483.	0.000
3.9556	0.029	0.075	2540.	0.000
4.0000	0.029	0.076	2597.	0.000
4.0444	0.030	0.078	2656.	0.000

Mitigated Routing

Channel 1

Bottom Length: 100.00 ft.
Bottom Width: 4.00 ft.
Manning's n: 0.03
Channel bottom slope 1: 1 To 1
Channel Left side slope 0: 1 To 1
Channel right side slope 2: 1 To 1
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.
Element Flows To:
Outlet 1 Outlet 2

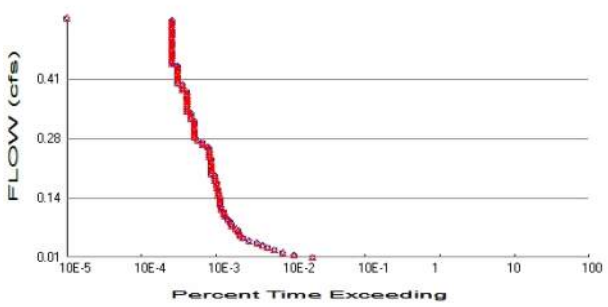
Channel Hydraulic Table

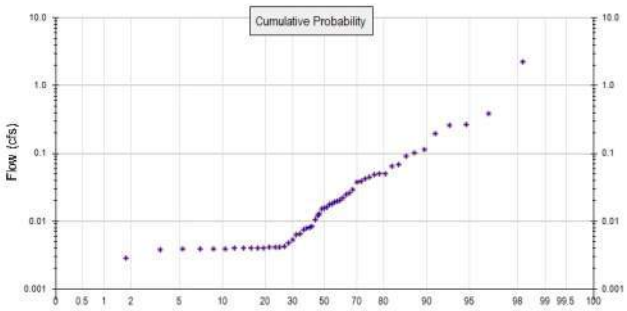
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.009	0.000	0.000	0.000
0.0444	0.009	0.000	1.105	0.000
0.0889	0.009	0.000	3.503	0.000
0.1333	0.009	0.001	6.876	0.000
0.1778	0.010	0.001	11.09	0.000
0.2222	0.010	0.002	16.08	0.000
0.2667	0.010	0.002	21.78	0.000
0.3111	0.010	0.003	28.16	0.000
0.3556	0.010	0.003	35.18	0.000
0.4000	0.011	0.004	42.83	0.000
0.4444	0.011	0.004	51.08	0.000
0.4889	0.011	0.005	59.93	0.000
0.5333	0.011	0.005	69.35	0.000
0.5778	0.012	0.006	79.34	0.000
0.6222	0.012	0.006	89.90	0.000
0.6667	0.012	0.007	101.0	0.000
0.7111	0.012	0.007	112.6	0.000
0.7556	0.012	0.008	124.8	0.000
0.8000	0.013	0.008	137.6	0.000
0.8444	0.013	0.009	150.9	0.000
0.8889	0.013	0.010	164.7	0.000
0.9333	0.013	0.010	179.1	0.000
0.9778	0.013	0.011	194.0	0.000
1.0222	0.014	0.011	209.5	0.000
1.0667	0.014	0.012	225.5	0.000
1.1111	0.014	0.013	242.0	0.000
1.1556	0.014	0.013	259.1	0.000
1.2000	0.015	0.014	276.7	0.000
1.2444	0.015	0.015	294.9	0.000
1.2889	0.015	0.015	313.6	0.000
1.3333	0.015	0.016	332.8	0.000
1.3778	0.015	0.017	352.6	0.000
1.4222	0.016	0.018	373.0	0.000
1.4667	0.016	0.018	393.9	0.000
1.5111	0.016	0.019	415.4	0.000
1.5556	0.016	0.020	437.4	0.000
1.6000	0.017	0.020	460.0	0.000
1.6444	0.017	0.021	483.1	0.000

1.6889	0.017	0.022	506.8	0.000
1.7333	0.017	0.023	531.1	0.000
1.7778	0.018	0.024	555.9	0.000
1.8222	0.018	0.024	581.4	0.000
1.8667	0.018	0.025	607.4	0.000
1.9111	0.018	0.026	633.9	0.000
1.9556	0.018	0.027	661.1	0.000
2.0000	0.019	0.028	688.8	0.000
2.0444	0.019	0.029	717.2	0.000
2.0889	0.019	0.029	746.1	0.000
2.1333	0.019	0.030	775.6	0.000
2.1778	0.020	0.031	805.7	0.000
2.2222	0.020	0.032	836.5	0.000
2.2667	0.020	0.033	867.8	0.000
2.3111	0.020	0.034	899.7	0.000
2.3556	0.020	0.035	932.3	0.000
2.4000	0.021	0.036	965.5	0.000
2.4444	0.021	0.037	999.2	0.000
2.4889	0.021	0.038	1033.	0.000
2.5333	0.021	0.039	1068.	0.000
2.5778	0.022	0.040	1104.	0.000
2.6222	0.022	0.041	1140.	0.000
2.6667	0.022	0.042	1177.	0.000
2.7111	0.022	0.043	1215.	0.000
2.7556	0.023	0.044	1253.	0.000
2.8000	0.023	0.045	1292.	0.000
2.8444	0.023	0.046	1331.	0.000
2.8889	0.023	0.047	1371.	0.000
2.9333	0.024	0.048	1412.	0.000
2.9778	0.024	0.049	1454.	0.000
3.0222	0.024	0.050	1496.	0.000
3.0667	0.024	0.051	1539.	0.000
3.1111	0.024	0.052	1582.	0.000
3.1556	0.025	0.053	1626.	0.000
3.2000	0.025	0.054	1671.	0.000
3.2444	0.025	0.056	1716.	0.000
3.2889	0.025	0.057	1763.	0.000
3.3333	0.026	0.058	1810.	0.000
3.3778	0.026	0.059	1857.	0.000
3.4222	0.026	0.060	1905.	0.000
3.4667	0.026	0.061	1954.	0.000
3.5111	0.027	0.063	2004.	0.000
3.5556	0.027	0.064	2054.	0.000
3.6000	0.027	0.065	2105.	0.000
3.6444	0.027	0.066	2157.	0.000
3.6889	0.028	0.067	2210.	0.000
3.7333	0.028	0.069	2263.	0.000
3.7778	0.028	0.070	2317.	0.000
3.8222	0.028	0.071	2371.	0.000
3.8667	0.029	0.073	2427.	0.000
3.9111	0.029	0.074	2483.	0.000
3.9556	0.029	0.075	2540.	0.000
4.0000	0.029	0.076	2597.	0.000
4.0444	0.030	0.078	2656.	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 5.17
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 5.17
Total Impervious Area: 0

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.014711
5 year	0.055076
10 year	0.119766
25 year	0.293534
50 year	0.544176
100 year	0.973154

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.014711
5 year	0.055076
10 year	0.119766
25 year	0.293534
50 year	0.544176
100 year	0.973154

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1956	0.048	0.048
1957	0.012	0.012
1958	0.008	0.008
1959	0.017	0.017
1960	0.016	0.016
1961	0.022	0.022
1962	0.004	0.004
1963	0.270	0.270
1964	0.069	0.069
1965	0.024	0.024

1966	0.004	0.004
1967	0.020	0.020
1968	0.008	0.008
1969	0.008	0.008
1970	0.016	0.016
1971	0.102	0.102
1972	0.090	0.090
1973	0.004	0.004
1974	0.039	0.039
1975	0.008	0.008
1976	0.045	0.045
1977	0.004	0.004
1978	0.037	0.037
1979	0.004	0.004
1980	0.005	0.005
1981	0.115	0.115
1982	0.196	0.196
1983	0.011	0.011
1984	0.015	0.015
1985	0.004	0.004
1986	0.020	0.020
1987	0.042	0.042
1988	0.004	0.004
1989	0.004	0.004
1990	0.006	0.006
1991	0.383	0.383
1992	2.210	2.210
1993	0.257	0.257
1994	0.004	0.004
1995	0.018	0.018
1996	0.050	0.050
1997	0.029	0.029
1998	0.004	0.004
1999	0.005	0.005
2000	0.003	0.003
2001	0.003	0.003
2002	0.006	0.006
2003	0.051	0.051
2004	0.064	0.064
2005	0.004	0.004
2006	0.004	0.004
2007	0.004	0.004
2008	0.004	0.004
2009	0.013	0.013
2010	0.019	0.019
2011	0.026	0.026

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	2.2097	2.2097
2	0.3832	0.3832
3	0.2703	0.2703
4	0.2573	0.2573
5	0.1963	0.1963
6	0.1152	0.1152
7	0.1021	0.1021
8	0.0899	0.0899

9	0.0691	0.0691
10	0.0636	0.0636
11	0.0506	0.0506
12	0.0498	0.0498
13	0.0479	0.0479
14	0.0452	0.0452
15	0.0420	0.0420
16	0.0392	0.0392
17	0.0373	0.0373
18	0.0292	0.0292
19	0.0263	0.0263
20	0.0244	0.0244
21	0.0217	0.0217
22	0.0204	0.0204
23	0.0197	0.0197
24	0.0188	0.0188
25	0.0179	0.0179
26	0.0173	0.0173
27	0.0161	0.0161
28	0.0155	0.0155
29	0.0150	0.0150
30	0.0126	0.0126
31	0.0120	0.0120
32	0.0106	0.0106
33	0.0083	0.0083
34	0.0080	0.0080
35	0.0079	0.0079
36	0.0075	0.0075
37	0.0064	0.0064
38	0.0063	0.0063
39	0.0054	0.0054
40	0.0048	0.0048
41	0.0042	0.0042
42	0.0042	0.0042
43	0.0041	0.0041
44	0.0041	0.0041
45	0.0040	0.0040
46	0.0040	0.0040
47	0.0040	0.0040
48	0.0040	0.0040
49	0.0039	0.0039
50	0.0039	0.0039
51	0.0039	0.0039
52	0.0039	0.0039
53	0.0038	0.0038
54	0.0038	0.0038
55	0.0029	0.0029
56	0.0027	0.0027

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0074	382	382	100	Pass
0.0128	219	219	100	Pass
0.0182	155	155	100	Pass
0.0236	119	119	100	Pass
0.0290	96	96	100	Pass
0.0345	82	82	100	Pass
0.0399	69	69	100	Pass
0.0453	54	54	100	Pass
0.0507	45	45	100	Pass
0.0562	41	41	100	Pass
0.0616	40	40	100	Pass
0.0670	39	39	100	Pass
0.0724	36	36	100	Pass
0.0778	32	32	100	Pass
0.0833	31	31	100	Pass
0.0887	30	30	100	Pass
0.0941	28	28	100	Pass
0.0995	26	26	100	Pass
0.1050	25	25	100	Pass
0.1104	25	25	100	Pass
0.1158	23	23	100	Pass
0.1212	23	23	100	Pass
0.1266	22	22	100	Pass
0.1321	22	22	100	Pass
0.1375	22	22	100	Pass
0.1429	22	22	100	Pass
0.1483	21	21	100	Pass
0.1538	21	21	100	Pass
0.1592	21	21	100	Pass
0.1646	20	20	100	Pass
0.1700	20	20	100	Pass
0.1755	20	20	100	Pass
0.1809	19	19	100	Pass
0.1863	19	19	100	Pass
0.1917	19	19	100	Pass
0.1971	17	17	100	Pass
0.2026	17	17	100	Pass
0.2080	17	17	100	Pass
0.2134	17	17	100	Pass
0.2188	17	17	100	Pass
0.2243	17	17	100	Pass
0.2297	17	17	100	Pass
0.2351	16	16	100	Pass
0.2405	16	16	100	Pass
0.2459	16	16	100	Pass
0.2514	16	16	100	Pass
0.2568	15	15	100	Pass
0.2622	13	13	100	Pass
0.2676	13	13	100	Pass
0.2731	11	11	100	Pass
0.2785	10	10	100	Pass
0.2839	10	10	100	Pass
0.2893	10	10	100	Pass

0.2947	10	10	100	Pass
0.3002	10	10	100	Pass
0.3056	10	10	100	Pass
0.3110	10	10	100	Pass
0.3164	10	10	100	Pass
0.3219	9	9	100	Pass
0.3273	9	9	100	Pass
0.3327	9	9	100	Pass
0.3381	8	8	100	Pass
0.3435	8	8	100	Pass
0.3490	8	8	100	Pass
0.3544	8	8	100	Pass
0.3598	8	8	100	Pass
0.3652	8	8	100	Pass
0.3707	8	8	100	Pass
0.3761	8	8	100	Pass
0.3815	8	8	100	Pass
0.3869	7	7	100	Pass
0.3923	7	7	100	Pass
0.3978	7	7	100	Pass
0.4032	6	6	100	Pass
0.4086	6	6	100	Pass
0.4140	6	6	100	Pass
0.4195	6	6	100	Pass
0.4249	6	6	100	Pass
0.4303	6	6	100	Pass
0.4357	6	6	100	Pass
0.4411	6	6	100	Pass
0.4466	5	5	100	Pass
0.4520	5	5	100	Pass
0.4574	5	5	100	Pass
0.4628	5	5	100	Pass
0.4683	5	5	100	Pass
0.4737	5	5	100	Pass
0.4791	5	5	100	Pass
0.4845	5	5	100	Pass
0.4900	5	5	100	Pass
0.4954	5	5	100	Pass
0.5008	5	5	100	Pass
0.5062	5	5	100	Pass
0.5116	5	5	100	Pass
0.5171	5	5	100	Pass
0.5225	5	5	100	Pass
0.5279	5	5	100	Pass
0.5333	5	5	100	Pass
0.5388	5	5	100	Pass
0.5442	5	5	100	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Channel 1 POC	☐	1.71			☐	0.00			
Total Volume Infiltrated		1.71	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

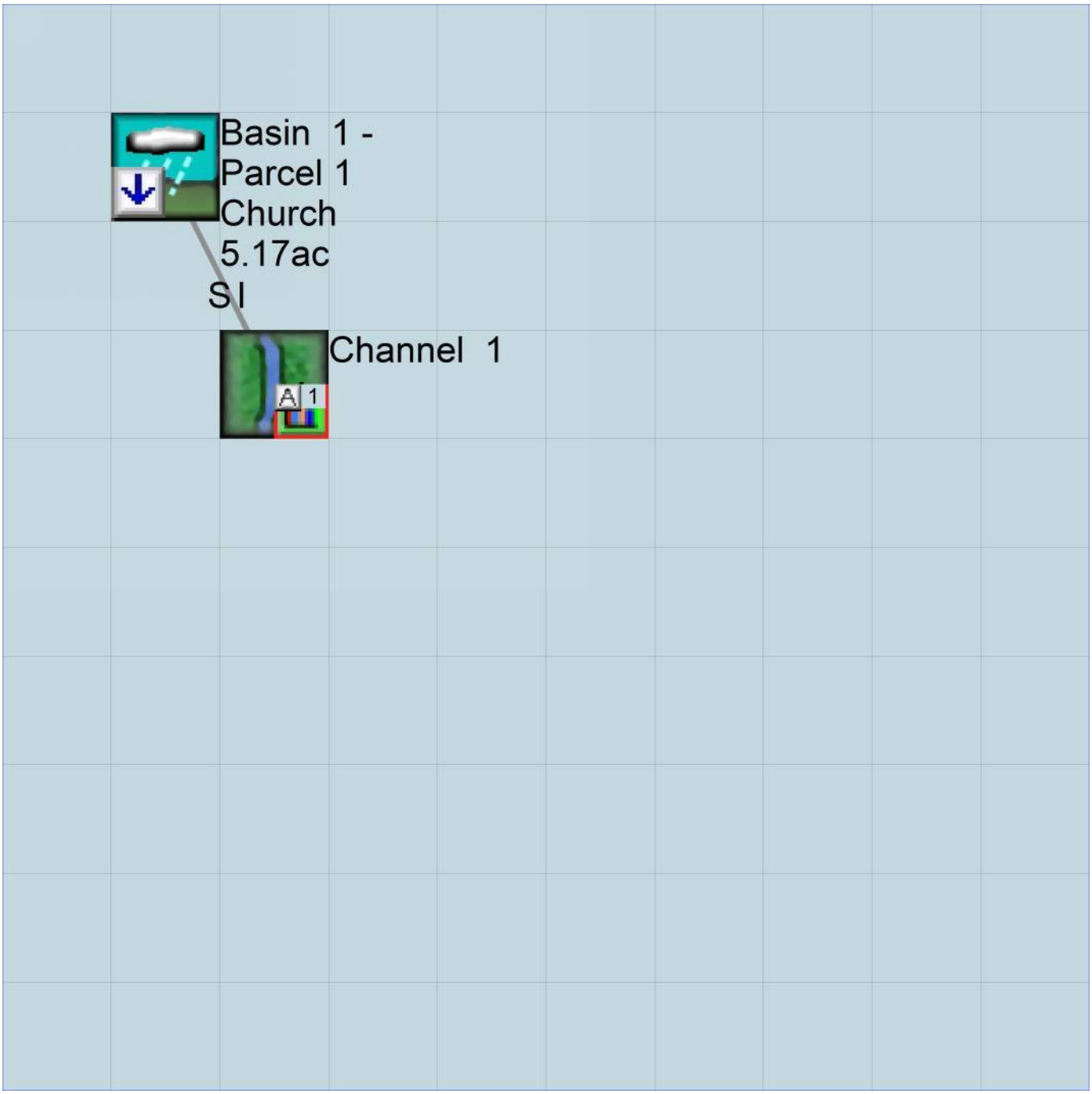
No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix

Predeveloped Schematic



Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   default[1].wdm
MESSU       25   Predefault[1].MES
            27   Predefault[1].L61
            28   Predefault[1].L62
            30   POCdefault[1]1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       2
      RCHRES       1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Channel  1                  MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
    2     A/B, Forest, Mod        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    2         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    2         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    2         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    2              0         5         2       400       0.1       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    2              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    2          0.2       0.5      0.35         0       0.7       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    2              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1 - Parcel 1 Church***
PERLND   2                        5.17     RCHRES   1      2
PERLND   2                        5.17     RCHRES   1      3

******Routing******
RCHRES   1                           1     COPY   501     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                       in  out                              ***
    1     Channel  1             1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1        0  1  0  0    4  0  0  0  0       0  0  0  0  0        2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1             1      0.02       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
           *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
```

FTABLES
FTABLE 1
91 4

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.009183	0.000000	0.000000		
0.044444	0.009395	0.000413	1.105418		
0.088889	0.009608	0.000835	3.503192		
0.133333	0.009821	0.001267	6.876030		
0.177778	0.010035	0.001708	11.09462		
0.222222	0.010248	0.002159	16.08113		
0.266667	0.010463	0.002619	21.78243		
0.311111	0.010677	0.003089	28.15976		
0.355556	0.010892	0.003568	35.18377		
0.400000	0.011107	0.004057	42.83156		
0.444444	0.011323	0.004556	51.08503		
0.488889	0.011539	0.005064	59.92968		
0.533333	0.011756	0.005581	69.35382		
0.577778	0.011972	0.006109	79.34799		
0.622222	0.012189	0.006645	89.90457		
0.666667	0.012407	0.007192	101.0174		
0.711111	0.012625	0.007748	112.6816		
0.755556	0.012843	0.008314	124.8932		
0.800000	0.013062	0.008890	137.6493		
0.844444	0.013280	0.009475	150.9477		
0.888889	0.013500	0.010070	164.7867		
0.933333	0.013719	0.010675	179.1654		
0.977778	0.013939	0.011290	194.0833		
1.022222	0.014160	0.011914	209.5401		
1.066667	0.014381	0.012549	225.5362		
1.111111	0.014602	0.013193	242.0722		
1.155556	0.014823	0.013846	259.1489		
1.200000	0.015045	0.014510	276.7676		
1.244444	0.015267	0.015184	294.9296		
1.288889	0.015490	0.015867	313.6365		
1.333333	0.015713	0.016561	332.8900		
1.377778	0.015936	0.017264	352.6921		
1.422222	0.016160	0.017977	373.0448		
1.466667	0.016384	0.018700	393.9504		
1.511111	0.016608	0.019434	415.4112		
1.555556	0.016833	0.020177	437.4297		
1.600000	0.017058	0.020930	460.0083		
1.644444	0.017283	0.021693	483.1497		
1.688889	0.017509	0.022466	506.8567		
1.733333	0.017735	0.023249	531.1319		
1.777778	0.017962	0.024043	555.9782		
1.822222	0.018189	0.024846	581.3985		
1.866667	0.018416	0.025659	607.3957		
1.911111	0.018644	0.026483	633.9730		
1.955556	0.018872	0.027317	661.1332		
2.000000	0.019100	0.028160	688.8796		
2.044444	0.019329	0.029014	717.2151		
2.088889	0.019558	0.029879	746.1431		
2.133333	0.019787	0.030753	775.6666		
2.177778	0.020017	0.031637	805.7888		
2.222222	0.020247	0.032532	836.5131		
2.266667	0.020478	0.033437	867.8426		
2.311111	0.020709	0.034352	899.7807		
2.355556	0.020940	0.035278	932.3307		
2.400000	0.021172	0.036214	965.4958		
2.444444	0.021404	0.037160	999.2794		
2.488889	0.021636	0.038116	1033.685		
2.533333	0.021869	0.039083	1068.715		
2.577778	0.022102	0.040060	1104.375		
2.622222	0.022335	0.041048	1140.666		
2.666667	0.022569	0.042046	1177.592		
2.711111	0.022803	0.043054	1215.157		
2.755556	0.023038	0.044073	1253.365		
2.800000	0.023273	0.045102	1292.217		
2.844444	0.023508	0.046141	1331.719		

```
  2.888889  0.023744  0.047191  1371.873
  2.933333  0.023980  0.048252  1412.683
  2.977778  0.024216  0.049323  1454.152
  3.022222  0.024453  0.050404  1496.283
  3.066667  0.024690  0.051496  1539.081
  3.111111  0.024927  0.052599  1582.548
  3.155556  0.025165  0.053712  1626.688
  3.200000  0.025403  0.054836  1671.504
  3.244444  0.025642  0.055970  1717.000
  3.288889  0.025881  0.057115  1763.178
  3.333333  0.026120  0.058271  1810.044
  3.377778  0.026359  0.059437  1857.599
  3.422222  0.026599  0.060614  1905.848
  3.466667  0.026840  0.061801  1954.794
  3.511111  0.027080  0.063000  2004.440
  3.555556  0.027321  0.064209  2054.789
  3.600000  0.027563  0.065428  2105.846
  3.644444  0.027805  0.066659  2157.613
  3.688889  0.028047  0.067900  2210.094
  3.733333  0.028289  0.069152  2263.292
  3.777778  0.028532  0.070414  2317.211
  3.822222  0.028775  0.071688  2371.854
  3.866667  0.029019  0.072972  2427.224
  3.911111  0.029263  0.074267  2483.326
  3.955556  0.029507  0.075573  2540.161
  4.000000  0.029752  0.076890  2597.734
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>           <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1955 10 01        END    2011 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   default[1].wdm
MESSU       25   Mitdefault[1].MES
            27   Mitdefault[1].L61
            28   Mitdefault[1].L62
            30   POCdefault[1]1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       2
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Channel  1                 MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
    2     A/B, Forest, Mod        1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    2         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    2         0    0    4    0    0    0    0    0    0    0    0    0    1    9
```

```
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    2         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    2              0         5         2       400       0.1       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    2              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    2          0.2       0.5      0.35         0       0.7       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    2             0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
```

```
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND   2                        5.17     RCHRES   1      2
PERLND   2                        5.17     RCHRES   1      3

******Routing******
PERLND   2                        5.17     COPY     1     12
PERLND   2                        5.17     COPY     1     13
RCHRES   1                           1     COPY   501     16
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<-----------------><---> User T-series  Engl Metr LKFG            ***
                                       in  out                              ***
    1     Channel  1             1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *        ***
    1        0  1  0  0    4  0  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------->      ***
    1               1      0.02       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES
```

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE   1
   91   4
     Depth   Area   Volume Outflow1 Velocity Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)   (Minutes)***
  0.000000 0.009183 0.000000 0.000000
  0.044444 0.009395 0.000413 1.105418
  0.088889 0.009608 0.000835 3.503192
  0.133333 0.009821 0.001267 6.876030
  0.177778 0.010035 0.001708 11.09462
  0.222222 0.010248 0.002159 16.08113
  0.266667 0.010463 0.002619 21.78243
  0.311111 0.010677 0.003089 28.15976
  0.355556 0.010892 0.003568 35.18377
  0.400000 0.011107 0.004057 42.83156
  0.444444 0.011323 0.004556 51.08503
  0.488889 0.011539 0.005064 59.92968
  0.533333 0.011756 0.005581 69.35382
  0.577778 0.011972 0.006109 79.34799
  0.622222 0.012189 0.006645 89.90457
  0.666667 0.012407 0.007192 101.0174
  0.711111 0.012625 0.007748 112.6816
  0.755556 0.012843 0.008314 124.8932
  0.800000 0.013062 0.008890 137.6493
  0.844444 0.013280 0.009475 150.9477
  0.888889 0.013500 0.010070 164.7867
  0.933333 0.013719 0.010675 179.1654
  0.977778 0.013939 0.011290 194.0833
  1.022222 0.014160 0.011914 209.5401
  1.066667 0.014381 0.012549 225.5362
  1.111111 0.014602 0.013193 242.0722
  1.155556 0.014823 0.013846 259.1489
  1.200000 0.015045 0.014510 276.7676
  1.244444 0.015267 0.015184 294.9296
  1.288889 0.015490 0.015867 313.6365
  1.333333 0.015713 0.016561 332.8900
  1.377778 0.015936 0.017264 352.6921
  1.422222 0.016160 0.017977 373.0448
  1.466667 0.016384 0.018700 393.9504
  1.511111 0.016608 0.019434 415.4112
  1.555556 0.016833 0.020177 437.4297
  1.600000 0.017058 0.020930 460.0083
  1.644444 0.017283 0.021693 483.1497
  1.688889 0.017509 0.022466 506.8567
  1.733333 0.017735 0.023249 531.1319
  1.777778 0.017962 0.024043 555.9782
  1.822222 0.018189 0.024846 581.3985
  1.866667 0.018416 0.025659 607.3957
  1.911111 0.018644 0.026483 633.9730
  1.955556 0.018872 0.027317 661.1332
  2.000000 0.019100 0.028160 688.8796
  2.044444 0.019329 0.029014 717.2151
  2.088889 0.019558 0.029879 746.1431
  2.133333 0.019787 0.030753 775.6666
  2.177778 0.020017 0.031637 805.7888
  2.222222 0.020247 0.032532 836.5131
  2.266667 0.020478 0.033437 867.8426
  2.311111 0.020709 0.034352 899.7807
  2.355556 0.020940 0.035278 932.3307
  2.400000 0.021172 0.036214 965.4958
  2.444444 0.021404 0.037160 999.2794
  2.488889 0.021636 0.038116 1033.685
  2.533333 0.021869 0.039083 1068.715
  2.577778 0.022102 0.040060 1104.375
  2.622222 0.022335 0.041048 1140.666
  2.666667 0.022569 0.042046 1177.592
  2.711111 0.022803 0.043054 1215.157

```
  2.755556  0.023038  0.044073  1253.365
  2.800000  0.023273  0.045102  1292.217
  2.844444  0.023508  0.046141  1331.719
  2.888889  0.023744  0.047191  1371.873
  2.933333  0.023980  0.048252  1412.683
  2.977778  0.024216  0.049323  1454.152
  3.022222  0.024453  0.050404  1496.283
  3.066667  0.024690  0.051496  1539.081
  3.111111  0.024927  0.052599  1582.548
  3.155556  0.025165  0.053712  1626.688
  3.200000  0.025403  0.054836  1671.504
  3.244444  0.025642  0.055970  1717.000
  3.288889  0.025881  0.057115  1763.178
  3.333333  0.026120  0.058271  1810.044
  3.377778  0.026359  0.059437  1857.599
  3.422222  0.026599  0.060614  1905.848
  3.466667  0.026840  0.061801  1954.794
  3.511111  0.027080  0.063000  2004.440
  3.555556  0.027321  0.064209  2054.789
  3.600000  0.027563  0.065428  2105.846
  3.644444  0.027805  0.066659  2157.613
  3.688889  0.028047  0.067900  2210.094
  3.733333  0.028289  0.069152  2263.292
  3.777778  0.028532  0.070414  2317.211
  3.822222  0.028775  0.071688  2371.854
  3.866667  0.029019  0.072972  2427.224
  3.911111  0.029263  0.074267  2483.326
  3.955556  0.029507  0.075573  2540.161
  4.000000  0.029752  0.076890  2597.734
  END FTABLE  1
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1             PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1             IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76          PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76          IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13
```

```
  MASS-LINK       16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK   16


END MASS-LINK

END RUN
```

Mitigated HSPF Message File

Disclaimer

Legal Notice

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Local (360)943-0304

www.clearcreeksolutions.com

DRAINAGE CONTROL PLAN

Attachment 2
Construction SWPPP Report

Please note:
The Construction SWPPP has not been included for this Preliminary Short Subdivision Submittal

DRAINAGE CONTROL PLAN

Attachment 3
Soils Report

Soil Map—Thurston County Area, Washington
(Gateway Christian Prelim Short Sub)

Map Scale: 1:2,470 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 35 70 140 210

Feet
0 100 200 400 600

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 1:24,000.

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: Thurston County Area, Washington
Survey Area Data: Version 17, Aug 29, 2023

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

Date(s) aerial images were photographed: Jul 31, 2022—Aug 8, 2022

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
2	Alderwood gravelly sandy loam, 8 to 15 percent slopes	3.4	10.7%
33	Everett very gravelly sandy loam, 8 to 15 percent slopes	28.1	89.3%
Totals for Area of Interest		**31.4**	**100.0%**

Thurston County Area, Washington

33—Everett very gravelly sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2t62b
Elevation: 30 to 900 feet
Mean annual precipitation: 35 to 91 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 180 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Everett and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Everett

Setting

Landform: Moraines, eskers, kames
Landform position (two-dimensional): Shoulder, footslope
Landform position (three-dimensional): Base slope, crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glacial outwash

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 3 inches: very gravelly sandy loam
Bw - 3 to 24 inches: very gravelly sandy loam
C1 - 24 to 35 inches: very gravelly loamy sand
C2 - 35 to 60 inches: extremely cobbly coarse sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4s
Hydrologic Soil Group: A
Ecological site: F002XA004WA - Puget Lowlands Forest

Forage suitability group: Droughty Soils (G002XN402WA), Droughty Soils (G002XS401WA), Droughty Soils (G002XF403WA)
Other vegetative classification: Droughty Soils (G002XN402WA), Droughty Soils (G002XS401WA), Droughty Soils (G002XF403WA)
Hydric soil rating: No

Minor Components

Alderwood
Percent of map unit: 10 percent
Landform: Hills, ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Nose slope, talf
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Indianola
Percent of map unit: 10 percent
Landform: Kames, eskers, terraces
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Data Source Information

Soil Survey Area: Thurston County Area, Washington
Survey Area Data: Version 17, Aug 29, 2023

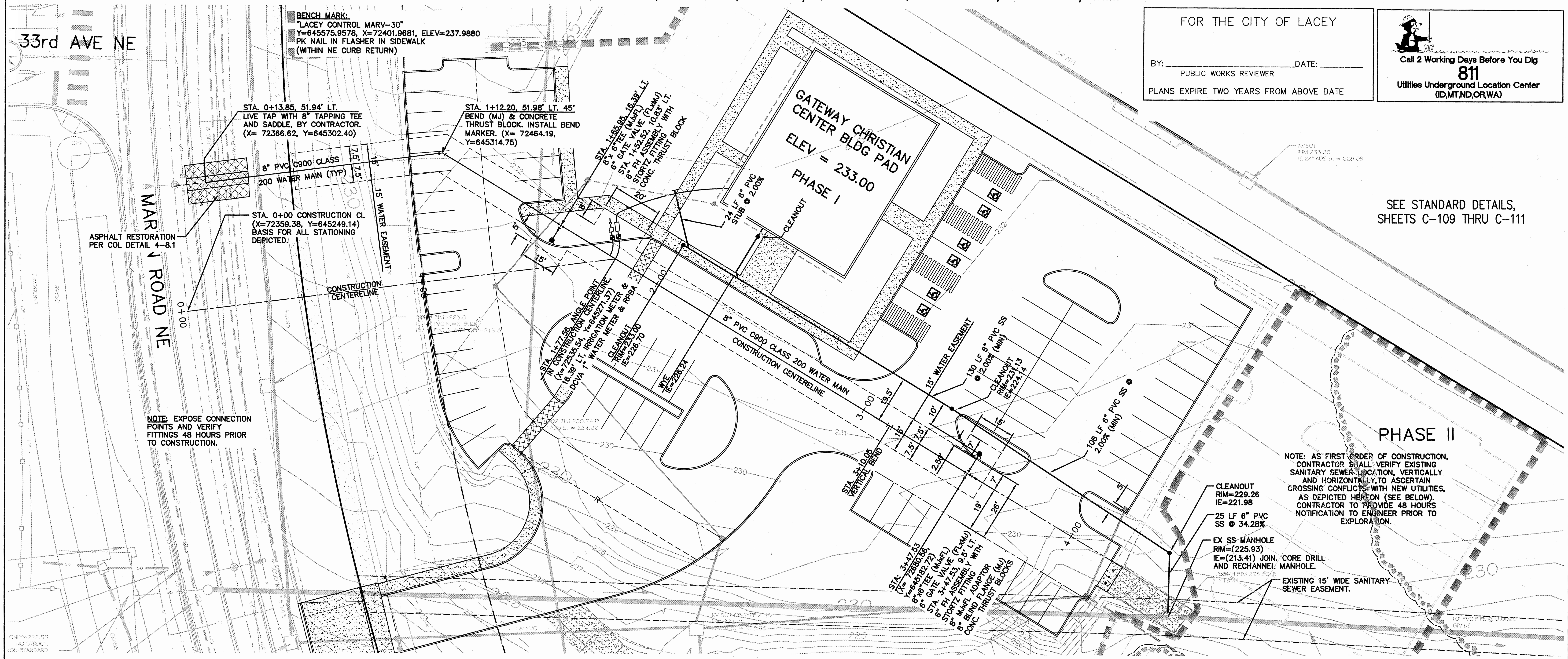
DRAINAGE CONTROL PLAN

Attachment 4

2014 Gateway Christian Center Drainage Plans
Utility Extension and Frontage Improvement Drawings

D-14-05/6

NW 1/4, NW 1/4, SE 1/4, NW 1/4 & SW 1/4, NW 1/4, OF SEC. 2, TWP. 18 N., RGE. 1 W., W.M.



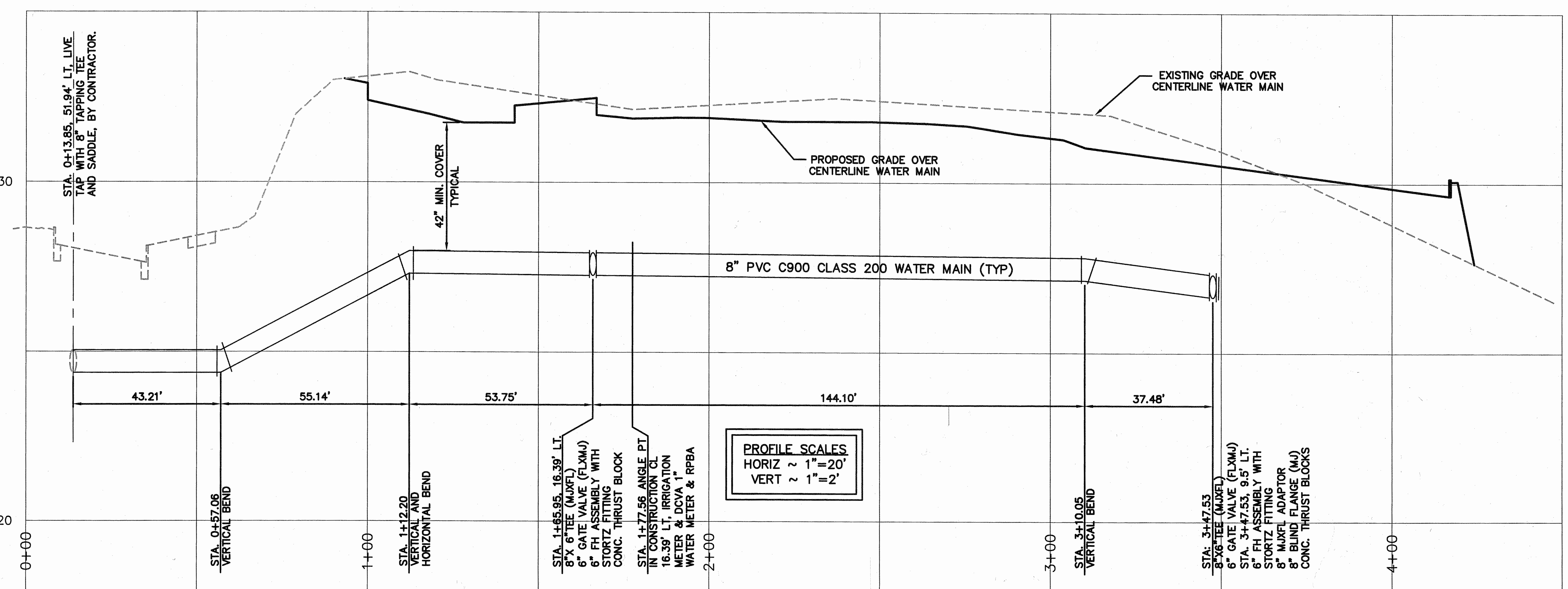
33rd AVE NE
MARVIN ROAD NE
BENCH MARK:
"LACEY CONTROL MARV-30"
Y=645575.9578, X=72401.9681, ELEV=237.9880
PK NAIL IN FLASHER IN SIDEWALK
(WITHIN NE CURB RETURN)
STA. 0+13.85, 51.94' LT.
LIVE TAP WITH 8" TAPPING TEE AND SADDLE, BY CONTRACTOR.
(X= 72366.62, Y=645302.40)
STA. 1+12.20, 51.98' LT. 45° BEND (MJ) & CONCRETE THRUST BLOCK. INSTALL BEND MARKER. (X= 72464.19, Y=645314.75)
8" PVC C900 CLASS 200 WATER MAIN (TYP)
STA. 0+00 CONSTRUCTION CL
(X=72359.38, Y=645249.14)
BASIS FOR ALL STATIONING DEPICTED.
ASPHALT RESTORATION PER COL DETAIL 4-8.1
15' WATER EASEMENT
CONSTRUCTION CENTERELINE
NOTE: EXPOSE CONNECTION POINTS AND VERIFY FITTINGS 48 HOURS PRIOR TO CONSTRUCTION.
GATEWAY CHRISTIAN CENTER BLDG PAD
ELEV = 233.00
PHASE I
24 LF 6" PVC STUB @ 2.00%
CLEANOUT
8" PVC C900 CLASS 200 WATER MAIN
CONSTRUCTION CENTERELINE
130 LF 6" PVC SS @ 2.00% (MIN)
108 LF 6" PVC SS @ 2.00% (MIN)
STA. 3+10.05 VERTICAL BEND
PHASE II
NOTE: AS FIRST ORDER OF CONSTRUCTION, CONTRACTOR SHALL VERIFY EXISTING SANITARY SEWER LOCATION, VERTICALLY AND HORIZONTALLY, TO ASCERTAIN CROSSING CONFLICTS WITH NEW UTILITIES, AS DEPICTED HEREON (SEE BELOW). CONTRACTOR TO PROVIDE 48 HOURS NOTIFICATION TO ENGINEER PRIOR TO EXPLORATION.
CLEANOUT
RIM=229.26
IE=221.98
25 LF 6" PVC SS @ 34.28%
EX SS MANHOLE
RIM=(225.93)
IE=(213.41) JOIN. CORE DRILL AND RECHANNEL MANHOLE.
EXISTING 15' WIDE SANITARY SEWER EASEMENT.
SEE STANDARD DETAILS, SHEETS C-109 THRU C-111

FOR THE CITY OF LACEY

BY:______________________ DATE:__________
PUBLIC WORKS REVIEWER

PLANS EXPIRE TWO YEARS FROM ABOVE DATE

Call 2 Working Days Before You Dig
811
Utilities Underground Location Center
(ID,MT,ND,OR,WA)



STA. 0+13.85, 51.94' LT. LIVE TAP WITH 8" TAPPING TEE AND SADDLE, BY CONTRACTOR.
EXISTING GRADE OVER CENTERLINE WATER MAIN
PROPOSED GRADE OVER CENTERLINE WATER MAIN
42" MIN. COVER TYPICAL
8" PVC C900 CLASS 200 WATER MAIN (TYP)
230
220
43.21'
55.14'
53.75'
144.10'
37.48'
0+00
1+00
2+00
3+00
4+00
STA. 0+57.06 VERTICAL BEND
STA. 1+12.20 VERTICAL AND HORIZONTAL BEND
STA. 1+65.95, 16.39' LT. 8"X 6" TEE (MJXFL) 6" GATE VALVE (FLXMJ) 6" FH ASSEMBLY WITH STORTZ FITTING CONC. THRUST BLOCK
STA. 1+77.56 ANGLE PT IN CONSTRUCTION CL 16.39' LT. IRRIGATION METER & DCVA 1" WATER METER & RPBA
STA. 3+10.05 VERTICAL BEND
STA. 3+47.53 8"X6" TEE (MJXFL) 6" GATE VALVE (FLXMJ) 6" FH ASSEMBLY WITH STORTZ FITTING 8" MJXFL ADAPTOR 8" BLIND FLANGE (MJ) CONC. THRUST BLOCKS
PROFILE SCALES
HORIZ ~ 1"=20'
VERT ~ 1"=2'

"AS-BUILT"

GRAPHIC SCALE

(IN FEET)
1 inch = 20 ft.

NO	REVISION	DATE
4	AS-BUILTS	05-19-14
3	REVISED PER CITY COMMENTS	02-10-14
2	REVISIONS PERMIT PER CITY COMMENTS	01-17-14
1	REVISIONS FOR GRADING PERMIT PER CITY COMMENTS	12-10-13
–	PERMIT SUBMITTAL	08-22-13

HAROLD E. HAGENS, PROFESSIONAL ENGINEER, STATE OF WASHINGTON — 05-19-14

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LAND DEVELOPMENT CONSULTANTS
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phone 425-765-5053 fax 425-242-0894
email j.vh@comcast.net

PROJECT NO. 2006022.00
DRAWN BY: JVH
CHECKED BY: HEH

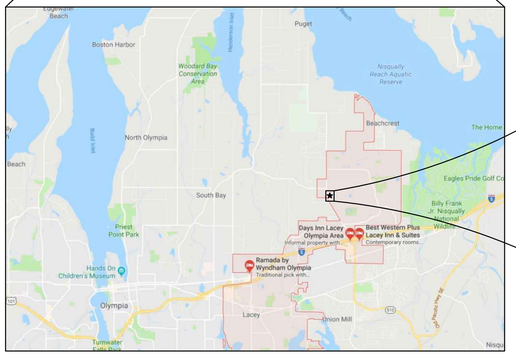
WATER & SEWER PLAN
GATEWAY CHRISTIAN CENTER
LACEY WASHINGTON

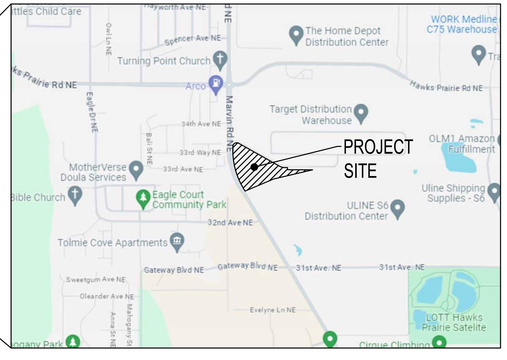
SHEET TITLE
WATER & SEWER PLAN

SHEET NO.
6 of 11

SEC. 18, T 18 N., R 1 W., W.M.

GATEWAY CHRISTIAN CENTER
CONSTRUCTION DOCUMENTS
LACEY, WA





NTS

A PORTION OF SEC 18, T 18 N, R 1 W., W.M.
LACEY, WA

OWNER / APPLICANT
GATEWAY CHRISTIAN CENTER
3300 MARVIN ROAD NE
LACEY, WA 98516
PHONE: 360.259.1894
CONTACT: SUNG HAN

CONSULTANTS
SCJ ALLIANCE
8730 TALLON LANE NE, SUITE 200
LACEY, WA 98516
PHONE: 360.352.1465
CONTACT: BILL DUNNING, PE

SURVEYOR:
MTN2COAST, LLC
2320 MOTTMAN ROAD SW, SUITE 106
TUMWATER, WA 98512
PHONE: 360.239.1497
CONTACT: BLAIR PRIGGE, P.L.S.

SITE INFORMATION
PARCEL NUMBER: 37590000100
ACRES: 8.47

SITE ADDRESS:
3300 MARVIN ROAD NE
LACEY, WA 98516

UTILITIES
WATER/SEWER:
CITY OF LACEY

POWER/GAS:
PUGET SOUND ENERGY

LEGAL DESCRIPTION:
PER STEWART TITLE COMMITMENT NO.1914417:
LOT 1 OF BINDING SITE PLAN NO. BSP-050004LA, AS RECORDED DECEMBER 28, 2005 UNDER AUDITOR'S FILE NO. 3796801;
EXCEPTING THAT PORTION CONVEYED TO THE CITY OF LACEY FOR MARVIN ROAD NORTHEAST UNDER AUDITOR'S FILE NO. 4403245;
IN THURSTON COUNTY, WASHINGTON.

BASIS OF BEARINGS:
FROM PRELIMINARY SHORT PLAT MAP BY MTN2COAST DATED 1/25/2024. NAD 83 / 91 BASED ON CITY OF LACEY COORDINATE SYSTEM AS SHOWN ON ROS RECORDED UNDER AFN 3111152, HOLDING A BEARING OF NORTH 58°41'59" WEST FOR THE NORTHWEST PROPERTY LINE OF TAX PARCEL 3759-00-00100

VERTICAL DATUM:
NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29)

CONTROLLING BENCHMARK:
FROM MERIDIAN GROUP 1 – STORM POND PLANS BY PATRICK HARRON & ASSOCIATES DATED 9/28/2004.
CITY OF LACEY BM# 104
RAIL ROAD SPIKE IN EAST SIDE OF POWER POLE AT THE SW CORNER OF THE INTERSECTION OF MARVIN RD NE AND 32ND AVE NE, ELEV 206.27

SHEET INDEX

SHEET NO.	SHEET TITLE	SHEET DESCRIPTION
1	CV-01	COVER SHEET
2	GN-01	GENERAL NOTES
3	EC-01	EROSION CONTROL AND DEMOLITION PLAN
4	EC-02	TESC NOTES AND DETAILS
5	FR-01	FRONTAGE IMPROVEMENTS PLAN
6	DT-01	SITE DETAILS
7	DR-01	DRAINAGE PLAN
8	WT-01	WATER PLAN
9	SS-01	SANITARY SEWER PLAN
10	UT-01	UTILITY DETAILS

CALL BEFORE YOU DIG
THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL EXISTING UTILITIES. THE CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION BY CALLING THE UNDERGROUND LOCATE LINE AT 811 OR (800)-342-1585 A MINIMUM OF 48 HOURS PRIOR TO ANY EXCAVATION.

BY | DATE | REVISIONS

SCJ ALLIANCE
CONSULTING SERVICES
8730 TALLON LANE NE, SUITE 200, LACEY, WA 98516
P: 360.352.1465
SCJALLIANCE.COM

SHEET TITLE: COVER SHEET

PROJECT NAME: GATEWAY CHRISTIAN CENTER
3300 MARVIN RD NE
LACEY, WA 98516

SEAL:

DESIGNER: D. PHILLIPS
DRAWN BY: N. ALTHAUSER
APPROVED BY: B. DUNNING
DATE: FEBRUARY, 2024
JOB NO: 23-000886
DRAWING FILE NO: 23-000886 CV-01
DRAWING NO: CV-01
SHEET NO: 1 OF 10

Feb 21, 2024 - 10:38:20am - User: nathan.althauser
N:\PROJECTS\6728 GATEWAY CHRISTIAN CENTER\23-000886 GATEWAY CHRISTIAN CTR PLAT INFRASTRUCT\CADD\23-000886 CV-01.DWG

GENERAL CONSTRUCTION NOTES:

1. ALL WORK, WORKMANSHIP AND MATERIALS FOR THIS PROJECT SHALL MEET OR EXCEED THE PROJECT SPECIFICATIONS, CITY OF LACEY DEVELOPMENT GUIDELINES AND PUBLIC WORKS STANDARDS AND MAY INCLUDE REFERENCES TO THE MOST CURRENT VERSION OF THE WSDOT STANDARD SPECIFICATIONS FOR ROAD, BRIDGE, AND MUNICIPAL CONSTRUCTION. IF THERE IS A CONFLICT BETWEEN THE SPECIFICATION TYPES, THE MOST RESTRICTIVE REFERENCE SHALL BE ADHERED TO.
2. ALL GOVERNMENTAL SAFETY REGULATIONS SHALL BE STRICTLY ADHERED TO INCLUDING OSHA, WISHA AND THE WASHINGTON DEPARTMENT OF LABOR AND INDUSTRY.
3. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DULY NOTIFY THE CITY IN ADVANCE OF THE COMMENCEMENT OF ANY AUTHORIZED WORK AND TO SCHEDULE REQUIRED INSPECTIONS. ALL REQUIRED INSPECTION TESTS WILL BE PERFORMED AT THE CONTRACTOR'S EXPENSE.
4. THE CONTRACTOR SHALL PROVIDE A TWO-YEAR WARRANTY ON ALL WORKMANSHIP AND MATERIAL FOLLOWING ACCEPTANCE OF THE PROJECT BY THE OWNER.
5. THE APPROVAL OF THESE PLANS BY THE CITY OF LACEY DOES NOT RELIEVE THE CONTRACTOR OR DEVELOPER OF THE RESPONSIBILITY TO COMPLY WITH THE REQUIREMENTS OF OTHER GOVERNING AGENCIES.

CAUTION – NOTICE TO CONTRACTOR

6. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON THE PROJECT SURVEY AND OTHER RECORDS OF UTILITIES. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR SHALL CALL 1-800-424-5555 48 HOURS PRIOR TO PLANNED EXCAVATIONS.
7. THE DESIGN SHOWN IS BASED UPON THE ENGINEER'S UNDERSTANDING OF THE EXISTING CONDITIONS. THE EXISTING CONDITIONS SHOWN ON THIS PLAN SHEET ARE BASED UPON COMPILED SURVEY DATA. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING FIELD CONDITIONS PRIOR TO BIDDING THE PROPOSED WORK IMPROVEMENTS. IF CONFLICTS ARE DISCOVERED, THE CONTRACTOR SHALL NOTIFY THE OWNER OR OWNERS REPRESENTATIVE.
8. EXISTING UTILITIES ARE SHOWN FOR REFERENCE ONLY. PRIOR TO CONNECTION TO EXISTING UTILITIES THE CONTRACTOR SHALL VERIFY EXACT LOCATION, DIA, LENGTH, CONDITION, PIPE TYPE, SLOPE AND VERTICAL AND HORIZONTAL ALIGNMENT OF THE EXISTING UTILITY AND PROPOSED POINT OF CONNECTION. THE CONTRACTOR SHALL REPORT ANY DISCREPANCIES TO ENGINEER PRIOR TO CONSTRUCTION.
9. PRIOR TO COMMENCING WORK, THE CONTRACTOR SHALL OBTAIN ALL NECESSARY LOCAL, STATE, AND FEDERAL APPROVALS AND PERMITS.
10. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO HAVE A COPY OF THE APPROVED PLANS, SPECIFICATIONS, AND CONTRACT DOCUMENTS AT THE CONSTRUCTION SITE AT ALL TIMES.
11. THE CONTRACTOR SHALL PROVIDE SLOPE PROTECTION FOR SLOPES OF 5:1 OR GREATER ACCORDING TO ASSOCIATED GENERAL CONTRACTORS (AGC) STANDARD GUIDELINES AND BEST MANAGEMENT PRACTICES (BMP'S).
12. THE CONTRACTOR SHALL MAINTAIN EROSION CONTROL FACILITIES IN ACCORDANCE WITH THE CITY OF LACEY, DEPARTMENT OF ECOLOGY STORMWATER MANUAL, THE STORMWATER POLLUTION PREVENTION PLAN (SWPPP), AND PER THE EROSION CONTROL PLAN.
13. THE CONTRACTOR SHALL SAFELY MAINTAIN TRAFFIC AND CONTINUOUS ACCESS TO PRIVATE AND/OR PUBLIC PROPERTY.
14. CONSTRUCTION SIGNING AND TRAFFIC CONTROL SHALL BE PER THE CURRENT COPY OF THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES (MUTCD).
15. ALL VEHICLES AND EQUIPMENT SHALL BE KEPT WITHIN THE WORK AREAS ESTABLISHED FOR THAT WORK SHIFT UNLESS TRAVELING TO OR FROM THE SITE. UNDER NO CIRCUMSTANCES SHALL VEHICLES OR EQUIPMENT BE PARKED OR STORED OUTSIDE OF THESE AREAS.
16. OTHER CONSTRUCTION PROJECTS MAY OCCUR NEAR THE PROJECT SITE AND MAY BE IN PROGRESS CONCURRENT WITH THE PROJECT. THE CONTRACTOR SHALL COOPERATE AS NECESSARY AND NOT INTERFERE OR HINDER THE PROGRESS OR COMPLETION OF WORK BEING PERFORMED BY OTHER CONTRACTORS.
17. THE CONTRACTOR SHALL BE RESPONSIBLE FOR FURNISHING AND INSTALLING ALL MATERIALS, LABOR, AND EQUIPMENT NECESSARY TO COMPLETE THE WORK SHOWN ON THESE DRAWINGS AND TO OBTAIN ACCEPTANCE BY THE CITY OF LACEY AND THE PROJECT OWNER.
18. ALL AREAS DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO THEIR ORIGINAL "PRE CONSTRUCTION" STATE OR BETTER.
19. DRIVEWAY ACCESS AND UTILITY SERVICE TO EXISTING HOMES AND BUSINESSES SHALL BE MAINTAINED AT ALL TIMES.
20. CONTRACTOR SHALL HIRE AN ARBORIST TO INSPECT ALL EXISTING TREES AND PROVIDE A REPORT ON RECOMMENDATIONS FOR PRUNING OR REMOVAL. CONTRACTOR SHALL PRUNE OR REMOVE TREES PER ARBORIST'S REPORT. SEE LANDSCAPE PLANS FOR ADDITIONAL INFORMATION.
21. CONTRACTOR SHALL RECORD ANY FIELD DEVIATION FROM THE ENGINEERING PLANS. THESE RECORDS SHALL BE KEPT ON CONSTRUCTION DRAWINGS AND TURNED OVER TO THE ENGINEER UPON COMPLETION OF THE PROJECT.

STREET IMPROVEMENT NOTES:

1. THE NEW ACCESS ROAD FROM MARVIN ROAD TO THE NEWLY CREATED PARCEL SHALL BE INSTALLED TO PRIVATE INDUSTRIAL ROADWAY STANDARD (SEE ATTACHED DETAIL). THIS ROADWAY SHALL BE CONSTRUCTED AND APPROVED PRIOR TO FINAL SHORT PLAT APPROVAL. THE ROAD SECTION FOR THIS ROAD IS 35-FEET. THE SECTION INCLUDES: 24-FEET OF ROADWAY, CURB AND GUTTER ON EACH SIDE OF THE ROAD AND A 5-FOOT SIDEWALK ON EACH SIDE OF THE ROAD.
2. IN ADDITION TO ALL FEDERAL AND STATE STREET LIGHTING REQUIREMENTS, STREET LIGHTING LEVELS SHALL COMPLY WITH CURRENT CITY OF LACEY DEVELOPMENT GUIDELINES AND PUBLIC WORKS STANDARDS REQUIREMENTS FOR ROADWAYS AND INTERSECTION. TO COMPLY WITH THESE STANDARDS AND ASSURE STREET LIGHTING IS IN CONFORMANCE WITH THESE STANDARDS, ADDITIONAL STREET LIGHTING MAY BE REQUIRED FOR ALL STREETS ADJACENT TO THIS PROJECT. ALL STREET LIGHTING DESIGNS SHALL BE PREPARED BY AN ENGINEERING FIRM CAPABLE OF PERFORMING SUCH WORK. (DG&PWS, TRANSPORTATION, ILLUMINATION 4E.010)
3. FIBER OPTIC CONDUIT SHALL CONFORM TO THE STANDARDS AND REQUIREMENTS AS SET FORTH IN CHAPTER 4 (TRANSPORTATION) FROM THE DEVELOPMENT GUIDELINES & PUBLIC WORKS STANDARDS (DG&PWS, TRANSPORTATION 4E.035).
4. ALL PUBLIC STREETS WITHIN THE CITY AND THE CITY'S UGA BOUNDARY WILL BE PLANTED WITH TREES TO CREATE A DISTINCT AND PLEASANT CHARACTER FOR THOSE ROADWAYS. THE STREET TREES LOCATED IN THE DEVELOPMENT GUIDELINES SHALL BE REQUIRED IN OR ALONG THE PUBLIC RIGHT-OF-WAY, INCLUDING MEDIANS. CONTACT THE CITY FOR SPECIFIC STREET AND ACCENT TREES IN THE CORE AREA. (DG&PWS, TRANSPORTATION 4G.100)
5. IN ADDITION TO ALL FEDERAL AND STATE ROADWAY REQUIREMENTS, THIS PROJECT SHALL COMPLY WITH CURRENT CITY OF LACEY DEVELOPMENT GUIDELINES AND PUBLIC WORKS STANDARDS MANUAL REQUIREMENTS FOR ROADWAYS.

GENERAL SURVEYING REQUIREMENTS:

1. UTILITY EASEMENTS ARE REQUIRED FOR ALL PUBLIC MAINS, WATER AND SEWER LOCATED ON PRIVATE PROPERTY. EASEMENTS SHALL INCLUDE FIRE HYDRANTS, WATER METERS, SEWER IMPROVEMENTS AND FUTURE EXTENSIONS OF MAINS TO ADJACENT PROPERTIES AS DETERMINED BY THE CITY. RATHER THAN BEING DESIGNATED AS WATER OR SEWER, ALL EASEMENTS SHALL BE IDENTIFIED AS "UTILITY" EASEMENTS ON THE CIVIL DRAWINGS AND IN THE EASEMENT DOCUMENT. SPECIFIC REQUIREMENTS WILL BE DETERMINED AT THE OF PLAN REVIEW. ALL EASEMENTS SHALL BE PREPARED BY A LICENSED LAND SURVEYOR AN SUBMITTED PRIOR TO RELEASE OF APPROVED CIVIL DRAWINGS (DG&PWS CHAPTER 3.110).
2. LANDSCAPING WITHIN EASEMENTS AREAS SHALL BE LIMITED TO SHRUBS AND OTHER LOW GROWING VEGETATION WITHOUT MAJOR ROOT SYSTEMS. TREES ARE PROHIBITED WITHIN EASEMENT AREAS.
3. THE CITY OF LACEY COORDINATE SYSTEM IS A GROUND SCALE COORDINATE SYSTEM DERIVED FROM THE WASHINGTON COORDINATE SYSTEM, NAD 83/91. UNITS ARE EXPRESSED IN FEET. DATA CAN BE OBTAINED FROM LACEY PUBLIC WORKS DEPARTMENT. CIVIL DRAWINGS SHALL BE SUBMITTED UTILIZING THE CITY OF LACEY COORDINATE SYSTEM. (DG&PWS 3.025)
4. CITY OF LACEY VERTICAL DATUM HAS ELEVATIONS REFERENCED TO THE NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD29). UNITS ARE EXPRESSED IN FEET. A BENCHMARK LISTING CAN BE OBTAINED FROM LACEY PUBLIC WORKS DEPARTMENT. CIVIL DRAWINGS SHALL BE SUBMITTED UTILIZING THE CITY OF LACEY VERTICAL DATUM. (DG&PWS 3.025)

ABBREVIATIONS

&	AND
Ð	ANGLE
±	APPROXIMATELY
@	AT
℄	CENTERLINE
°	DEGREE
=	EQUALS
'	FOOT
>	GREATER THAN
"	INCH
#	NUMBER
%	PERCENT
AC	ASPHALTIC CONCRETE
ADD'L	ADDITIONAL
ADJT	ADJACENT
AFF	ABOVE FINISH FLOOR
AP	ANGLE POINT
APPROX	APPROXIMATE
ARCH	ARCHITECT
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS
ATB	ASPHALT TREATED BASE COURSE
AVE	AVENUE
BCR	BEGIN CURB RETURN
BFV	BUTTERFLY VALVE
BGS	BELOW GROUND SURFACE
BLK	BLOCK(S)
BLDG	BUILDING
BM	BENCHMARK
BVC	BEGIN VERTICAL CURB
C	CONDUIT
CB	CATCH BASIN
CF	CUBIC FEET
CIRC	CIRCUIT, CIRCULA(R, TION)
CIP	CAST-IN-PLACE
CIP MON	CAST-IN-PLACE MONUMENT
CJ	CENTER JOINT
℄	CENTER LINE
CL	CROWNLINE
CLR	CLEAR
CO	CLEANOUT
COMM	COMMUNICATION
COMPT	COMPACTED
CONC	CONCRETE
CONST	CONSTRUCT
CONT	CONTINU(E, ED, OUS, ATION)
COORD	COORDINATE
CSBC	CRUSHED SURFACING BASE COURSE
CSTC	CRUSHED SURFACING TOP COURSE
CULV	CULVERT
CU YD	CUBIC YARD
D/W	DRIVEWAY
DEF	DEFLECTION
DEG	DEGREE
DEMO	DEMOLISH/DEMOLITION
DIA	DIAMETER
DIM	DIMENSION(S)
DIP	DUCTILE IRON PIPE
DR	DRIVE
DWG(S)	DRAWING(S)
E	EAST OR ELECTRICAL
EA	EACH
ECR	END CURB RETURN
EHH	ELECTRICAL HANDHOLE
EL, ELEV	ELEVATION
ELEC	ELECTRIC(AL)
ENGR	ENGINEER
EOP	EDGE OF PAVEMENT
EQ	EQUAL(LY)
EQUIP	EQUIPMENT
ESMT	EASEMENT
EVC	END VERTICAL CURVE
EX, EXIST	EXISTING EXP EXPANSION
EXP	EXPANSION
FDC	FIRE DEPARTMENT CONNECTION
FDN	FOUNDATION
FF	FINISH FLOOR
FG	FINISH GRADE ELEVATION
FH	FIRE HYDRANT
FIN	FINISH(ED)
FL	FIRE LINE/FLANGE
FT	FOOT/FEET
G	GAS
GALV	GALVANIZED
GRND	GROUND
GV	GATE VALVE
HH	HANDHOLE
HORIZ	HORIZONTAL
HT	HEIGHT
IE	INVERT ELEVATION
IN	INCH
JB, J-BOX	JUNCTION BOX
JT	JOINT TRENCH
KV	KILOVOLTS
KW	KILOWATT
KWH	KILOWATT HOURS
L	LENGTH
LB(S)	POUND(S)
LF	LINEAR FEET
LP	LOW POINT ELEVATION
LT	LEFT
MAX	MAXIMUM
MFR	MANUFACTURER
MH	MANHOLE
MIN	MINIMUM, MINUTE
MISC	MISCELLANEOUS
MON	MONUMENT IN CASE
N	NORTH, NORTHING
N/A	NOT APPLICABLE
NE	NORTHEAST
NEMA	NATIONAL ELECTRICAL MANUFACTURER ASSOCIATION
NIC	NOT IN CONTRACT
NO, NO	NUMBER
NTS	NOT TO SCALE
NW	NORTHWEST
OC, OC	ON CENTER
OD	OUTSIDE DIAMETER
OSHA	OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION
P	POWER, POWER VAULT
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVE OR PORTLAND CEMENT CONCRETE
PED	PEDESTAL
PI	POINT OF INTERSECTION
ℙ	PROPERTY LINE
POC	POINT OF CONNECTION
PP	POWER POLE
PRC	POINT OF REVERSE CURVATURE
PROP	PROPERTY
PSI	POUNDS PER SQUARE INCH
PT	POINT OF TANGENCY
PVC	POINT OF VERTICAL CURVE
PVI	POINT OF VERTICAL INTERSECTION
PVT	POINT OF VERTICAL TANGENT
PVMT	PAVEMENT
PWR	POWER
QTY	QUANTITY
R	RADIUS
RD	ROAD, ROADWAY
REF	REFERENCE
REINF	REINFORC(E, ED, ING, MENT)
REQ'D	REQUIRED
REV	REVISION
RIM	STRUCTURE RIM ELEVATION
RT	RIGHT TURN
R/W, ROW	RIGHT OF WAY
S	SOUTH OR SLOPE
SCHED	SCHEDULE
SD, SDMH	STORM DRAIN, STORM DRAIN MANHOLE
SE	SOUTHEAST
SECT	SECTION(S)
SHT	SHEET
SP	SPRINKLER
SQ	SQUARE
SQ FT	SQUARE FEET
SQ IN	SQUARE INCH
SS	SANITARY SEWER
SSMH	SANITARY SEWER MANHOLE
ST	STREET
STA	STATION
STD	STANDARD
STRUCT	STRUCTURE(E, AL)
SW	SOUTHWEST
SYS	SYSTEM
T	TELEPHONE OR TELEPHONE VAULT
TBD	TO BE DETERMINED
TBM	TEMPORARY BENCH MARK
TC	TOP OF CURB ELEVATION
TELE	TELEPHONE
TEMP	TEMPORARY
TOW	TOP OF WALL ELEVATION
TP, T/P	TOP OF PIPE
TYP	TYPICAL
UDG	UNDERGROUND
VAP	VERTICAL ANGLE POINT
VC	VERTICAL CURVE
VERT	VERTICAL
VOL	VOLUME
W	WEST, WIDTH, WIDE OR WATER
W/	WITH
W/O	WITHOUT
WM	WATER MAIN OR WILLAMETTE MERIDIAN
WV	WATER VALVE
XFMR	TRANSFORMER

BY	DATE	REVISIONS

SCJ ALLIANCE
CONSULTING SERVICES
8730 TALLON LANE NE, SUITE 200, LACEY, WA 98516
P: 360.352.1465
SCJALLIANCE.COM

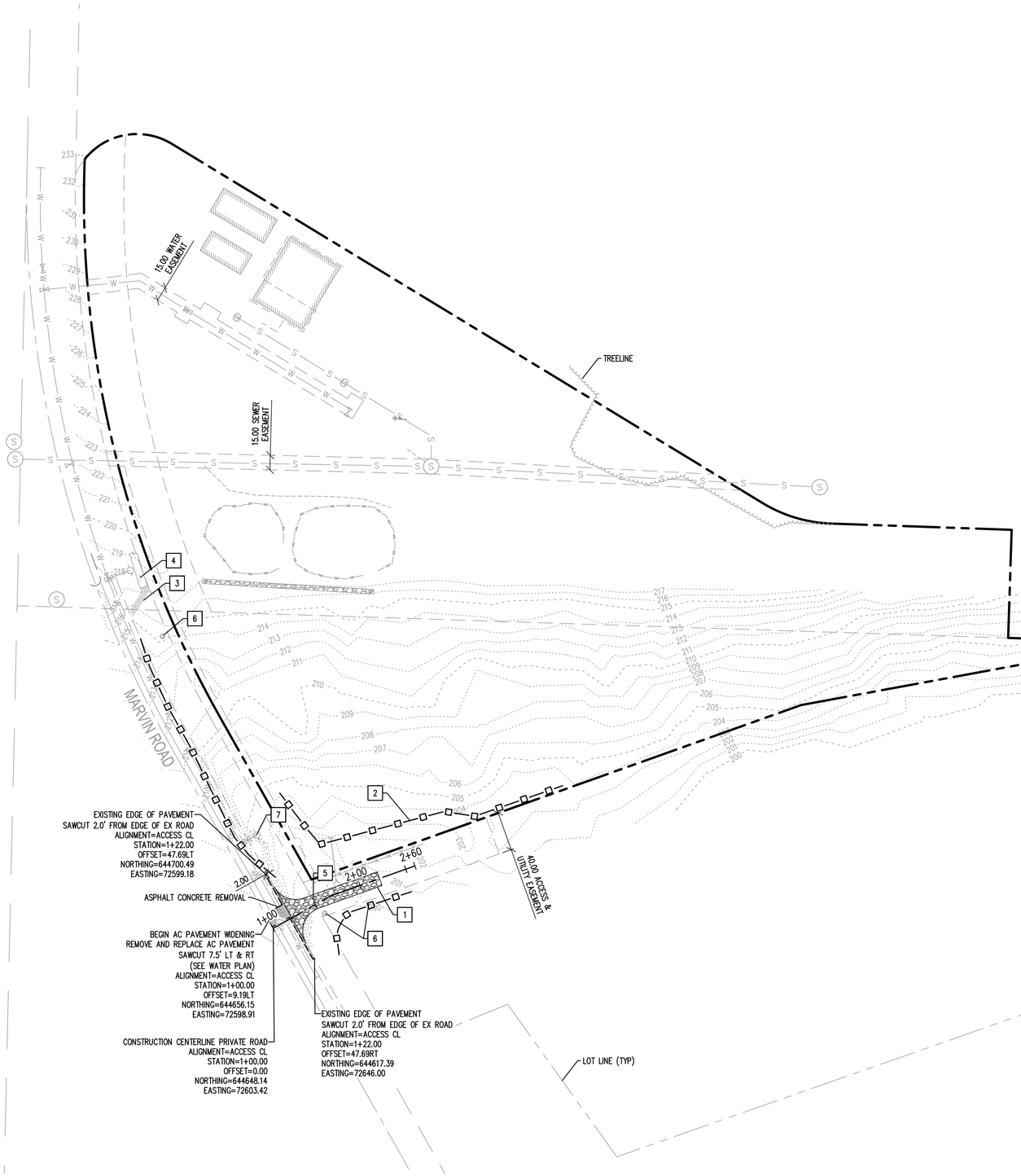
SHEET TITLE: GENERAL NOTES

PROJECT NAME: GATEWAY CHRISTIAN CENTER
3300 MARVIN RD NE
LACEY, WA 98516

SEAL:

DESIGNER: D. PHILLIPS
DRAWN BY: N. ALTHAUSER
APPROVED BY: B. DUNNING
DATE: FEBRUARY, 2024
JOB NO: 23-000886
DRAWING FILE NO: 23-000886 GN-01
DRAWING NO: GN-01
SHEET NO: 2 OF 10

SEC. 18, T 18 N., R 1 W., W.M.



LEGEND

- EXISTING PROPERTY LINE
- PROPOSED LOT LINE
- SILT FENCE, SEE EC-02
- STABILIZED CONSTRUCTION ENTRANCE SEE EC-02
- ASPHALT CONCRETE REMOVAL
- HMA SIDEWALK REMOVAL

EROSION ACONTROL AND DEMOLITION NOTES:

1. STABILIZED CONSTRUCTION ENTRANCE, SEE EC-02
2. SILT FENCE, SEE EC-02
3. REMOVE HMA SIDEWALK AND BASE
4. REMOVE PORTLAND CEMENT CONCRETE SIDEWALK TO THE NEAREST EXPANSION JOINT
5. REMOVE EXISTING FENCE AND GATES AS NECESSARY FOR CONSTRUCTION
6. PROTECT IN PLACE ALL EXISTING STORMWATER INFRASTRUCTURE
7. PROTECT IN PLACE EXISTING FIRE HYDRANT

NOTE:

CONTRACTOR TO VERIFY EXISTING GRADES PRIOR TO CONTRACTOR PERFORMING WORK. COORDINATE WITH ENGINEER IF DISCREPANCIES ARE IDENTIFIED. COORDINATE TO AS-BUILT SURVEY IMPROVEMENTS AS PART OF BASE CONTRACT.

BY	DATE	REVISIONS

SCJ ALLIANCE
CONSULTING SERVICES
8730 TALLON LANE NE, SUITE 200, LACEY, WA 98516
P: 360.352.1465
SCJALLIANCE.COM

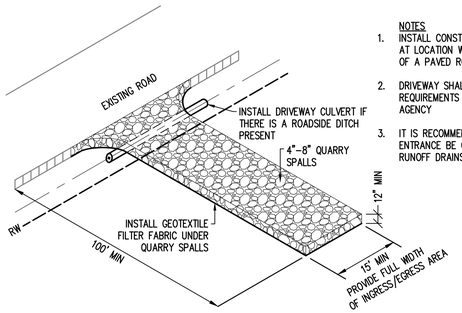
SHEET TITLE: EROSION CONTROL AND DEMOLITION PLAN

PROJECT NAME: GATEWAY CHRISTIAN CENTER
3300 MARVIN RD NE
LACEY, WA 98516

SEAL:

DESIGNER:	D. PHILLIPS
DRAWN BY:	N. ALTHAUSER
APPROVED BY:	B. DUNNING
DATE:	FEBRUARY, 2024
JOB NO:	23-000886
DRAWING FILE NO:	23-000886 EC-01
DRAWING NO:	EC-01
SHEET NO:	3 OF 10

Feb 21, 2024 10:39:07am – User: nathan.althauser
N:\PROJECTS\6728 GATEWAY CHRISTIAN CENTER\23-000886 GATEWAY CHRISTIAN CTR PLAT INFRASTRUCT\CADD\23-000886 EC-01.DWG

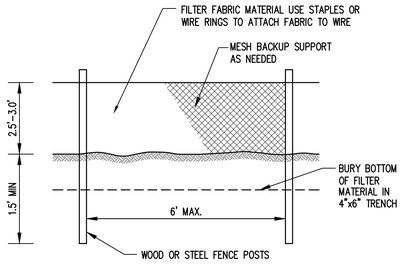


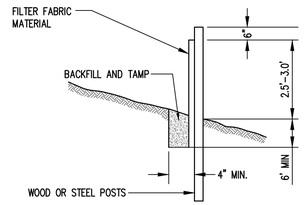
NOTES

1. INSTALL CONSTRUCTION ENTRANCE AT LOCATION WHERE ACCESS OFF OF A PAVED ROADWAY BEGINS.
2. DRIVEWAY SHALL MEET THE REQUIREMENTS OF THE PERMITTING AGENCY
3. IT IS RECOMMENDED THAT THE ENTRANCE BE CROWNED SO THAT RUNOFF DRAINS OFF THE PAD

STABILIZED CONSTRUCTION ENTRANCE

NTS





SILT FENCE

NTS

GENERAL EROSION CONTROL NOTES:

1. THE CONTRACTOR SHALL FOLLOW EROSION CONTROL PRACTICES OUTLINED IN THE WASHINGTON STATE DEPARTMENT OF ECOLOGY STORMWATER MANAGEMENT MANUAL FOR WESTERN WASHINGTON AND THE SWPPP.
2. EROSION CONTROL MEASURES ARE NOT LIMITED TO THE ITEMS ON THESE PLANS. THE CONTRACTOR IS RESPONSIBLE FOR THE INSTALLATION AND MAINTENANCE OF ALL EROSION CONTROL MEASURES. NO SILTATION OF EXISTING OR PROPOSED DRAINAGE FACILITIES SHALL BE ALLOWED. CARE SHALL BE TAKEN TO PREVENT MIGRATION OF SILTS TO OFF-SITE PROPERTIES.
3. EROSION CONTROL MEASURES SHALL BE IN PLACE PRIOR TO THE BEGINNING OF CONSTRUCTION. THE PROJECT ENGINEER AND THE REVIEWING AGENCY SHALL INSPECT AND APPROVE THE INSTALLATION OF EROSION CONTROL MEASURES PRIOR TO BEGINNING CONSTRUCTION.
   A. INSTALL INLET SEDIMENTATION AS SPECIFIED AT ALL CATCH BASIN LOCATIONS IMMEDIATELY UPON ARRIVAL AT PROJECT/CONSTRUCTION SITE.
   B. STABILIZED CONSTRUCTION ENTRANCE SHALL CONFORM TO DETAIL ON SHEET EC-02, STABILIZED CONSTRUCTION ENTRANCE. A STABILIZED CONSTRUCTION ENTRANCE SHALL BE INSTALLED AT ALL INGRESS/EGRESS POINTS TO CONSTRUCTION SITE.
4. ALL EROSION/SEDIMENTATION CONTROL FACILITIES SHALL BE MAINTAINED IN A SATISFACTORY CONDITION UNTIL CONSTRUCTION IS COMPLETE AND THE SITE HAS BEEN STABILIZED. THE CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTATION, MAINTENANCE, REPLACEMENT, AND ADDITIONS TO THE SYSTEM AS REQUIRED BY THE OWNER, ENGINEER, OR THE CITY OF LACEY ⚷⚷.
5. THE CONTRACTOR SHALL MAKE A DAILY SURVEILLANCE OF ALL EROSION CONTROL MEASURES AND MAKE ANY NECESSARY REPAIRS OR ADDITIONS TO THE EROSION CONTROL MEASURES AS REQUIRED. THE CONTRACTOR SHALL PROVIDE ADDITIONAL EROSION CONTROL MEASURES AS DETERMINED NECESSARY BY THE INSPECTOR AND/OR PROJECT ENGINEER. FAILURE TO COMPLY WITH ALL LOCAL AND STATE EROSION CONTROL REQUIREMENTS MAY RESULT IN CIVIL PENALTIES BEING LEVIED AGAINST THE CONTRACTOR.
6. PRIOR TO CLEARING AND GRADING THE CONTRACTOR SHALL PROTECT TREES TO BE SAVED WITH HIGH VISIBILITY FENCING AT THE ROOT PROTECTION DELINEATION OR OTHERWISE PROTECTED AS DIRECTED BY THE ENGINEER, CITY STAFF, OR OWNERS REPRESENTATIVE. CLEARING AND GRADING LIMITS SHALL BE STAKED IN THE FIELD PRIOR TO EXCAVATION.
7. ALL STORM DRAINAGE INLETS RECEIVING RUNOFF FROM THE PROJECT DURING CONSTRUCTION SHALL BE PROTECTED SO THAT SEDIMENT-LADEN WATER WILL BE FILTERED BEFORE ENTERING THE CONVEYANCE SYSTEM.
8. ALL OFF-SITE CATCH BASINS IMMEDIATELY ADJACENT TO THE PROPOSED SITE SHALL BE PROTECTED FROM SILTATION.
9. THE CONSTRUCTION OF TRENCHES (E.G., PIPES, UNDERGROUND UTILITY LINES AND STRUCTURES) SHALL BE SUBJECT TO THE FOLLOWING CRITERIA:
   A. NO MORE THAN 300 FEET OF TRENCH ON A DOWNSLOPE OF MORE THAN FIVE PERCENT SHALL BE OPENED AT ONE TIME.
   B. EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF TRENCHES.
10. TRENCH DEWATERING DEVICES SHALL BE DISCHARGED IN A MANNER THAT WILL NOT ADVERSELY AFFECT STREAMS, DRAINAGE SYSTEMS, OR OFF-SITE PROPERTIES.
11. TRACKING OF SOIL, MUD, OR DEBRIS OFF-SITE IS NOT ALLOWED. SOIL, MUD, OR DEBRIS TRACKED ONTO A PUBLIC ROADWAY, SHALL BE REMOVED ON AN ONGOING BASIS. TO PREVENT THE TRACKING OF SOIL, MUD, OR DEBRIS ONTO PUBLIC ROADWAYS, SWEEPING OR WASHING OF THE VEHICLE'S TIRES MAY BE REQUIRED PRIOR TO ENTERING A PUBLIC ROADWAY.
12. ALL DISTURBED AREAS SHALL BE HYDROSEEDED WITH EROSION CONTROL SEED MIX. INCLUDING BUT NOT LIMITED TO ROADWAY EMBANKMENTS, SHOULDERS, UTILITY EASEMENTS, STAGING AREAS, CONSTRUCTED WETLANDS AND CUT/FILL SLOPES.
13. ALL SEEDED OR SODDED AREAS SHALL BE CHECKED REGULARLY TO ENSURE VEGETATIVE COVERAGE IS COMPLETE. AREAS SHALL BE REPAIRED, RESEEDED, AND FERTILIZED AS REQUIRED.
14. DROP-IN CATCH BASIN FILTERS MAY BE USED IN PLACE OF OTHER STANDARD INLET PROTECTION PRACTICES. THIS INLET PROTECTION TECHNOLOGY CAN BE USED IN SITUATIONS WHERE RIGHT-OF-WAY FLOODING WOULD BE PROBLEMATIC.
15. TO MAINTAIN FUNCTION, THE CONTRACTOR SHALL REMOVE AND CLEAN OR REPLACE FILTERS AFTER EACH STORM EVENT. CONTACT THE JURISDICTION TO DETERMINE ITS ACCEPTANCE OF SPECIFIC FILTER PRODUCTS, PRIOR TO INSTALLATION.
16. NO MATERIAL SHALL BE STOCKPILED ON PAVEMENT WITHOUT AUTHORIZATION FROM THE PROJECT ENGINEER OR OWNER'S REPRESENTATIVE WHICH WILL BE CONDITIONAL ON IMPLEMENTATION OF A PROCEDURE TO PREVENT SEDIMENT TRANSPORT.
17. ALL TEMPORARY EROSION CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION HAS BEEN ACHIEVED OR AFTER THE MEASURES ARE NO LONGER NEEDED. SEDIMENT COLLECTED IN TRAPS, PONDS, OR SILT FENCE SHALL BE REMOVED AND DISPOSED IN AN APPROVED MANNER OR STABILIZED ON SITE. DISTURBED SOIL AREAS RESULTING FROM SEDIMENT REMOVAL SHALL BE PERMANENTLY STABILIZED WITHIN SEVEN (7) DAYS.

WET WEATHER CONSTRUCTION NOTES:

1. GROUND SURFACE SHALL BE SLOPED SO SURFACE WATER IS COLLECTED AND DIRECTED AWAY FROM THE WORK AREA TO AN APPROVED COLLECTION/DISPERSION POINT
2. EARTHWORK ACTIVITIES SHALL NOT TAKE PLACE DURING PERIODS OF HEAVY PRECIPITATION
3. MEASURES SHALL BE TAKEN TO PREVENT ONSITE SOIL AND SOIL STOCKPILES FROM BECOMING WET OR UNSTABLE
4. STRUCTURAL FILL MATERIALS USED DURING PERIODS OF WET WEATHER SHALL BE COMPACTED TO THE PROJECT SPECIFICATIONS. SUITABLE STRUCTURAL FILL MATERIAL FOR WET WEATHER USE INCLUDES IMPORTED ALL-WEATHER FILL PER PROJECT'S GEOTECHNICAL ENGINEERING REPORT
5. A SMOOTH-DRUM ROLLER SHALL BE USED TO SEAL THE GROUND SURFACE PRIOR TO PERIODS OF PRECIPITATION TO REDUCE THE EXTENT TO WHICH THE SOIL BECOMES WET OR UNSTABLE
6. CONSTRUCTION TRAFFIC SHALL BE RESTRICTED TO SPECIFIC AREAS OF THE SITE SURFACED WITH MATERIALS NOT SUSCEPTIBLE TO WET WEATHER DISTURBANCE
7. A MINIMUM 1 FOOT THICK LAYER OF 4- TO 6-INCH QUARRY SPALLS SHALL BE USED IN HIGH-TRAFFIC AREAS TO PROTECT THE SUBGRADE SOIL FROM DISTURBANCE
8. DURING THE WET SEASON (OCTOBER 1 THROUGH APRIL 30 INCLUSIVE), ALL DISTURBED SOILS SHALL BE STABILIZED WITHIN 48 HOURS AFTER STOP OF WORK. EROSION CONTROL MEASURES SHALL INCLUDE, BUT ARE NOT LIMITED TO, COVERING THE AFFECTED AREA INCLUDING SOIL PILES WITH PLASTIC SHEETING, STRAW MATTING, JUTE MATTING, STRAW MULCH, OR WOOD CHIPS. SEEDING OF THE DISTURBED AREAS SHALL TAKE PLACE AS WEATHER PERMITS.

BY	DATE	REVISIONS
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SCJ ALLIANCE
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P: 360.352.1465
SCJALLIANCE.COM

SHEET TITLE: TESC NOTES AND DETAILS

PROJECT NAME: GATEWAY CHRISTIAN CENTER
3300 MARVIN RD NE
LACEY, WA 98516

SEAL:

DESIGNER:	D. PHILLIPS
DRAWN BY:	N. ALTHAUSER
APPROVED BY:	B. DUNNING
DATE:	FEBRUARY, 2024
JOB NO:	23-000886
DRAWING FILE NO:	23-000886 EC-02
DRAWING NO:	EC-02
SHEET NO:	4 OF 10

Feb 21, 2024 10:39:30am - User: nathan.althauser
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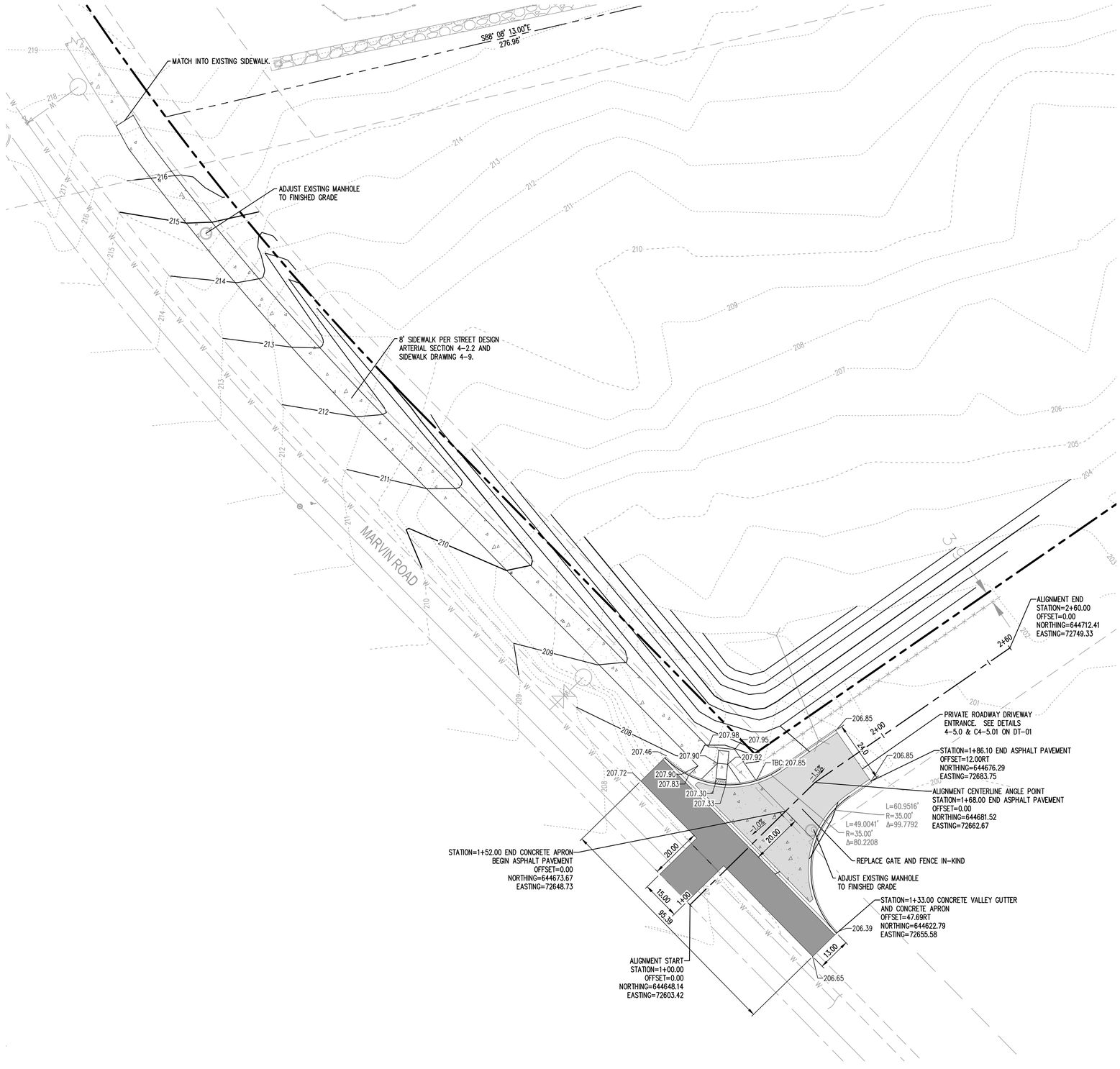
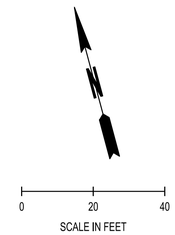
SEC. 18, T 18 N., R 1 W., W.M.





LEGEND

- RIGHT-OF-WAY
- RIGHT-OF-WAY CENTERLINE
- PROPERTY LINE
- EXISTING EASEMENT
- LOT LINE
- CONCRETE SIDEWALK SEE DT-01
- BOULEVARD & ARTERIAL ASPHALT SEE DT-01
- MINOR LOCAL RESIDENTIAL & PRIVATE ASPHALT SEE DT-01
- PORTLAND CEMENT APRON FOR PRIVATE ROAD DRIVEWAY PER DWG. NO. 4-5.01: SEE DT-01

CITY OF LACEY GENERAL NOTES (STREET CONSTRUCTION):

1. SEE APPROPRIATE DETAIL FOR SPECIFICATIONS FOR JOINING NEW AND EXISTING ASPHALT.
2. COMPACTION OF SUBGRADE, ROCK, AND ASPHALT SHALL BE IN ACCORDANCE WITH THE MOST CURRENT ADOPTED VERSION OF THE WSDOT/APWA STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION.
3. FORM AND SUBGRADE INSPECTION BY THE CITY IS REQUIRED BEFORE POURING CONCRETE. (SEE WSDOT/APWA STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION 8-14.3 (1) THROUGH (4)). TWENTY-FOUR HOURS NOTICE IS REQUIRED FOR FORM INSPECTION.
4. SEE CITY OF LACEY DEVELOPMENT GUIDELINES AND PUBLIC WORKS STANDARDS, CHAPTER 4B.200, FOR TESTING AND SAMPLING FREQUENCIES.
5. THE CITY MANUFACTURES AND INSTALLS PUBLIC AND PRIVATE STREET NAME SIGNS, AND REGULATORY SIGNS AT THE CONTRACTOR'S/DEVELOPER'S EXPENSE. OTHER SIGNS THAT SHALL BE MANUFACTURED AND INSTALLED BY THE CITY AND PAID FOR BY THE CONTRACTOR/DEVELOPER'S WILL INCLUDE SIGNS FOR WELL SITES, TANK SITES, LIFT STATIONS, ODOR CONTROL STATIONS, MAINTENANCE AND/OR FIRE ACCESS THROUGH AN EASEMENT. (SEE 4B.050). SIGNS SHALL BE REQUESTED AT THE TIME STREET CONSTRUCTION BEGINS.
6. MATERIAL USED FOR ALL PLASTIC STOP LINES, PLASTIC CROSSWALK LINES, PLASTIC TRAFFIC ARROWS, PLASTIC TRAFFIC LETTERS, PLASTIC LEGENDS, AND PLASTIC SYMBOLS SHALL BE TYPE B - PRE-FORMED FUSED THERMOPLASTIC AT 120 MIL THICKNESS.

NOTES:

1. CONTRACTOR TO VERIFY EXISTING GRADES PRIOR TO CONTRACTOR PERFORMING WORK. COORDINATE WITH ENGINEER IF DISCREPANCIES ARE IDENTIFIED. COORDINATE TO AS-BUILT SURVEY IMPROVEMENTS AS PART OF BASE CONTRACT.
2. THE CITY WILL INSTALL BOTH PUBLIC AND PRIVATE ROADWAY SIGNS AT THE DEVELOPERS EXPENSE

REVISIONS	DATE	BY

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SHEET TITLE: FRONTAGE IMPROVEMENTS PLAN

PROJECT NAME: GATEWAY CHRISTIAN CENTER
3300 MARVIN RD NE
LACEY, WA 98516

SEAL:

DESIGNER:	D. PHILLIPS
DRAWN BY:	N. ALTHAUSER
APPROVED BY:	B. DUNNING
DATE:	FEBRUARY, 2024
JOB NO:	23-000886
DRAWING FILE NO:	23-00086 FR-01
DRAWING NO:	FR-01
SHEET NO:	5 OF 10

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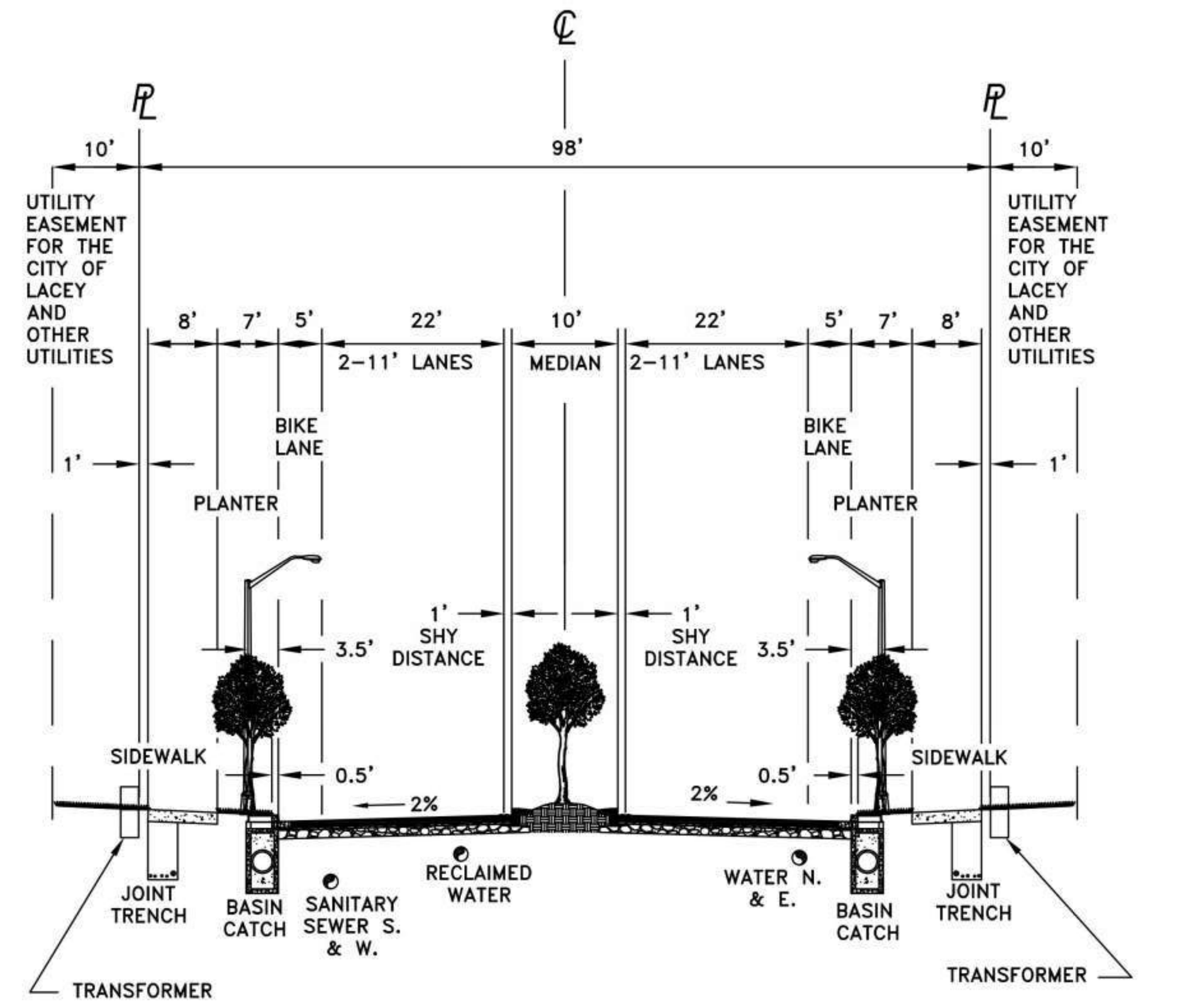


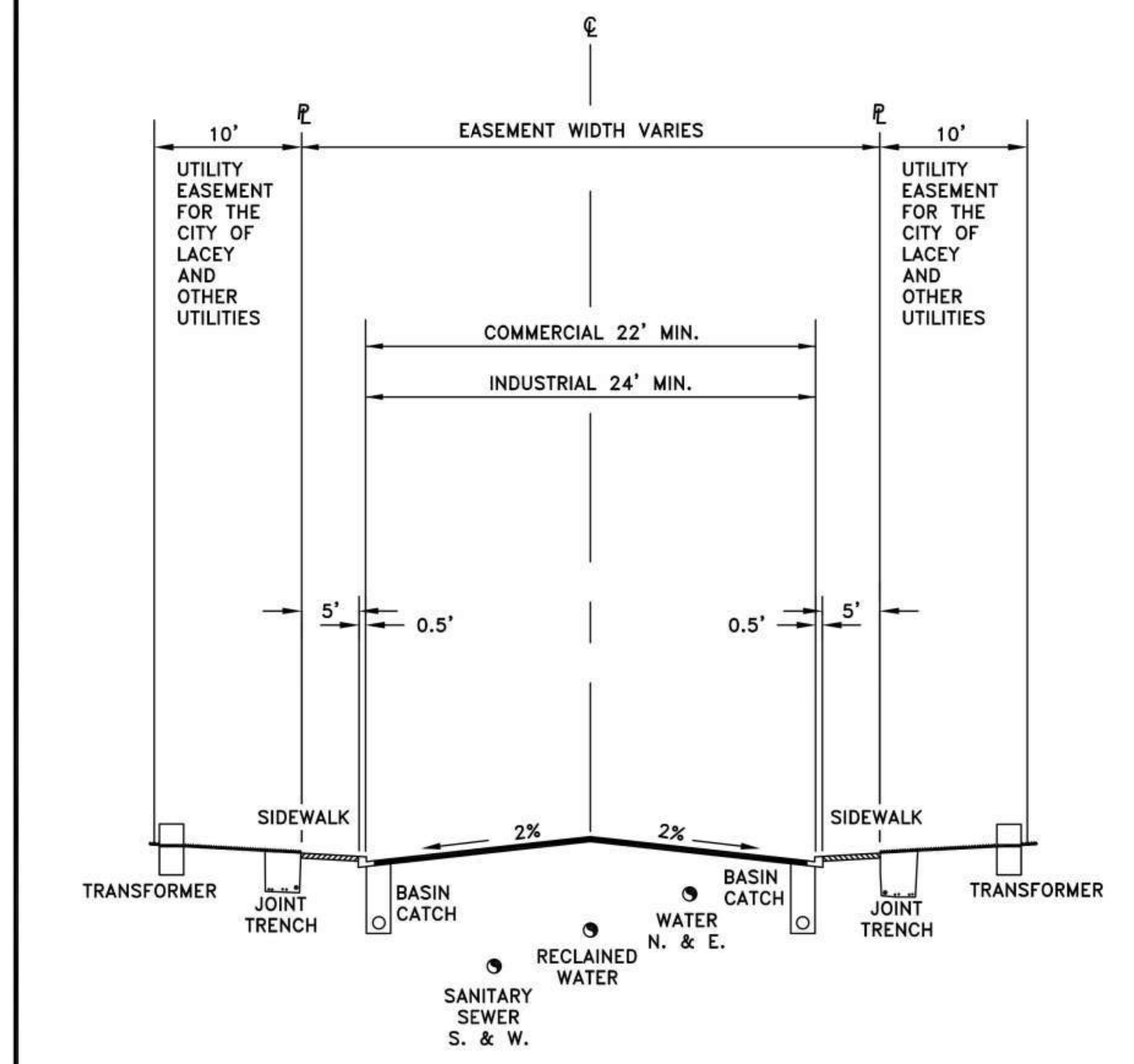
GENERAL NOTES:
1. ON-STREET PARKING PROHIBITED.
2. SEE DETAIL 4-6.1 FOR PAVEMENT STRUCTURE.
3. MANHOLE LIDS AND WATER VALVE BOXES SHALL BE LOCATED IN THE IN THE MIDDLE OF THE OUTSIDE VEHICLE TRAVEL LANES.
4. STREET TREES IN MEDIAN SHALL BE CENTERED. STREET TREES IN PLANTERS SHALL BE 2.5' FROM EDGE OF SIDEWALK TO CENTERLINE OF TREE.
5. APPLY RECLAIMED WATER WHERE APPLICABLE.
6. SEE PIPING SEPARATION DETAIL FOR PIPE VERTICAL AND HORIZONTAL SEPARATION.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

STREET DESIGN
ARTERIAL

APPROVED: CITY ENGINEER — DWG. NO. 4-2.2
DES. MAH | DWN. WHO | CKD. PDM | DATE 12/15/2014

DG4-2.2.DWG



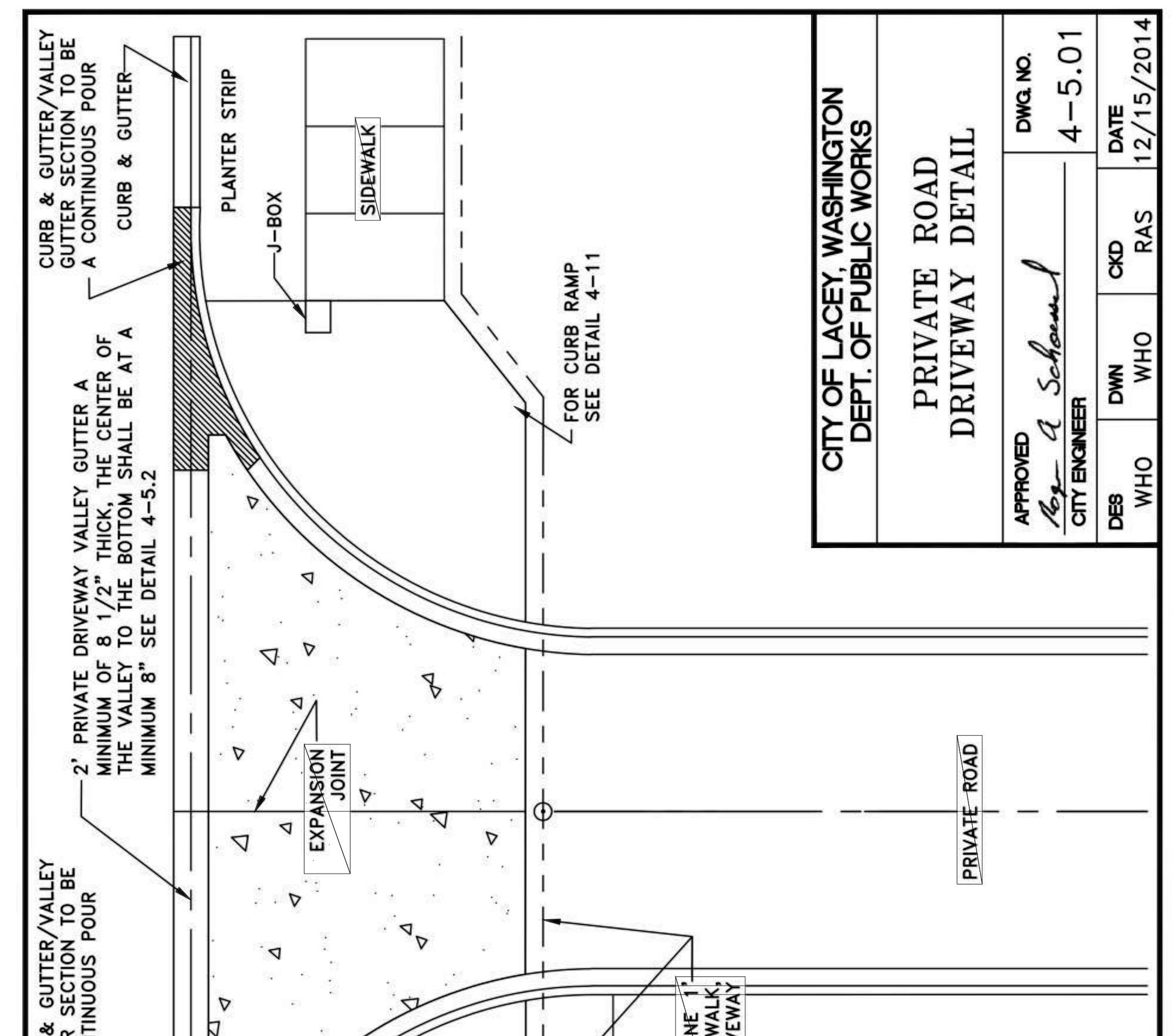
GENERAL NOTES:
1. SEE DETAIL 4-6.1 FOR PAVEMENT STRUCTURE.
2. IF PARKING IS DESIRED, AN ADDITIONAL 12 FEET SHALL BE ADDED TO THE ROADWAY CURB TO CURB WIDTH.
3. PLANTER STRIPS ARE OPTIONAL.
4. MANHOLE LIDS AND WATER VALVE BOXES SHALL BE LOCATED IN THE MIDDLE OF THE OUTSIDE VEHICLE TRAVEL LANE.
5. UNLESS AUTHORIZED BY THE CITY OF LACEY ALL PRIVATE UTILITIES SHALL BE INSTALLED IN THE 10' EASEMENT.
6. APPLY RECLAIMED WATER WHERE APPLICABLE.
7. SEE PIPING SEPARATION DETAIL FOR PIPE VERTICAL AND HORIZONTAL SEPARATION.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

STREET DESIGN
PRIVATE

APPROVED: CITY ENGINEER — DWG. NO. 4-5.0
DES. MAH | DWN. WHO | CKD. PDM | DATE 12/15/2014

DG4-5.0.DWG



GENERAL NOTES:
1. PROVIDE RIGHT-OF-WAY OR EASEMENT TO INSTALL CURB RAMPS AND CONCRETE APRON.
2. A VALLEY GUTTER SHALL BE INSTALLED AS SHOWN. SEE DETAIL 4-5.2.
3. THE SLOPE FOR THE GUTTER AT THE RADIUS SHALL BE ADJUSTED TO MEET THE SLOPE OF THE PRIVATE ROAD DRIVEWAY. SEE DETAIL 4-14 CEMENT CURB & GUTTER FOR REVERSE CURB & GUTTER.
4. MONOLITHICAL POURING OF VALLEY GUTTER AND CONCRETE DRIVEWAY WILL NOT BE ALLOWED.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

PRIVATE ROAD
DRIVEWAY DETAIL

APPROVED: CITY ENGINEER — DWG. NO. 4-5.01
DES. WHO | DWN. WHO | CKD. RAS | DATE 12/15/2014

DG4-5.01.DWG

PAVEMENT DESIGN–CONSTANTS

	BOULEVARD & ARTERIAL	MAJOR COLLECTOR	MINOR COLLECTOR	MAJOR LOCAL RESIDENTIAL	MINOR LOCAL RESIDENTIAL & PRIVATE	TRUCK ROUTE	ALLEY
AADT	30,000	30,000	16,000	8,000	2,000	25,000	500
% AADTT	8	8	8	5	5	30	5
GROWTH RATE	5	5	5	5	2	5	2
LANE FACTOR	0.5	0.5	0.5	0.5	0.8	0.5	0.8
DESIGN EAL	4,444,844	4,444,844	2,370,584	740,812	217,744	14,000,000	54,436
R%	95	90	90	85	80	95	80
So	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Pi	4.20	4.20	4.20	4.20	4.20	4.20	4.20
Pt	2.5	2.4	2.4	2.3	2.2	2.5	2.2
Δ PSI	1.7	1.8	1.8	1.9	2.0	1.7	2.0
MIN. DEPTH HMA	6"	6"	5"	3"	3"	8"	2.5"
MIN. TOTAL DEPTH	14"	14"	14"	12"	12"	20"	9"
* HMA	6"	6"	6"	4"	4"	8"	3"
* CSTC	2"	2"	2"	2"	2"	2"	2"
* BALLAST OR	31"	27"	22"	21"	13"	28"	11"
* CRUSHED BASE COURSE	22"	19"	16"	15"	9"	23"	8"
COMMERCIAL CONCRETE	CONCRETE STREETS ARE PERMITTED. PROVIDE AASHTO DESIGN CALCULATIONS.						6"
CRUSHED BASE COURSE OR WELL GRADED SAND							1"

* STREET STRUCTURE REQUIRED IN LIEU OF DESIGN BASED ON FIELD VERIFIED "R" VALUE

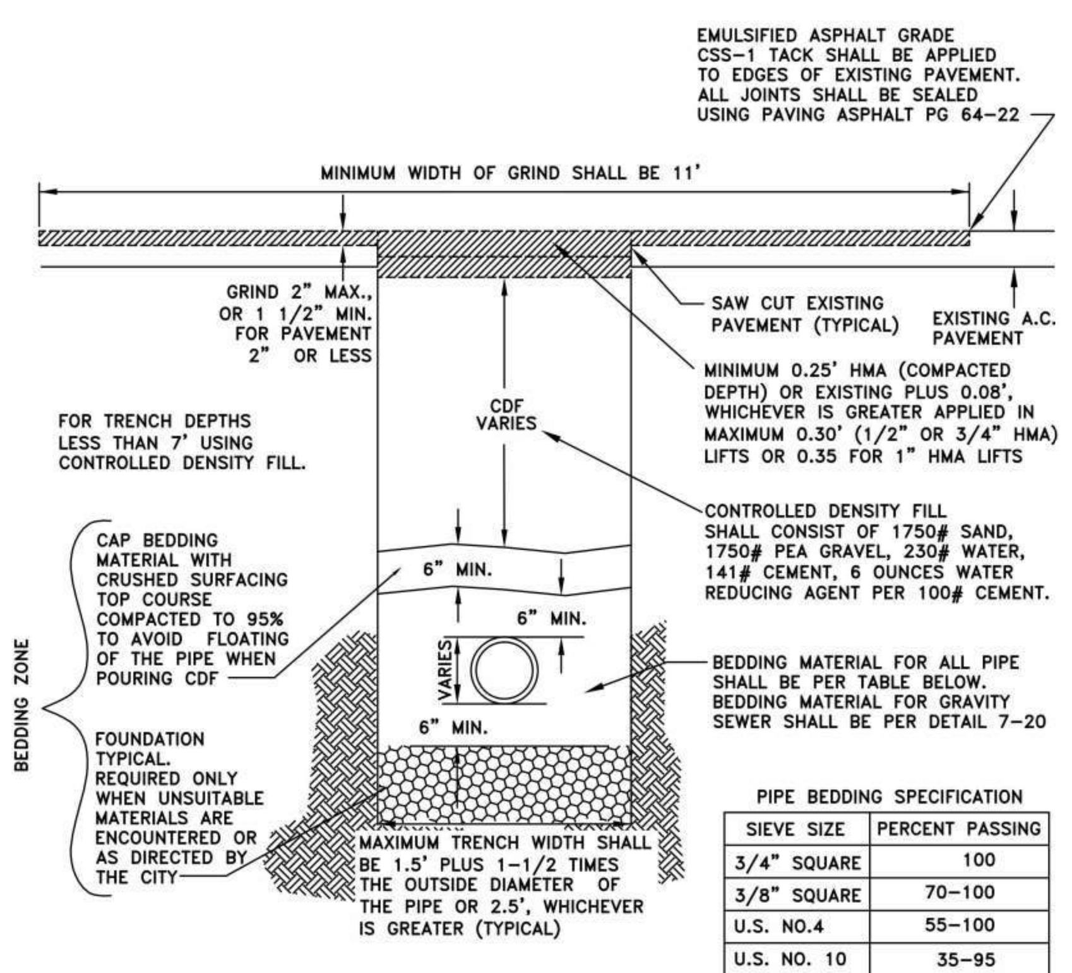
GENERAL NOTES:
1. SEE 4B.160 FOR APPROVED ALTERNATES.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

PAVEMENT DESIGN

APPROVED: CITY ENGINEER — DWG. NO. 4-6.1
DES. M.H. | DWN. WHO | CKD. R.A.S. | DATE 12/15/2014

DG4-6.1.DWG



PIPE BEDDING SPECIFICATION

SIEVE SIZE	PERCENT PASSING
3/4" SQUARE	100
3/8" SQUARE	70–100
U.S. NO.4	55–100
U.S. NO. 10	35–95
U.S. NO. 20	20–80
U.S. NO. 40	10–55
U.S. NO. 100	0–10
U.S. NO. 200	0–03

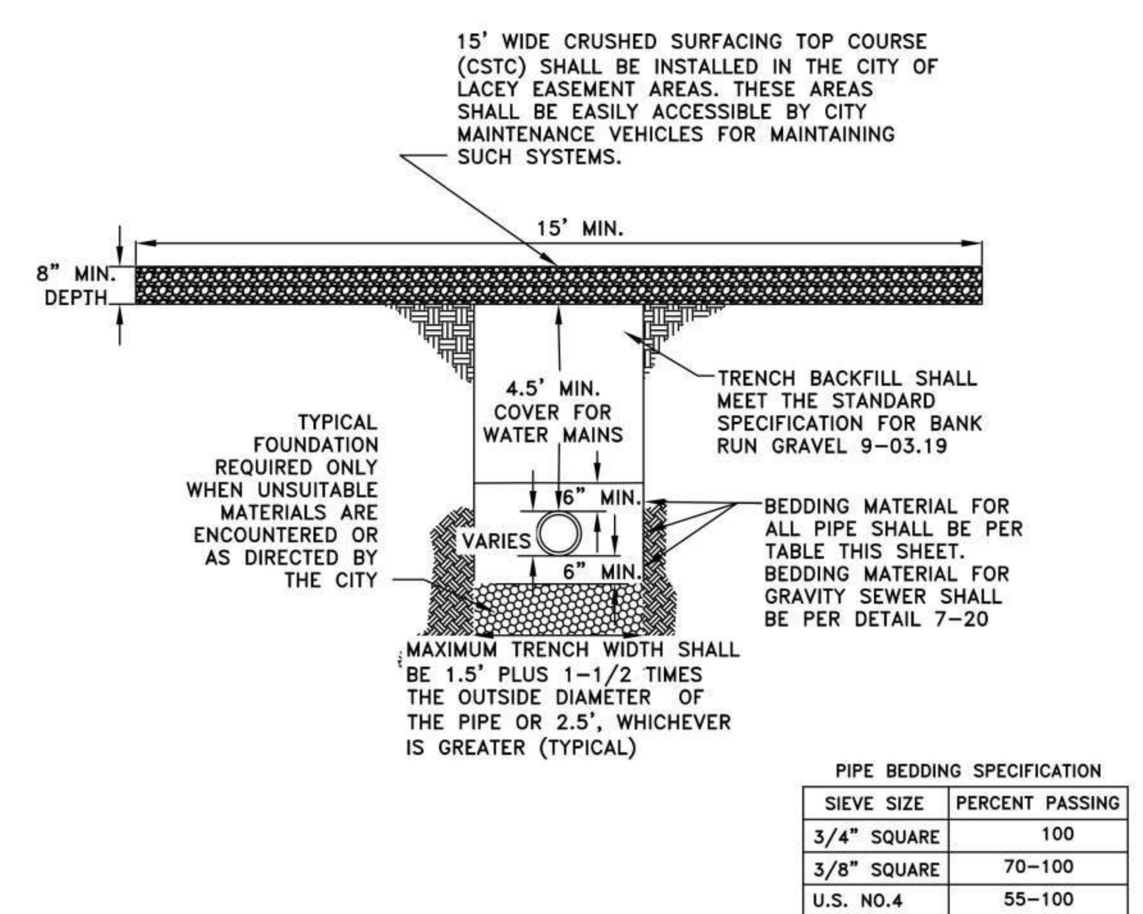
GENERAL NOTES:
1. ALL MATERIALS EXCEPT H.M.A. SHALL BE COMPACTED IN 6-INCH MAXIMUM LIFTS TO 95% DENSITY AS DETERMINED BY ASTM D1557.
2. ALL MATERIALS, WORKMANSHIP, AND INSTALLATION SHALL BE IN CONFORMANCE WITH THE WSDOT STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION AS AMENDED BY CITY OF LACEY STANDARDS.
3. KEEP TRENCH BOTTOM COMPACTED WITH UNIFORM GRADE. NO TEMPORARY SUPPORTS, I.E. BLOCKS, WILL BE ALLOWED TO SUPPORT PIPE. TRENCH BOTTOM SHALL BE TO GRADE PRIOR TO PIPE INSTALLATION.
4. SAW CUT PAVEMENT TO MAX. TRENCH WIDTH. BACKFILL AND PAVE TO TOP OF EXISTING PAVEMENT FOR TRENCH WIDTH. ALLOW 24 HOURS MINIMUM FOR TRENCH PATCH TO CURE. GRIND AND PAVE FINAL PATCH AS SHOWN.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

PERPENDICULAR SHALLOW
TRENCH RESTORATION
ARTERIALS, BLVDS. & COLLECTORS

APPROVED: CITY ENGINEER — DWG. NO. 4-8.0
DES WHO | DWN WHO | CKD RAS | DATE 12/15/2014

DG4-8.0.DWG



PIPE BEDDING SPECIFICATION

SIEVE SIZE	PERCENT PASSING
3/4" SQUARE	100
3/8" SQUARE	70–100
U.S. NO.4	55–100
U.S. NO. 10	35–95
U.S. NO. 20	20–80
U.S. NO. 40	10–55
U.S. NO. 100	0–10
U.S. NO. 200	0–03

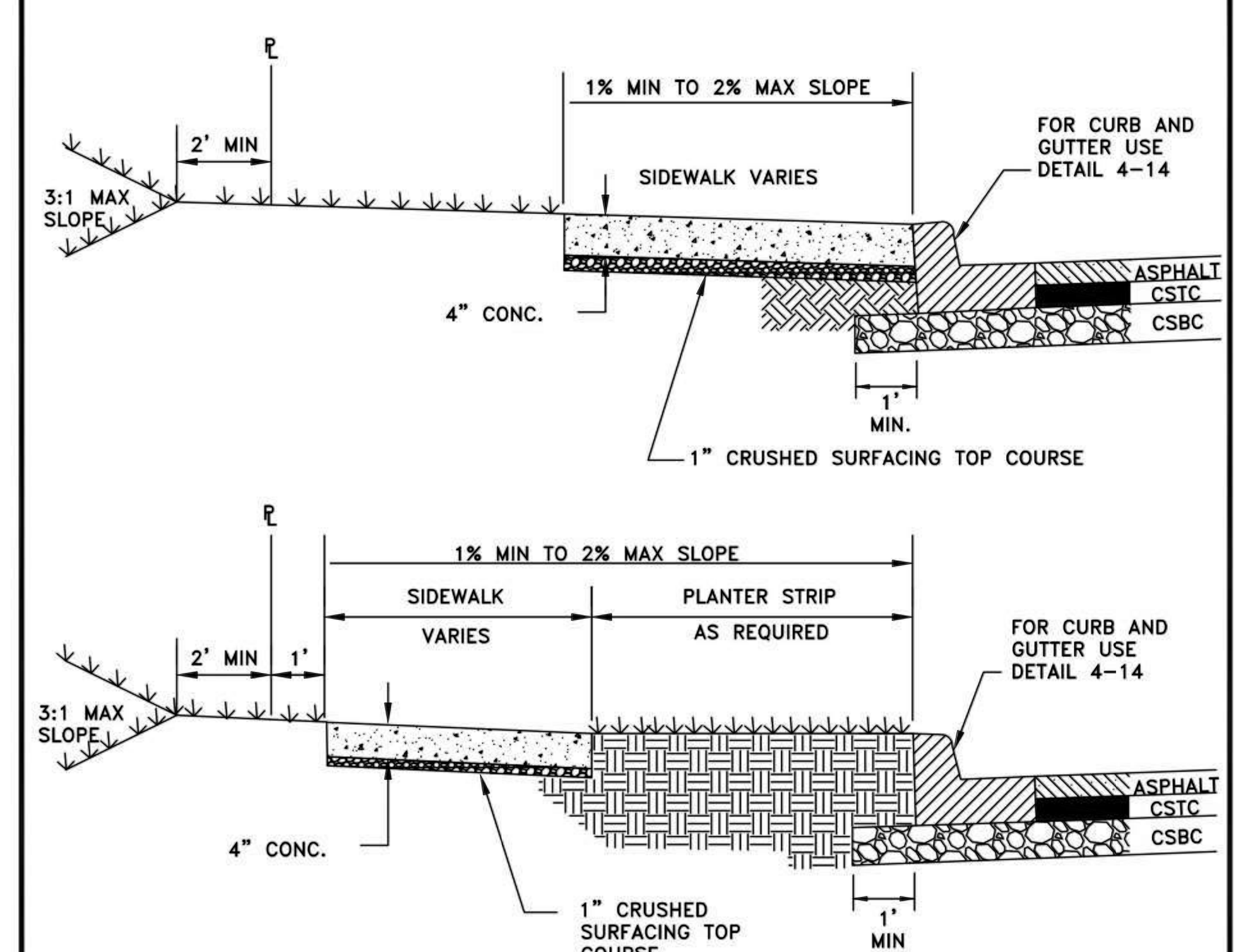
GENERAL NOTES:
1. BEDDING MATERIAL SHALL BE PER THE CHART ON THIS SHEET.
2. COMPACTION: BEDDING SHALL BE COMPACTED TO 95% MIN. AS DETERMINED BY ASTM D1557. BACKFILL SHALL BE COMPACTED TO 90% MIN. IN UNPAVED AREAS AND 95% MIN. IN PAVED OR SHOULDER AREAS AS DETERMINED BY ASTM D1557.
3. ALL MATERIALS, WORKMANSHIP AND INSTALLATION SHALL BE IN CONFORMANCE WITH THE WSDOT STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION AS AMENDED BY THE CITY OF LACEY STANDARDS.
4. KEEP TRENCH BOTTOM COMPACTED WITH UNIFORM GRADE. A BELL JOINT SHALL BE REQUIRED AT EACH JOINT FOR PROPER SUPPORT. NO TEMPORARY SUPPORTS, I.E. BLOCKS, WILL BE ALLOWED TO SUPPORT PIPE. TRENCH BOTTOM SHALL BE TO GRADE PRIOR TO PIPE INSTALLATION.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

TRENCH RESTORATION
FOR UNPAVED AREAS

APPROVED: CITY ENGINEER — DWG. NO. 4-8.4
DES WHO | DWN WHO | CKD RAS | DATE 12/15/2014

DG4-8.4.DWG



NTS

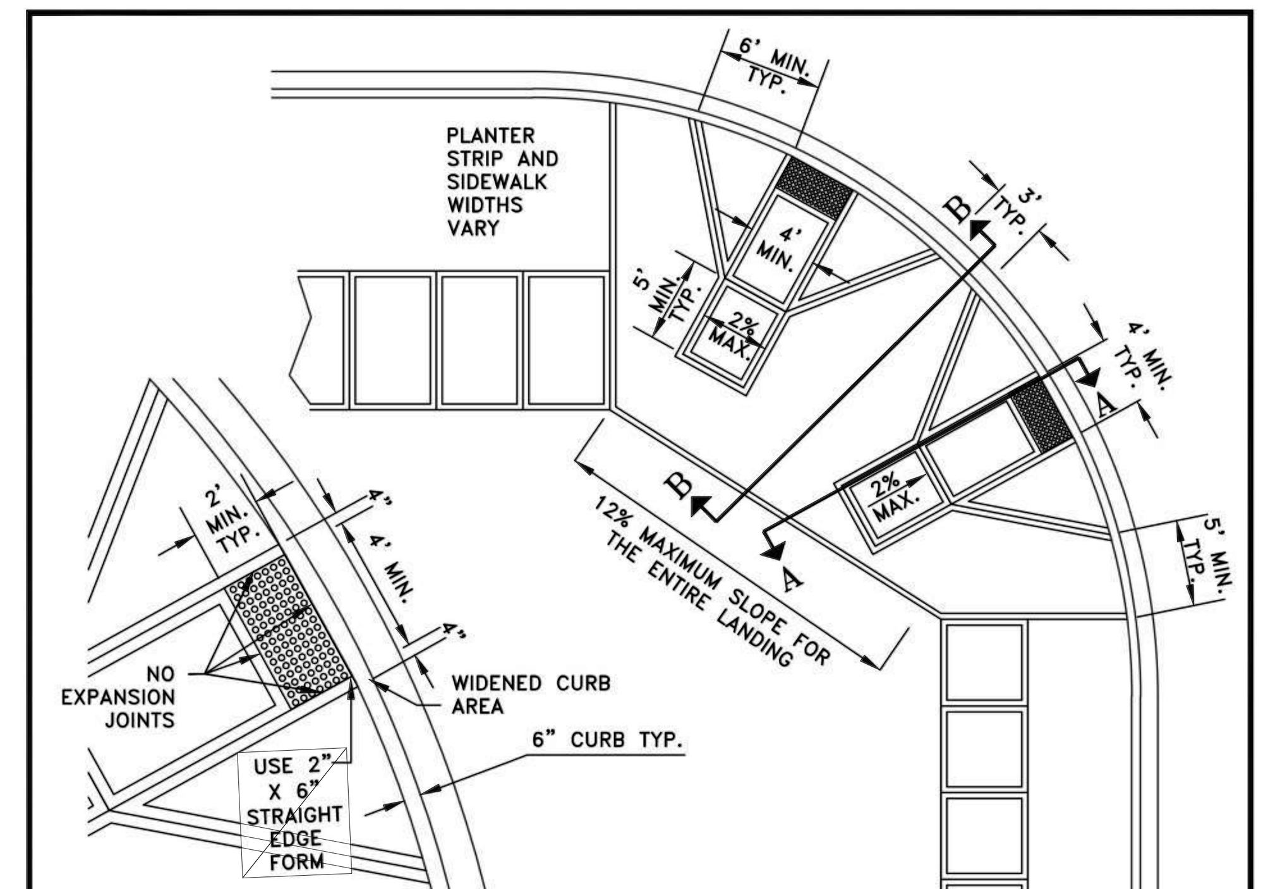
GENERAL NOTES:
1. FORMS SHALL BE WOOD OR METAL AND SHALL EXTEND FOR THE FULL DEPTH OF THE CONCRETE, SEE SECTION 8-14.3(2).
2. ALL FORMS SHALL BE STRAIGHT, FREE FROM WARP, AND OF SUFFICIENT STRENGTH TO RESIST THE PRESSURE OF THE CONCRETE WITHOUT SPRING.
3. FOR JOINTS AND SCORING SEE DETAIL 4-10.
4. CONCRETE DRIVEWAYS REQUIRE A MINIMUM DEPTH OF 6".
5. SEE ROADWAY SECTIONS FOR STREET TREE LOCATIONS.
6. THE TOP OR TOE OF ALL SLOPES SHALL BEGIN 2' BACK OF THE SIDEWALK OR THE RIGHT-OF-WAY LINE.
7. WHEN APPLICABLE THE RIGHT-OF-WAY LINE SHALL BE 1' BEHIND THE SIDEWALK.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

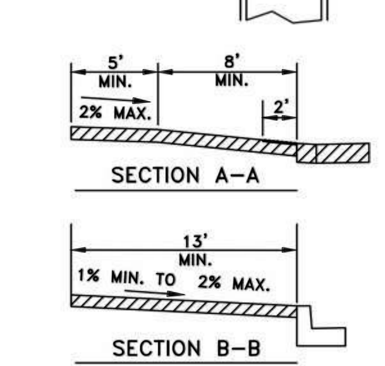
SIDEWALK

APPROVED: CITY ENGINEER — DWG. NO. 4-9
DES. WHO | DWN. WHO | CKD. RAS | DATE 12/15/2014

DG4-9.DWG



GENERAL NOTES:
1. RAMP SLOPES SHALL NOT BE STEEPER THAN 12H:1V; HOWEVER A 14H:1V IS DESIRED.
2. THE RIGHT-OF-WAY LINE SHALL BE 1' BEHIND THE SIDEWALK.
3. THE CURB RAMP SHALL BE POURED SEPARATE FROM THE SIDEWALK SECTION.
4. THE TRUNCATED DOME PANEL IS REQUIRED AS SHOWN AND SHALL BE INSTALLED PER THE MANUFACTURER'S REQUIREMENTS.
5. STAMPING OF TRUNCATED DOMES SHALL NOT BE ALLOWED.
6. THE TRUNCATED DOME SHALL BE A 2' (W) X 4' (L) PANEL. THE DETECTABLE WARNING PATTERN AREA SHALL BE YELLOW IN COMPLIANCE WITH STANDARD SPECIFICATION 8-14.3.
7. CUTTING OR ALTERING THE TRUNCATED DOME PANEL SHALL NOT BE ALLOWED.
8. THERE SHALL BE NO EXPANSION MATERIAL AROUND THE TRUNCATED DOME PANEL.
9. FOR SIDEWALK SPACING, EXPANSION JOINTS, SCORE MARKS, CRUSHED BEDDING OR ADDITIONAL NOTES SEE DETAILS 4-9 AND 4-10.
10. THE SLOPE FOR THE ENTIRE LANDING SHALL NOT EXCEED 12%.
11. IT MAY BE NECESSARY TO CONSTRUCT A WALL, STRUCTURE OR SLOPE TO TRANSITION BETWEEN THE CURB RAMP LANDING AND THE PROPERTY BEHIND IT.
12. THE BACK EDGE OF THE CURB RAMP SHALL ALIGN WITH THE BACK EDGES OF THE SIDEWALKS ON EACH SIDE OF IT.



SECTION A–A

SECTION B–B

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

CURB RAMP TYPE I

APPROVED: CITY ENGINEER — DWG. NO. 4-11
DES WHO | DWN WHO | CKD RAS | DATE 12/15/2014

DG4-11.DWG

REVISIONS | DATE | BY

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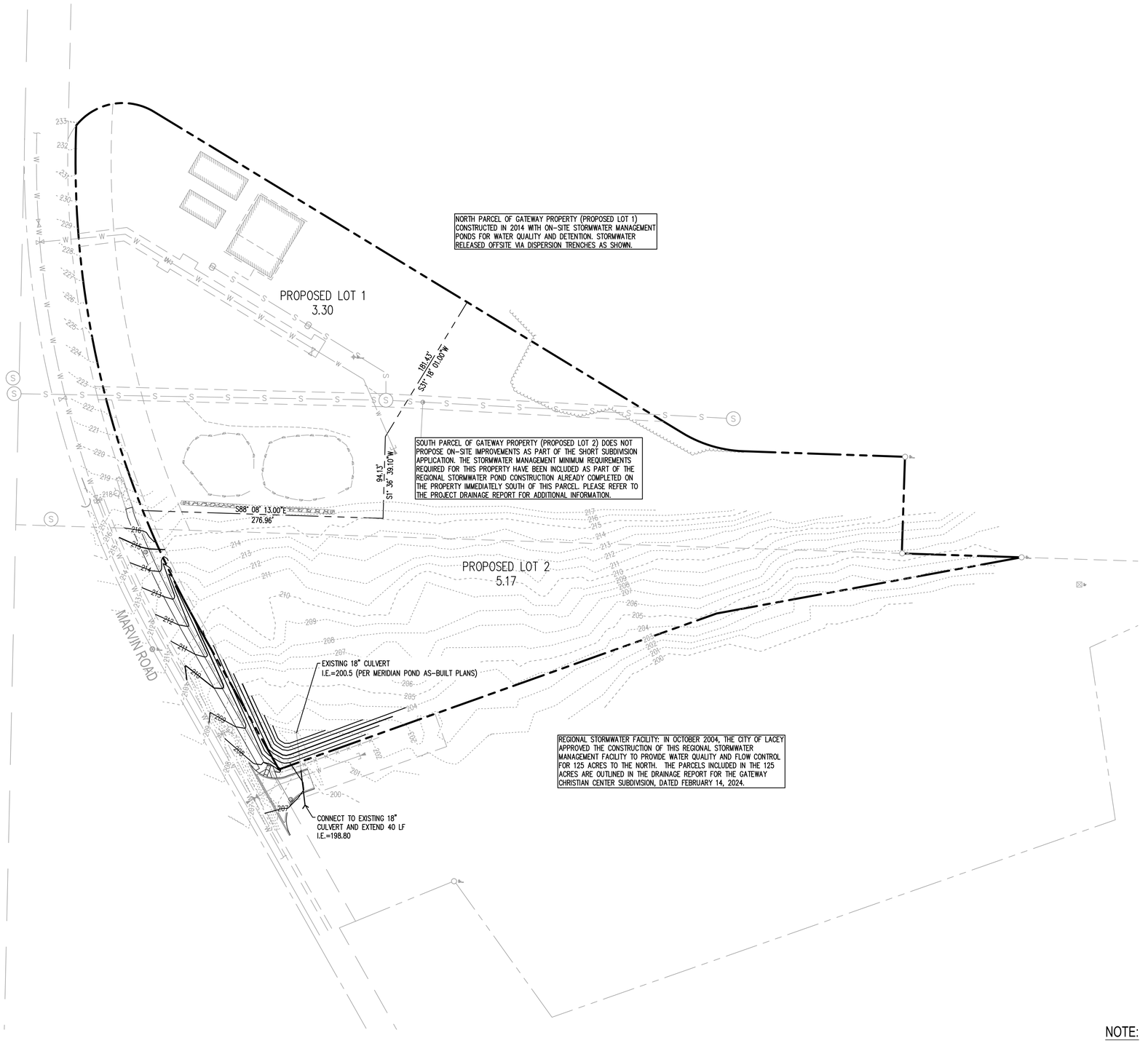
SHEET TITLE: SITE DETAILS

PROJECT NAME: GATEWAY CHRISTIAN CENTER
3300 MARVIN RD NE
LACEY, WA 98516

SEAL:

DESIGNER: D. PHILLIPS
DRAWN BY: N. ALTHAUSER
APPROVED BY: B. DUNNING
DATE: FEBRUARY, 2024
JOB NO: 23-000886
DRAWING FILE NO: 23-000886 DT-01
DRAWING NO: DT-01
SHEET NO: 6 OF 10

SEC. 18, T 18 N., R 1 W., W.M.



N

0 60 120

SCALE IN FEET

LEGEND

- EXISTING CONTOURS (MAJOR/MINOR)
- PROPOSED CONTOURS (MAJOR/MINOR)
- EXISTING STORM PIPE
- EXISTING CULVERT
- PROPOSED CULVERT
- EXISTING EASEMENT
- PROPOSED EASEMENT

GENERAL STORMWATER NOTES:

1. CONTRACTOR SHALL RECORD ANY FIELD DEVIATION FROM ENGINEERING PLAN. THESE RECORDS SHALL BE KEPT ON CONSTRUCTION DRAWINGS AND TURNED OVER TO ENGINEER UPON COMPLETION OF PROJECT.
2. IN ADDITION TO ALL FEDERAL AND STATE STORMWATER REQUIREMENTS, THIS PROJECT SHALL COMPLY WITH THE CURRENT CITY OF LACEY DEVELOPMENT GUIDELINES AND PUBLIC WORKS STANDARDS MANUAL AND THE CURRENT CITY OF LACEY STORMWATER DESIGN MANUAL (LMC 14.27). THE STORMWATER DESIGN MANUAL REQUIRES THE USE OF LOW IMPACT DEVELOPMENT (LID) TECHNIQUES TO THE MAXIMUM EXTENT POSSIBLE., STORMWATER DRAINAGE AND EROSION CONTROL SUBMITTAL SHALL BE IN CONFORMANCE WITH THE FORMATTING AND CONTENT REQUIREMENTS DESCRIBED IN CHAPTER 3 OF THE STORMWATER DESIGN MANUAL.
3. TREATMENT AND INFILTRATION FACILITIES SHALL BE CONSTRUCTED FOR STORMWATER ASSOCIATED WITH THE SITE, ADJACENT PROPERTIES CURRENTLY DISCHARGING TO THE SITE AND STORMWATER CURRENTLY DISCHARGING ONTO THE SITE FROM MARVIN ROAD. ADDITIONAL TREATMENT CANISTERS AT THE STORMWATER FACILITY TO THE SOUTH WILL BE REQUIRED FOR THE NEW ROADWAY REQUIRED WITH THE SHORT PLAT.
4. CURRENTLY THERE IS AN OVERFLOW FROM THE EXISTING STORMWATER FACILITY ON SITE DIRECTING STORMWATER TO THE SOUTH. WITH THE SHORT SUBDIVISION OF THE PROPERTY, PROVISIONS FOR THE OVERFLOW STORMWATER WILL NEED TO BE ADDRESSED.
5. IT IS BELIEVED THIS SITE IS PART OWNER OF THE STORM SYSTEM TO THE SOUTH. PRIOR TO FINAL SHORT PLAT APPROVAL, CONFIRMATION OF ALLOWABLE DISCHARGES FROM THE EXISTING LOT SHALL BE PROVIDED. ALSO, THE PROPORTIONATE SHARE OF STORMWATER FOR THE NEW CREATED LOT SHALL BE DETERMINED.
6. IN CONFORMANCE WITH THE CITY OF LACEY STORMWATER DESIGN MANUAL, POST-CONSTRUCTION SOIL QUALITY AND DEPTH (BMP T5.13) SHALL BE INCORPORATED INTO THE SITE DESIGN AND CONSTRUCTION (SDM 2.2.5 & 7.4.1).
7. STORMWATER POLLUTION PREVENTION PLAN (SWPPP) SHALL BE SUBMITTED TO AND APPROVED BY THE CITY PRIOR TO BEGINNING ANY SITE DISTURBING ACTIVITIES AT THE PROJECT. EACH OF THE 13 REQUIRED ELEMENTS AS IDENTIFIED IN SDM CHAPTER 5 MUST BE ADDRESSED AND INCLUDED IN THE CONSTRUCTION SWPPP. IF SITE CONDITIONS RENDER ANY ELEMENT UNNECESSARY, THE EXEMPTION FOR THAT ELEMENT SHALL BE CLEARLY JUSTIFIED IN THE NARRATIVE FOR THE SWPPP. THE SWPPP SHALL BE SUBMITTED TO AND APPROVED BY THE CITY PRIOR TO CIVIL PLAN APPROVAL.
8. A STORMWATER FACILITY MAINTENANCE AND SOURCE CONTROL MANUAL PER CHAPTER 3 OF THE CITY OF LACEY STORMWATER DESIGN MANUAL SHALL BE SUBMITTED TO AND APPROVED BY THE CITY OF LACEY. THE MAINTENANCE MANUAL SHALL BE INCLUDED WITH THE SUBMITTED DRAINAGE REPORT AS PART OF THE STORMWATER SITE PLAN.
9. ALSO, THE MAINTENANCE AND SOURCE CONTROL MANUAL SHALL BE PREPARED AS A STAND-ALONE DOCUMENT FOR THE POST-DEVELOPMENT FACILITY OWNER(S). THE MAINTENANCE MANUAL SHALL BE SUBMITTED TO AND APPROVED BY THE CITY PRIOR TO CIVIL DRAWING APPROVAL.

NOTE:

CONTRACTOR TO VERIFY EXISTING GRADES PRIOR TO CONTRACTOR PERFORMING WORK. COORDINATE WITH ENGINEER IF DISCREPANCIES ARE IDENTIFIED.
COORDINATE TO AS-BUILT SURVEY IMPROVEMENTS AS PART OF BASE CONTRACT.

BY	DATE	REVISIONS

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SHEET TITLE: DRAINAGE PLAN

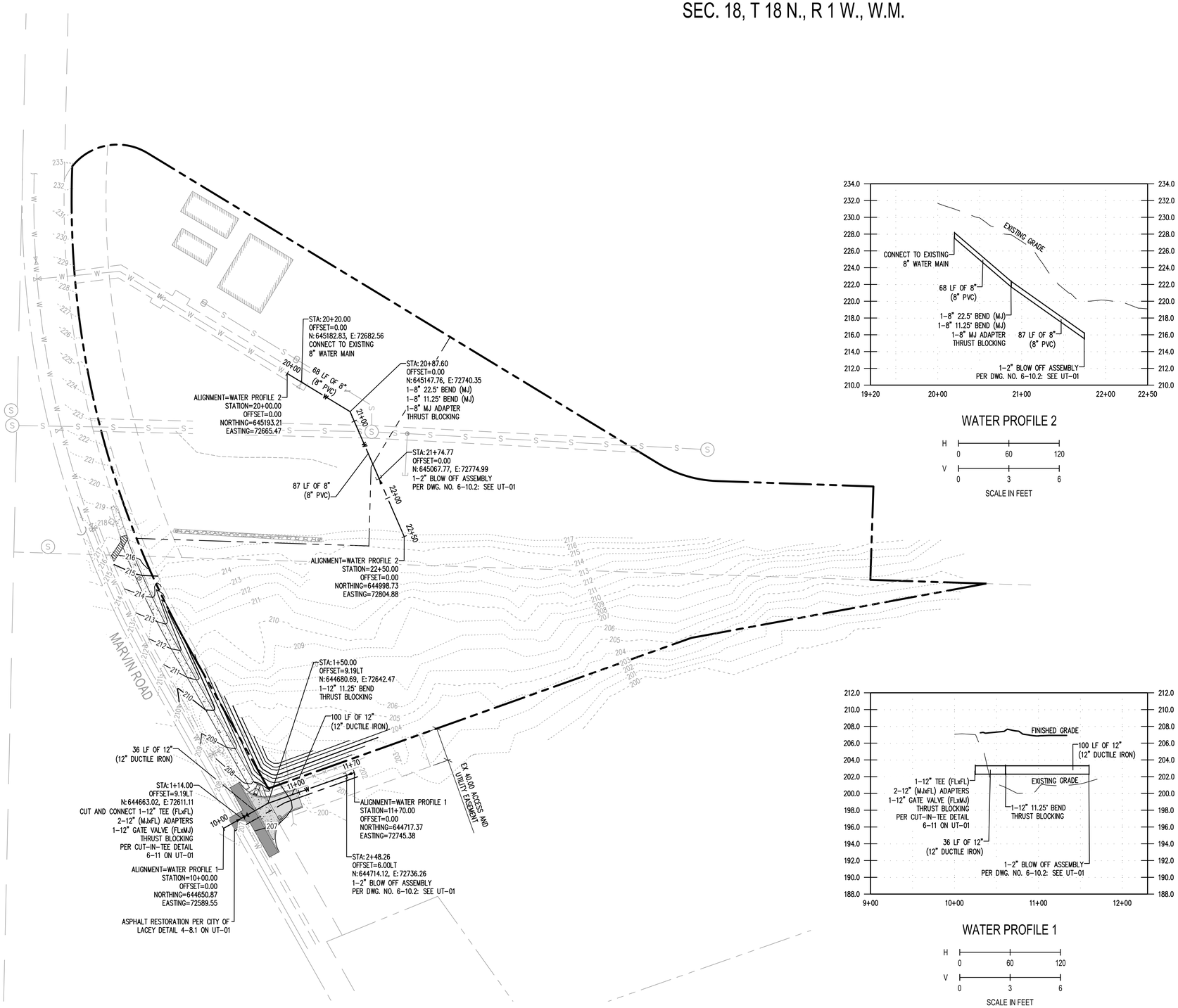
PROJECT NAME: GATEWAY CHRISTIAN CENTER
3300 MARVIN RD NE
LACEY, WA 98516

SEAL:

DESIGNER:	D. PHILLIPS
DRAWN BY:	N. ALTHAUSER
APPROVED BY:	B. DUNNING
DATE:	FEBRUARY, 2024
JOB NO:	23-000886
DRAWING FILE NO:	23-000886 DR-01
DRAWING NO:	DR-01
SHEET NO:	7 OF 10

Feb 21, 2024 10:42:01am - User nathan.althauser
N:\PROJECTS\6728 GATEWAY CHRISTIAN CENTER\23-000886 GATEWAY CHRISTIAN CTR PLAT INFRASTRUCT\CADD\23-000886 DR-01.DWG

SEC. 18, T 18 N., R 1 W., W.M.



WATER PROFILE 2

H 0 60 120

V 0 3 6

SCALE IN FEET

WATER PROFILE 1

H 0 60 120

V 0 3 6

SCALE IN FEET

N

0 60 120

SCALE IN FEET

LEGEND

- WATER LINE — 8": DR14 C900 PVC 12": CL52 DUCTILE IRON
- EXISTING WATER LINE
- GATE VALVE
- EXISTING EASEMENT

GENERAL WATER NOTES:

1. AN IRRIGATION METER WITH A DOUBLE CHECK VALVE ASSEMBLY BACKFLOW PREVENTION DEVICE SHALL BE PROVIDED FOR ALL LANDSCAPED AREAS. (DG&PWS 6.120 F)
2. IN ADDITION TO ALL FEDERAL AND STATE REQUIREMENTS, WATER SYSTEM IMPROVEMENTS SHALL MEET THE REQUIREMENTS OF THE CITY OF LACEY CITY OF LACEY DEVELOPMENT GUIDELINES AND PUBLIC WORKS STANDARDS MANUAL, THE COORDINATED WATER SYSTEM PLAN (CWSP), DEPARTMENT OF HEALTH (DOH), CITY OF LACEY WATER SYSTEM PLAN, AWWA, DEPARTMENT OF ECOLOGY, THURSTON COUNTY ENVIRONMENTAL HEALTH AND CITY OF LACEY FIRE CODE OFFICIAL'S STANDARDS. (DG&PWS, WATER 6.010)
3. IF UTILITY EXTENSIONS ARE NEEDED FOR THE PROPOSED PROJECT FOR ROADS THAT WERE PAVED IN THE LAST FIVE YEARS AND THE ROADS MUST BE "CUT", A DISRUPTION FEE WILL BE CHARGED IN ACCORDANCE WITH LACEY MUNICIPAL CODE (LMC) 12.16.055.

CITY OF LACEY GENERAL NOTES (WATER MAIN INSTALLATION):

1. WATER MAINS UP TO 10" SHALL BE AWWA C900 DR14 OR DUCTILE IRON STANDARD THICKNESS CLASS 52. WATER MAINS LARGER THAN 10"SHALL BE DUCTILE IRON STANDARD THICKNESS CLASS 52. SEE CHAPTER 6.030B FOR MORE DETAILED PIPE SPECIFICATIONS.
2. ALL WATER MAINS SHALL BE DELIVERED FROM THE MANUFACTURER WITH PIPE DUST CAPS INSTALLED. THE CAPS SHALL REMAIN ON THE PIPE UNTIL THE TIME OF INSTALLATION.
3. GATE VALVES SHALL BE RESILIENT WEDGE, NRS (NON RISING STEM) WITH O-RING SEALS. VALVE ENDS SHALL BE MECHANICAL JOINT OR ANSI FLANGES. VALVES SHALL CONFORM TO AWWA C-515 LATEST REVISION. VALVES SHALL BE MUELLER, M & H, KENNEDY, CLOW R/W, WATEROUS SERIES 2500, EJ FLOWMASTER OR AMERICAN AVK.
4. EXISTING VALVES SHALL BE OPERATED BY CITY EMPLOYEES ONLY.
5. HYDRANTS SHALL BE CITY APPROVED AS SPECIFIED ON THE HYDRANT DETAILS AND SHALL BE BAGGED UNTIL THE SYSTEM IS APPROVED.
6. THE CONTRACTOR WITH THE ASSISTANCE OF THE CITY INSPECTOR SHALL INSTALL, CHLORINATE AND FILL THE WATER MAIN, INCLUDING APPURTENANCES. TESTING SHALL INCLUDE THE MAIN, VALVES, SERVICE LINES AND APPURTENANCES. AFTER TESTING IS COMPLETED, THE NEWLY CONSTRUCTED SYSTEM SHALL BE FLUSHED. AFTER FLUSHING CHLORINATED WATER FROM DISINFECTED LINES, THE CITY SHALL MEASURE CHLORINE RESIDUAL TO VERIFY THAT FLUSHING IS COMPLETE. THIS WILL BE COMPLETED PRIOR TO THE CITY TAKING MICROBIOLOGICAL SAMPLES.
7. ALL PIPE AND SERVICES SHALL BE INSTALLED WITH CONTINUOUS TRACER TAPE INSTALLED 12" TO 18" UNDER THE FINAL GROUND SURFACE. THE MARKER SHALL BE PLASTIC NON-BIODEGRADABLE, METAL CORE BACKING MARKED "WATER" WHICH CAN BE DETECTED BY A STANDARD METAL DETECTOR. TAPE SHALL BE 3 INCH WIDE TERRA TAPE "D" OR APPROVED EQUAL. IN ADDITION TO TRACER TAPE, INSTALL DIRECT BURY, U.S.E. 12 GAUGE BLUE COATED COPPER WIRE, WRAPPED AROUND OR TAPED TO THE PIPE, AS SHOWN ON DETAIL. LOW VOLTAGE GREASE-TYPE SPLICE KITS SHALL BE USED ON TRACER WIRE. AFTER THE WIRE NUT IS USED TO CONNECT THE WIRE TOGETHER AN OVERHAND KNOT SHALL BE TIED JUST OUTSIDE THE GREASE KIT TO PREVENT IT FROM COMING APART. CONTINUITY TESTING OF THE WIRE WILL BE DONE BY THE CITY.
8. ALL SERVICE LINE LOCATIONS SHALL BE MARKED ON THE TOP OR FACE OF THE CURB WITH AN EMBOSSED "W" 3 INCHES HIGH AND 1/4 INCH INTO CONCRETE.
9. THE CITY WILL BE GIVEN 72 HOURS NOTICE PRIOR TO SCHEDULING A SHUTDOWN. WHERE CONNECTIONS REQUIRE "FIELD VERIFICATION", CONNECTION POINTS SHALL BE EXPOSED BY THE CONTRACTOR AND FITTINGS VERIFIED 72 HOURS PRIOR TO DISTRIBUTING SHUT-DOWN NOTICES.
10. SEPARATION BETWEEN WATER AND SEWER SHALL BE MAINTAINED PER DOE STANDARDS. SEE DEVELOPMENT GUIDELINE CHAPTER 6.130 FOR MORE INFORMATION.
11. A CONCRETE PAD PER DETAIL SHALL BE INSTALLED AROUND ALL VALVE BOXES AND BLOW-OFFS THAT ARE NOT IN A PAVEMENT AREA.
12. AT ANY CONNECTION TO AN EXISTING LINE WHERE A NEW VALVE IS NOT INSTALLED, THE EXISTING VALVE MUST BE PRESSURE TESTED TO CITY STANDARDS PRIOR TO CONNECTION. IF AN EXISTING VALVE FAILS TO PASS THE TEST, THE CONTRACTOR SHALL MAKE THE NECESSARY PROVISIONS TO TEST THE NEW LINE PRIOR TO CONNECTION TO THE EXISTING SYSTEM OR INSTALL A NEW VALVE.
13. THE MINIMUM BURIAL DEPTH OF ALL WATER LINES SHALL BE 42 INCHES. THE CONTRACTOR SHALL MAINTAIN A MINIMUM OF 18 INCHES OF VERTICAL SEPARATION BETWEEN SANITARY SEWERS/RECLAIMED WATER AND WATER MAINS. TO ACCOMMODATE CROSSINGS, THE MINIMUM COVER FOR WATER MAIN OF 42 INCHES MAY BE REDUCED TO 30 INCHES UPON APPROVAL BY THE CITY TO PROVIDE FOR AS MUCH VERTICAL SEPARATION AS POSSIBLE. WHEN A REDUCED DEPTH IS ALLOWED, DUCTILE IRON PIPING AND/OR CASINGS MAY BE REQUIRED. SEE 6.080 FOR CASING SPECIFICATIONS.
14. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO FIELD VERIFY THE LOCATION AND DEPTH OF THE EXISTING MAIN AND PROVIDE THE FITTINGS REQUIRED TO MAKE THE CONNECTION TO THE EXISTING MAIN.
15. THE CONTRACTOR SHALL INSTALL A TEMPORARY 2 INCH BRASS BLOW OFF FOR FLUSHING AND SAMPLING ON THE EXISTING AND/OR NEW WATER MAIN. THE BLOW OFF SHALL BE CONSTRUCTED WITH A STANDARD 2 INCH TAPPING SADDLE AND FORD BRASS CORPORATION STOP WITH 2 INCH BRASS PIPE EXTENDED UP TO FINISHED GRADE. WHEN FLUSHING AND SAMPLING ARE COMPLETED, THE 2 INCH PIPE SHALL BE REMOVED. THE CORPORATION STOP SHALL BE SHUT OFF AND CAPPED TIGHT WITH A THREADED BRASS CAP.

NOTE:

CONTRACTOR TO VERIFY EXISTING GRADES PRIOR TO CONTRACTOR PERFORMING WORK. COORDINATE WITH ENGINEER IF DISCREPANCIES ARE IDENTIFIED. COORDINATE TO AS-BUILT SURVEY IMPROVEMENTS AS PART OF BASE CONTRACT.

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SHEET TITLE: WATER PLAN & PROFILE

PROJECT NAME: GATEWAY CHRISTIAN CENTER
3300 MARVIN RD NE
LACEY, WA 98516

SEAL:

DESIGNER:	D. PHILLIPS
DRAWN BY:	N. ALTHAUSER
APPROVED BY:	B. DUNNING
DATE:	FEBRUARY, 2024
JOB NO:	23-000886
DRAWING FILE NO:	23-000886 WT-01
DRAWING NO:	WT-01
SHEET NO:	8 OF 10

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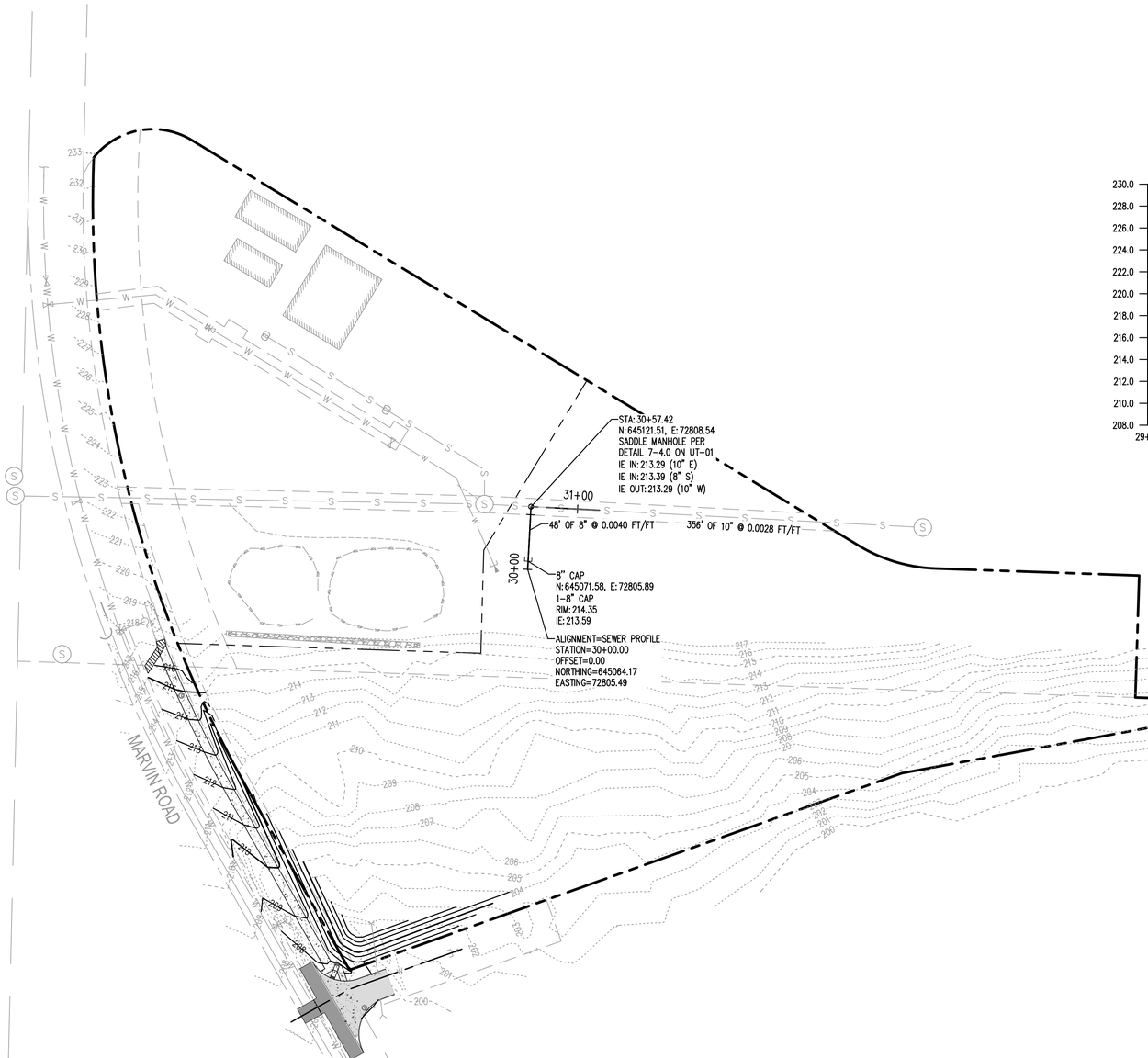

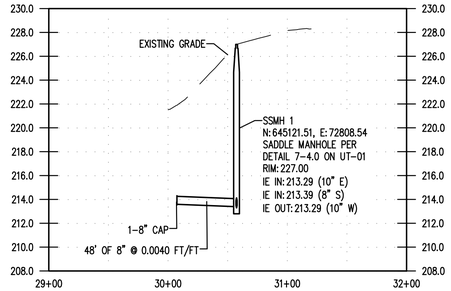

SEWER PROFILE

H 0 60 120

V 0 3 6

SCALE IN FEET

N

0 60 120

SCALE IN FEET

LEGEND

- SS — SANITARY SEWER LINE
- SS SS SS — EXISTING SANITARY SEWER LINE
- SADDLE MANHOLE
- EXISTING EASEMENT

GENERAL SANITARY SEWER NOTES:

1. THE CONTRACTOR SHALL VERIFY DIA, LENGTH, CONDITION, PIPE TYPE, SLOPE AND VERTICAL AND HORIZONTAL ALIGNMENT OF THE EXISTING ALIGNMENT OF THE PROPOSED POINT OF CONNECTION PRIOR TO CONNECTION AND REPORT ANY DISCREPANCIES TO ENGINEER PRIOR TO CONSTRUCTION.
2. CONTRACTOR SHALL FURNISH AND INSTALL ALL MATERIALS NECESSARY TO COMPLETE THIS WORK.
3. STATIONS AND OFFSETS FOR MANHOLES ARE CALLED OUT TO CENTER OF STRUCTURE.
4. MAINTAIN 10' MINIMUM HORIZONTAL AND 1.5' MINIMUM VERTICAL SEPARATION FROM WATER MAINS.
5. PIPE LENGTHS CALLED OUT FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE.
6. TYPICAL MANHOLES: CONFORM TO CITY OF LACEY DWG 7-1 AND "MANHOLE COLLAR", SEE DWG 7-3
7. SEWER END SHALL BE MARKED WITH AN 8-FT 2X4 PAINTED GREEN WITH A WHITE "S" FOR SEWER PAINTED ON THE TIMBER.
8. ALL TIE-INS TO LIVE MAINS SHALL BE COMPLETED BY CITY CREWS.
9. IN ADDITION TO ALL FEDERAL AND STATE REQUIREMENTS, SANITARY SEWER IMPROVEMENTS ASSOCIATED WITH THIS PROJECT SHALL COMPLY WITH THE CURRENT CITY OF LACEY DEVELOPMENT GUIDELINES AND PUBLIC WORKS STANDARDS MANUAL, CITY OF LACEY COMPREHENSIVE SANITARY SEWER PLAN, THURSTON COUNTY HEALTH DEPARTMENT, WASHINGTON STATE DEPARTMENT OF HEALTH (DOH), THE LOTT CLEAN WATER ALLIANCE AND DEPARTMENT OF ECOLOGY. (DG&PWS, SEWER 7A.010 AND SUBDIVISIONS AND SHORT PLAN 2-21)

CITY OF LACEY GENERAL NOTES (SANITARTY SEWER MAIN INSTALLATION:

1. GRAVITY SEWER MAIN SHALL BE PVC, ASTM D 3034 SDR 35 OR ASTM F 679 WITH JOINTS AND RUBBER GASKETS CONFORMING TO ASTM D 3212 AND ASTM F 477.
2. PRE-CAST MANHOLES SHALL MEET THE REQUIREMENTS OF ASTM C 478. MANHOLES SHALL BE TYPE 1-48 INCH MANHOLE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL MANHOLE BASES SHALL BE POSITIVE SEAL TYPE AS MANUFACTURED BY PREDL SYSTEMS NORTH AMERICA INC. OR APPROVED EQUAL. JOINTS SHALL BE RUBBER GASKET CONFORMING TO ASTM C 443 AND SHALL BE GROUTED FROM THE INSIDE. LIFT HOLES SHALL BE GROUTED FROM THE OUTSIDE AND INSIDE OF THE MANHOLE. (SEE NOTE 1.) CONNECTION OF A PIPE LINE TO A SYSTEM WHERE A MANHOLE IS NOT AVAILABLE SHALL BE ACCOMPLISHED BY THE USE OF A SADDLE TYPE OR CAST-IN-PLACE MANHOLE. THIS IS ACCOMPLISHED BY POURING A CONCRETE BASE AND SETTING MANHOLE SECTIONS ON IT. THE EXISTING PIPE SHALL NOT BE CUT INTO UNTIL THE MANHOLE IS VACUUM TESTED AND APPROVED BY THE CITY. (SEE DETAIL)
3. MANHOLE FRAMES AND LOCO LIDS SHALL BE EJ OR OLYMPIC FOUNDRY WSDOT STYLE DUCTILE IRON CASTING MARKED 'CITY OF LACEY', 'SEWER', 'MADE IN USA', 'CONFINED SPACE', 'PERMIT REQUIRED' AND CONFORMING TO THE REQUIREMENTS OF ASTM A-30, CLASS 25. THE FRAMES AND LIDS SHALL BE FREE OF POROSITY, SHRINK CAVITIES, COLD SHUNTS, CRACKS, OR ANY SURFACE DEFECTS WHICH WOULD IMPAIR SERVICEABILITY. THE FRAMES AND LIDS SHALL BE MACHINE FINISHED OR GROUND ON SEATING SURFACES SO AS TO ASSURE A NON-ROCKING, SELF SEATING FIT IN ANY POSITION AND BE INTERCHANGEABLE IN OTHER STANDARD MANHOLE FRAMES.
4. LOCK-TYPE COVERS SHALL BE REQUIRED IN ALL MULTI-FAMILY COMPLEXES, ON SCHOOL GROUNDS, ON MANHOLES CONTAINING ODOR CONTROL DEVICES OR AS DETERMINED BY THE CITY. THE MANHOLE OPENING SHALL BE CENTERED OVER THE OUTLET CHANNEL REGARDLESS OF THE LOCATION OF THE LADDER RUNGS. ALL CASTING SHALL BE COATED WITH A BITUMINOUS COATING PRIOR TO DELIVERY TO THE JOB SITE.
5. SIDE SEWER SERVICES SHALL BE PVC, ASTM D 3034 SDR 35 WITH FLEXIBLE GASKET JOINTS (SEE DETAIL). SIDE SEWER CONNECTIONS SHALL BE MADE BY A TAP TO AN EXISTING MAIN OR A WYE BRANCH FROM A NEW MAIN CONNECTED ABOVE THE SPRING LINE OF THE PIPE. WHEN A TAP IS USED TO CONNECT A NEW SERVICE LATERAL TO AN EXISTING SEWER MAIN, TELEVISING FROM THE CLOSEST MANHOLE TO 15 FEET PAST THE TAP IS REQUIRED. FOREIGN OBJECTS AND DEBRIS SHALL BE REMOVED BY HIGH PRESSURE CLEANING AND/OR VACUUM REMOVAL. ALL SEWER MAINS SHALL BE FIELD STAKED FOR GRADES AND ALIGNMENT IN ACCORDANCE WITH SECTION 7A.030 OF THE DEVELOPMENT GUIDELINES.
6. ALL PLASTIC PIPE AND SERVICES SHALL BE INSTALLED WITH CONTINUOUS GREEN TRACER TAPE 12 INCHES TO 18 INCHES UNDER THE PROPOSED FINISHED SUB THE MARKER SHALL BE PLASTIC NON-BIODEGRADABLE, METAL CORE OR BACKING, MARKED 'SEWER' WHICH CAN BE DETECTED BY A STANDARD METAL DETECTOR. TAPE SHALL BE TERRA TAPE "D" OR APPROVED EQUAL. THE TAPE SHALL BE FURNISHED BY THE CONTRACTOR.
7. ALL SIDE SEWER LOCATIONS SHALL BE MARKED ON THE FACE OF THE CURB WITH AN EMBOSSED "S" 3 INCH HIGH AND 1/4 INCH INTO CONCRETE.
8. BEDDING OF THE SEWER MAIN SHALL BE A MINIMUM 6 INCHES OF 3/8 INCH MINUS PEA GRAVEL UNDER THE PIPE AND A MINIMUM OF 12 INCHES OF 3/8 INCH MINUS PEA GRAVEL OVER THE PIPE. WHEN WORKING IN SENSITIVE SOILS A BARRIER ABOVE THE PEA GRAVEL MAY BE REQUIRED TO PREVENT THE FINE SOILS FROM MIGRATING INTO THE PEA GRAVEL. ALL PEA GRAVEL SHALL BE WASHED. COMPACTION OF THE BACKFILL MATERIAL SHALL BE REQUIRED IN ACCORDANCE WITH THE ABOVE MENTIONED SPECIFICATION (SEE NOTE #1). THE APPLICABLE CHAPTER 4-8 TRENCH RESTORATION DETAILS AND DETAIL 7-20 SHALL BE USED.
9. INSTALL A 4'X 4'SQUARE X 8 INCH THICK CONCRETE PAD WITH #4 REBAR AROUND ALL MANHOLE FRAMES AND CLEANOUTS THAT ARE NOT IN A PAVEMENT AREA.
10. ALL LINES SHALL BE HIGH VELOCITY CLEANED AND PRESSURE TESTED PRIOR TO PAVING IN CONFORMANCE WITH THE ABOVE REFERENCED SPECIFICATIONS. SEE NOTE HYDRANT FLUSHING OF LINES IS NOT AN ACCEPTABLE CLEANING METHOD. TESTING OF THE SANITARY SEWER MAIN SHALL INCLUDE VIDEOTAPING OF THE MAIN BY THE CONTRACTOR. IMMEDIATELY PRIOR TO VIDEOTAPING, ENOUGH WATER SHALL BE RUN DOWN THE LINE SO IT COMES OUT THE LOWER MANHOLE. A COPY OF THE VIDEO TAPE SHALL BE SUBMITTED TO THE CITY OF LACEY INSPECTOR. ACCEPTANCE OF THE LINE WILL BE MADE AFTER THE TAPE HAS BEEN REVIEWED AND APPROVED BY THE INSPECTOR. A VACUUM TEST OF ALL MANHOLES IN ACCORDANCE WITH LACEY STANDARD IS ALSO REQUIRED. TESTING SHALL TAKE PLACE AFTER ALL UNDERGROUND UTILITIES ARE INSTALLED AND COMPACTION OF THE ROADWAY SUB GRADE IS COMPLETED. AFTER THE PAVING AND RAISING OF MANHOLES ARE COMPLETE, THE DEVELOPER SHALL CLEAN AND VIDEOTAPE THE SEWER CONVEYANCE SYSTEM AGAIN AT THE DEVELOPERS EXPENSE. THE METHOD OF CLEANING SHALL BE HIGH VELOCITY WATER PRESSURE CLEANING. ALL ROCKS AND DEBRIS SHALL BE REMOVED AND DISPOSED AT THE DEVELOPER'S EXPENSE.
11. CONTRACTORS SHALL BE RESPONSIBLE FOR CLEANUP OF ANY DEBRIS IN NEW OR EXISTING MANHOLES AND MAINS ASSOCIATED WITH THE PROJECT AFTER THE NEW LINES ARE CLEANED AS OUTLINED ABOVE. THE SEWER SYSTEM SHALL BE TELEVISED TO ASSURE THE SYSTEM IS CLEAN.
12. ENCASEMENT MATERIAL SHALL INCLUDE ¼ INCH STEEL. DUCTILE IRON AND IN SPECIAL OR UNUSUAL CASES C-900 DR 14 PVC PIPE MAY BE ALLOWED IF APPROVED BY THE DIRECTOR OF PUBLIC WORKS IN ADVANCE. CONCRETE, CDF AND OTHER METHODS OF ENCASEMENT SHALL NOT BE ALLOWED.

NOTE:

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COORDINATE TO AS-BUILT SURVEY IMPROVEMENTS AS PART OF BASE CONTRACT.

REVISIONS	DATE	BY

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SHEET TITLE: SANITARY SEWER PLAN AND PROFILE

PROJECT NAME: GATEWAY CHRISTIAN CENTER
3300 MARVIN RD NE
LACEY, WA 98516

SEAL:

DESIGNER:	D. PHILLIPS
DRAWN BY:	N. ALTHAUSER
APPROVED BY:	B. DUNNING
DATE:	FEBRUARY, 2024
JOB NO:	23-000886
DRAWING FILE NO:	23-000886 SS-01
DRAWING NO:	SS-01
SHEET NO:	9 OF 10

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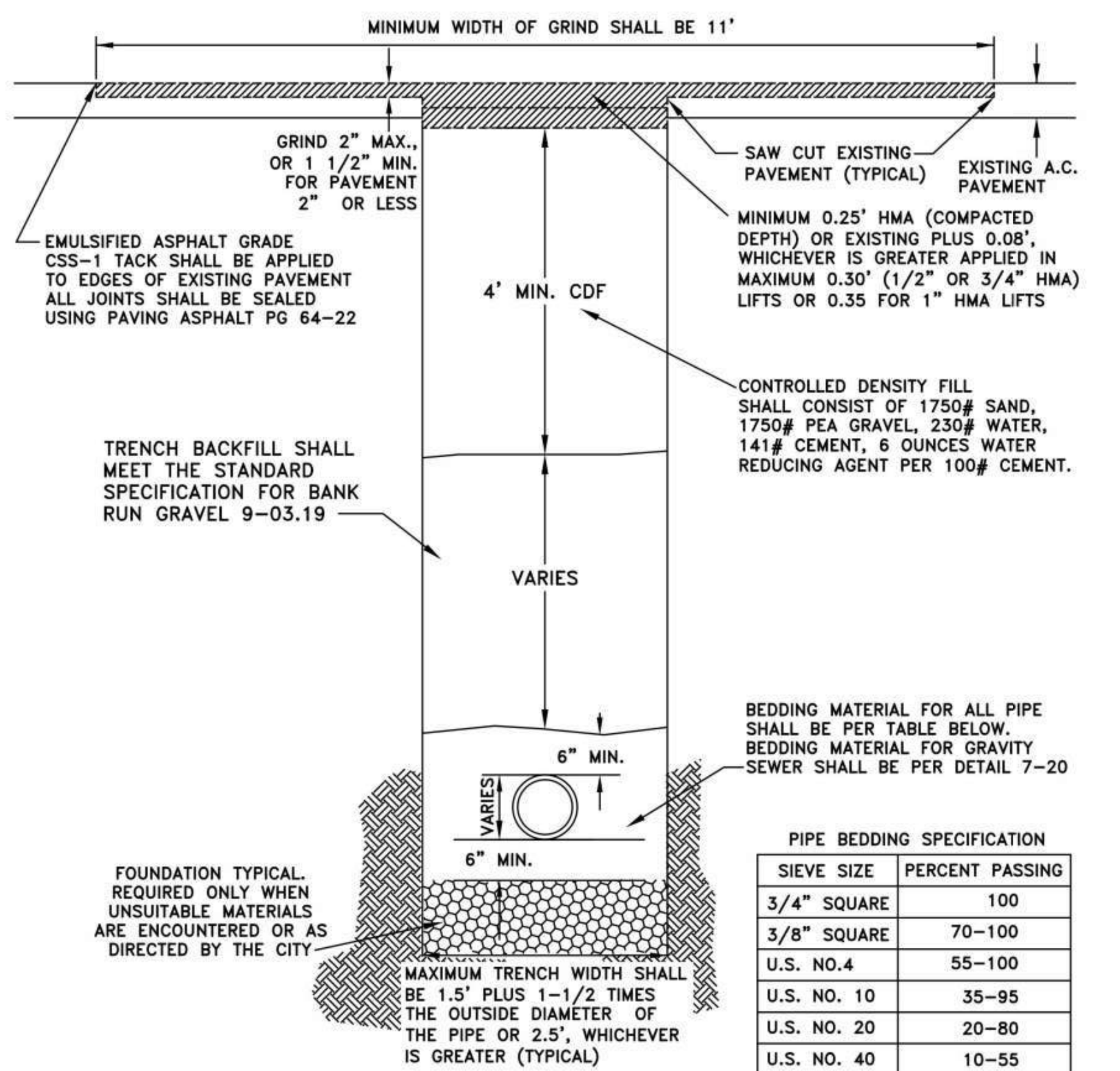


PIPE BEDDING SPECIFICATION

SIEVE SIZE	PERCENT PASSING
3/4" SQUARE	100
3/8" SQUARE	70–100
U.S. NO.4	55–100
U.S. NO. 10	35–95
U.S. NO. 20	20–80
U.S. NO. 40	10–55
U.S. NO. 100	0–10
U.S. NO. 200	0–03

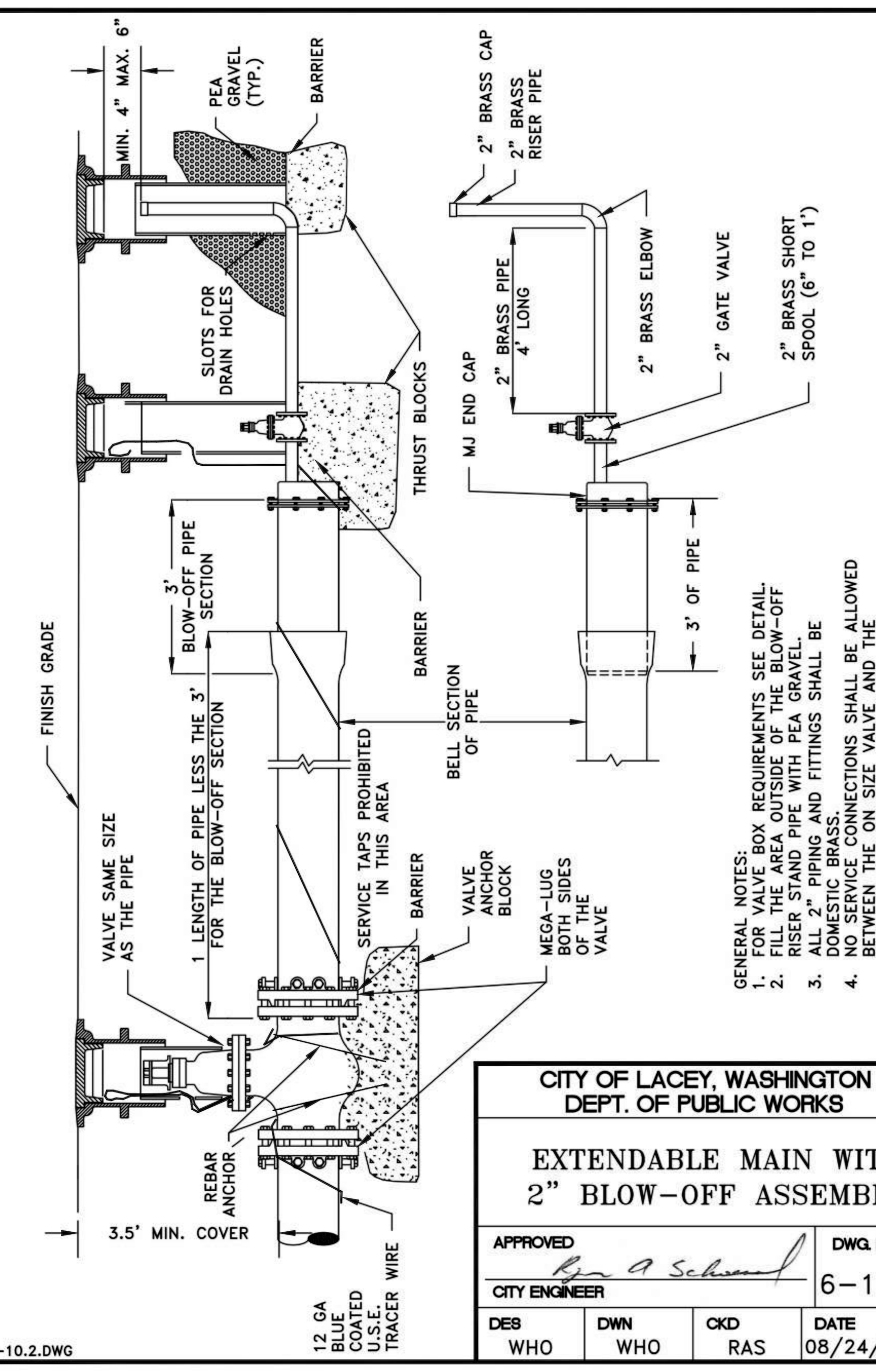
GENERAL NOTES:
1. ALL MATERIALS EXCEPT H.M.A. SHALL BE COMPACTED IN 6-INCH MAXIMUM LIFTS TO 95% DENSITY AS DETERMINED BY ASTM D1557.
2. ALL MATERIALS, WORKMANSHIP, AND INSTALLATION SHALL BE IN CONFORMANCE WITH THE WSDOT STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION AS AMENDED BY CITY OF LACEY STANDARDS.
3. KEEP TRENCH BOTTOM COMPACTED WITH UNIFORM GRADE. NO TEMPORARY SUPPORTS, I.E. BLOCKS, WILL BE ALLOWED TO SUPPORT PIPE. TRENCH BOTTOM SHALL BE TO GRADE PRIOR TO PIPE INSTALLATION.
4. SAW CUT PAVEMENT TO MAX. TRENCH WIDTH. BACKFILL AND PAVE TO TOP OF EXISTING PAVEMENT FOR TRENCH WIDTH. ALLOW 24 HOURS MINIMUM FOR TRENCH PATCH TO CURE. GRIND AND PAVE FINAL PATCH AS SHOWN.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

PERPENDICULAR TRENCH RESTORATION
ARTERIALS, BLVDS. & COLLECTORS

APPROVED / CITY ENGINEER			DWG. NO. 4-8.1
DES WHO	DWN WHO	CKD RAS	DATE 12/15/2014

DG4-8.1.DWG



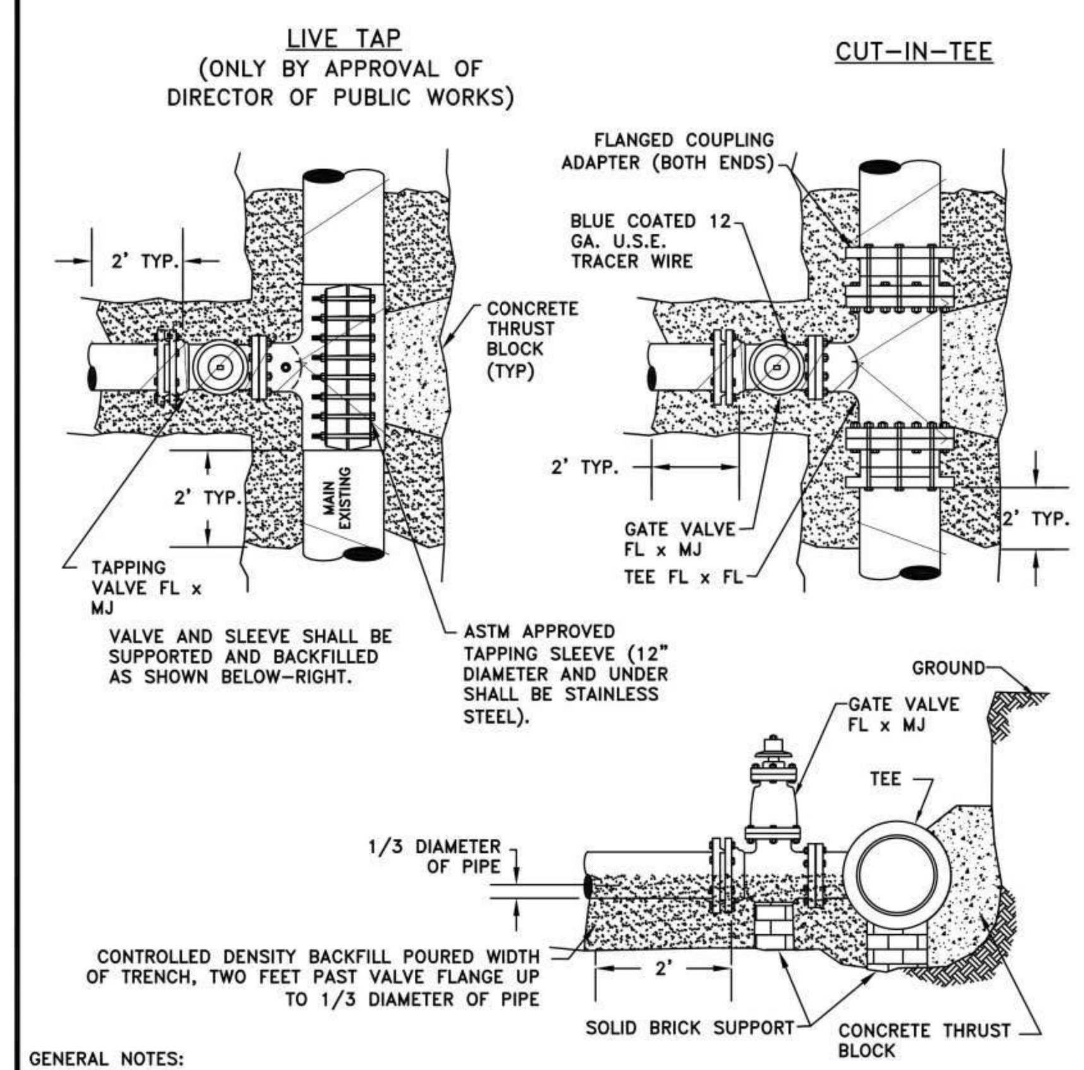
GENERAL NOTES:
1. FOR VALVE BOX REQUIREMENTS SEE DETAIL.
2. FILL THE AREA OUTSIDE OF THE BLOW-OFF RISER STAND PIPE WITH PEA GRAVEL.
3. ALL 2" PIPING AND FITTINGS SHALL BE DOMESTIC BRASS.
4. NO SERVICE CONNECTIONS SHALL BE ALLOWED BETWEEN THE ON SIZE VALVE AND THE BLOW-OFF VALVE.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

EXTENDABLE MAIN WITH 2" BLOW-OFF ASSEMBLY

APPROVED / CITY ENGINEER			DWG. NO. 6-10.2
DES WHO	DWN WHO	CKD RAS	DATE 08/24/2017

DG6-10.2.DWG



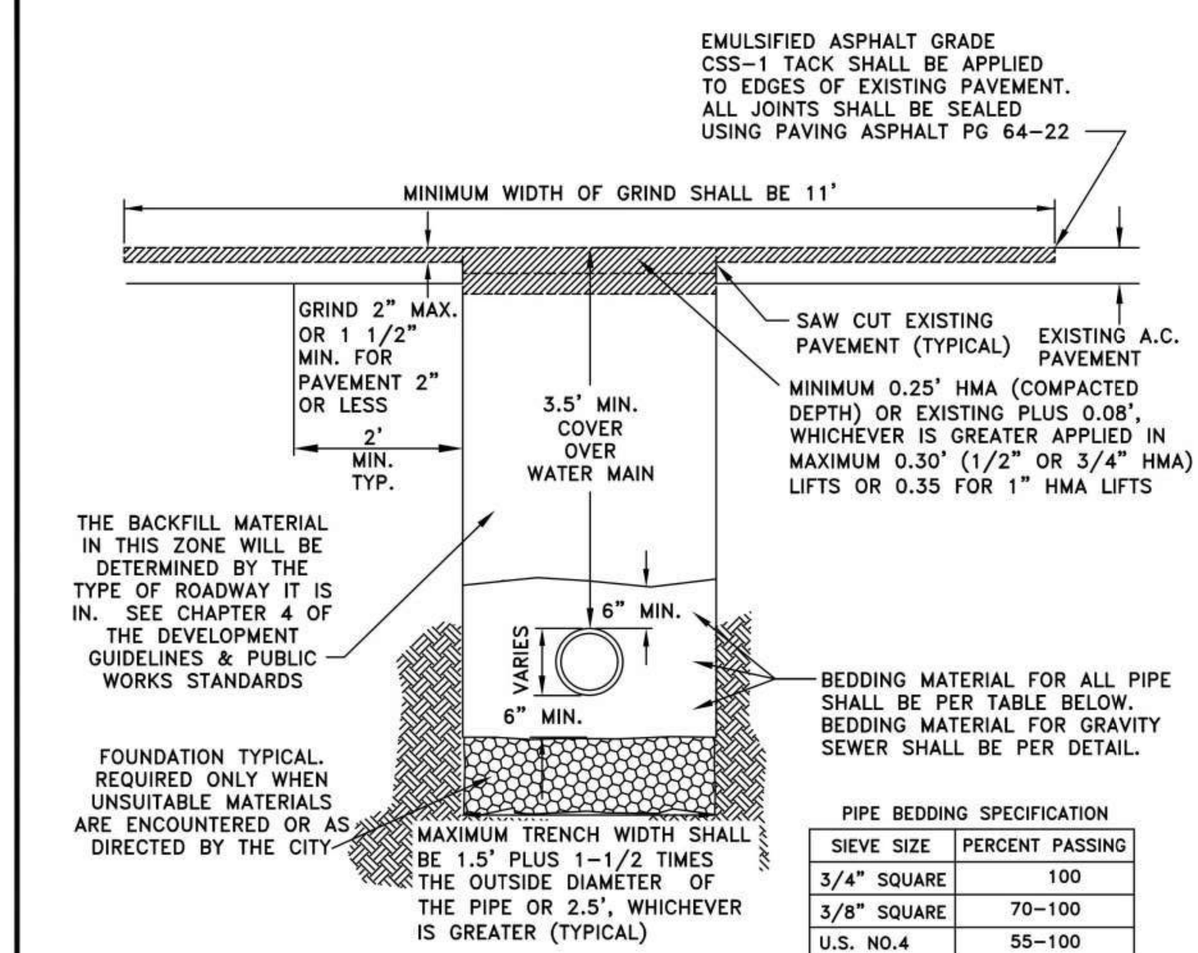
GENERAL NOTES:
1. 11 MIL. PLASTIC OR CONSTRUCTION FABRIC SHALL BE WRAPPED AROUND PIPE AND FITTINGS BEFORE THRUST BLOCK OR CDF BACKFILL ARE POURED.
2. CONTROLLED DENSITY FILL SHALL CONSIST OF 1750# SAND, 1750# PEA GRAVEL, 230# WATER, 141# CEMENT, 6 OUNCES WATER REDUCING AGENT PER 100# CEMENT.
3. THE EXISTING MAIN, TAPPING SLEEVE AND VALVE SHALL BE SUPPORTED THROUGHOUT THE ENTIRE PROCESS WHEN TAPPING THE EXISTING WATER MAIN.
4. CONNECT TO EXISTING TRACER WIRE, IF PRESENT.
5. CUTTING AC PIPE REQUIRES PROPER AC CUTTING AND DISPOSAL PRACTICES BE FOLLOWED. REFER TO OLYMPIC AIR POLLUTION CONTROL AUTHORITY DOCUMENT AND AWWA AC PIPE CUTTING DOCUMENT. AC PIPE CUTTER SHALL BE CERTIFIED.
6. ADDITIONAL VALVES MAYBE REQUIRED WITH CUT IN OFF TEE.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

CONNECTION TO EXISTING MAIN

APPROVED / CITY ENGINEER			DWG. NO. 6-11.0
DES. LRW	DWN. WHO	CKD. RAS	DATE 08/24/2017

DG6-11.0.DWG



PIPE BEDDING SPECIFICATION

SIEVE SIZE	PERCENT PASSING
3/4" SQUARE	100
3/8" SQUARE	70–100
U.S. NO.4	55–100
U.S. NO. 10	35–95
U.S. NO. 20	20–80
U.S. NO. 40	10–55
U.S. NO. 100	0–10
U.S. NO. 200	0–03

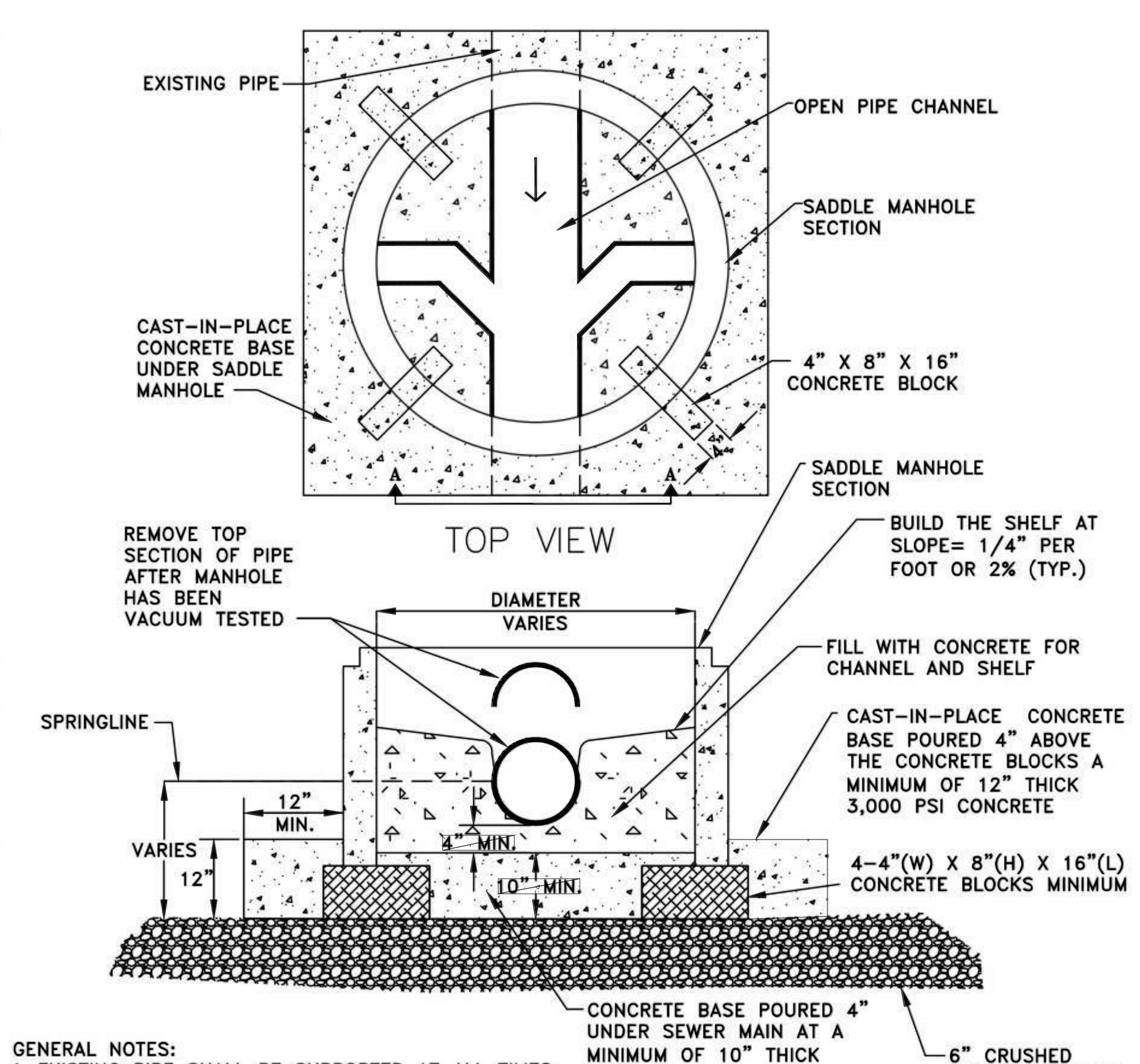
GENERAL NOTES:
1. ALL MATERIALS EXCEPT H.M.A. SHALL BE COMPACTED IN 6-INCH MAXIMUM LIFTS TO 95% DENSITY AS DETERMINED BY ASTM D1557.
2. ALL MATERIALS, WORKMANSHIP, AND INSTALLATION SHALL BE IN CONFORMANCE WITH THE WSDOT STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION AS AMENDED BY CITY OF LACEY STANDARDS.
3. KEEP TRENCH BOTTOM COMPACTED WITH UNIFORM GRADE. NO TEMPORARY SUPPORTS, I.E. BLOCKS, WILL BE ALLOWED TO SUPPORT PIPE. TRENCH BOTTOM SHALL BE TO GRADE PRIOR TO PIPE INSTALLATION.
4. WHENEVER GROUND WATER IS PRESENT A BARRIER SHALL BE INSTALLED ABOVE THE BEDDING.
5. DEVIATION FROM COMPACTION STANDARDS MAY BE APPROVED BY THE DIRECTOR, OR DESIGNEE, WHERE RECOMMENDED BY THE LICENSED PROFESSIONAL ENGINEER FOR PLANNED OR EXISTING INFILTRATION FACILITIES.
6. EXISTING SURFACES PAVED WITH PERMEABLE MATERIALS SHALL BE REPLACED IN-KIND WHERE FEASIBLE IN CONFORMANCE WITH 4B.180 TRENCH BACKFILL AND RESTORATION.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

PIPE ZONE BEDDING FOR WATER MAINS & SERVICES

APPROVED / CITY ENGINEER			DWG. NO. 6-26.0
DES WHO	DWN WHO	CKD RAS	DATE 08/24/2017

DG6-26.0.DWG



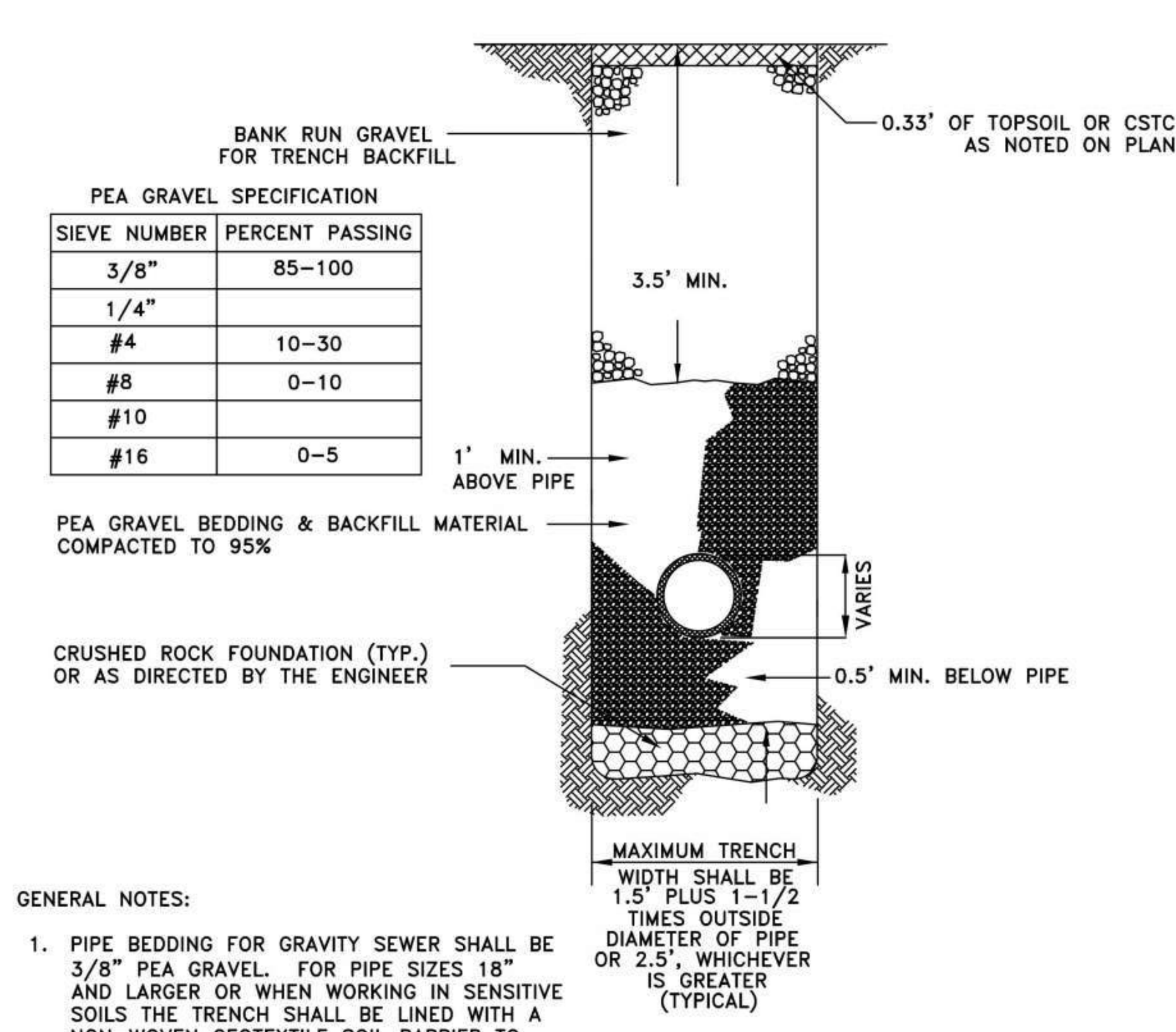
GENERAL NOTES:
1. EXISTING PIPE SHALL BE SUPPORTED AT ALL TIMES.
2. NO WEIGHT OF THE PRECAST MANHOLE UNIT SHALL BEAR ON THE EXISTING PIPE.
3. CAST-IN-PLACE BASE SHALL BE COMMERCIAL CONCRETE.
4. PRECAST MANHOLE SECTION SHALL BE INSTALLED IN ACCORDANCE WITH THE STANDARD PLAN FOR THE SPECIFIED MANHOLE SIZE AND TYPE.
5. THE PRECAST BASE SHALL SIT ON 4-4"(W) X 8"(H) X 16"(L) CONCRETE BLOCKS PLACED ON COMPACTED SUB-GRADE.
6. THE UPPER HALF OF THE EXISTING PIPE SHALL BE REMOVED WHILE THE BOTTOM SHALL REMAIN AS THE CHANNEL OF THE NEW MANHOLE. IF PVC THE OUTSIDE OF THE PVC PIPE SHALL BE MADE ABRASIVE USING PRIMER AND SAND.
7. THE CAST-IN-PLACE MANHOLE SHALL NOT BE INSTALLED OVER A BELL SECTION OR JOINT OF THE SEWER MAIN. THE MINIMUM DISTANCE FROM THE OUTSIDE WALL OF THE MANHOLE AND A BELL SECTION OR JOINT SHALL BE 2'.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

SADDLE MANHOLE W/CAST-IN-PLACE BASE

APPROVED / CITY ENGINEER			DWG. NO. 7-4.0
DES WHO	DWN WHO	CKD RAS	DATE 08/24/2017

DG7-4.0.DWG



PEA GRAVEL SPECIFICATION

SIEVE NUMBER	PERCENT PASSING
3/8"	85–100
1/4"	
#4	10–30
#8	0–10
#10	
#16	0–5

GENERAL NOTES:
1. PIPE BEDDING FOR GRAVITY SEWER SHALL BE 3/8" PEA GRAVEL. FOR PIPE SIZES 18" AND LARGER OR WHEN WORKING IN SENSITIVE SOILS THE TRENCH SHALL BE LINED WITH A NON-WOVEN GEOTEXTILE SOIL BARRIER TO PREVENT SOIL MIGRATION INTO THE PEA GRAVEL.
2. COMPACTION: THE TESTING REQUIREMENTS SHALL BE PER THE CITY OF LACEY DEVELOPMENT GUIDELINES AND PUBLIC WORKS STANDARDS SECTION 4B.200 TESTING.
3. ALL MATERIALS, WORKMANSHIP, AND INSTALLATION SHALL BE IN CONFORMANCE WITH THE STANDARD SPECIFICATIONS FOR ROAD, BRIDGE AND MUNICIPAL CONSTRUCTION AS AMENDED BY CITY OF LACEY STANDARDS.
4. KEEP TRENCH BOTTOM COMPACTED WITH UNIFORM GRADE. A BELL JOINT SHALL BE REQUIRED AT EACH JOINT FOR PROPER SUPPORT. NO TEMPORARY SUPPORTS, I.E. BLOCKS, WILL BE ALLOWED TO SUPPORT PIPE. TRENCH BOTTOM SHALL BE TO GRADE PRIOR TO PIPE INSTALLATION.

CITY OF LACEY, WASHINGTON
DEPT. OF PUBLIC WORKS

GRAVITY SEWER PIPE BEDDING REQUIREMENT

APPROVED / CITY ENGINEER			DWG. NO. 7-14.0
DES. WHO	DWN. BRM	CKD. RAS	DATE 08/24/2017

DG7-14.0.DWG

REVISIONS	DATE	BY

SCJ ALLIANCE
CONSULTING SERVICES
8730 TALLON LANE NE, SUITE 200, LACEY, WA 98516
P: 360.352.1465
SCJALLIANCE.COM

SHEET TITLE: UTILITY DETAILS

PROJECT NAME: GATEWAY CHRISTIAN CENTER
3300 MARVIN RD NE
LACEY, WA 98516

SEAL:

DESIGNER: D. PHILLIPS
DRAWN BY: N. ALTHAUSER
APPROVED BY: B. DUNNING
DATE: FEBRUARY, 2024
JOB NO: 23-000886
DRAWING FILE NO: 23-000886 UT-01
DRAWING NO: UT-01
SHEET NO: 10 OF 10

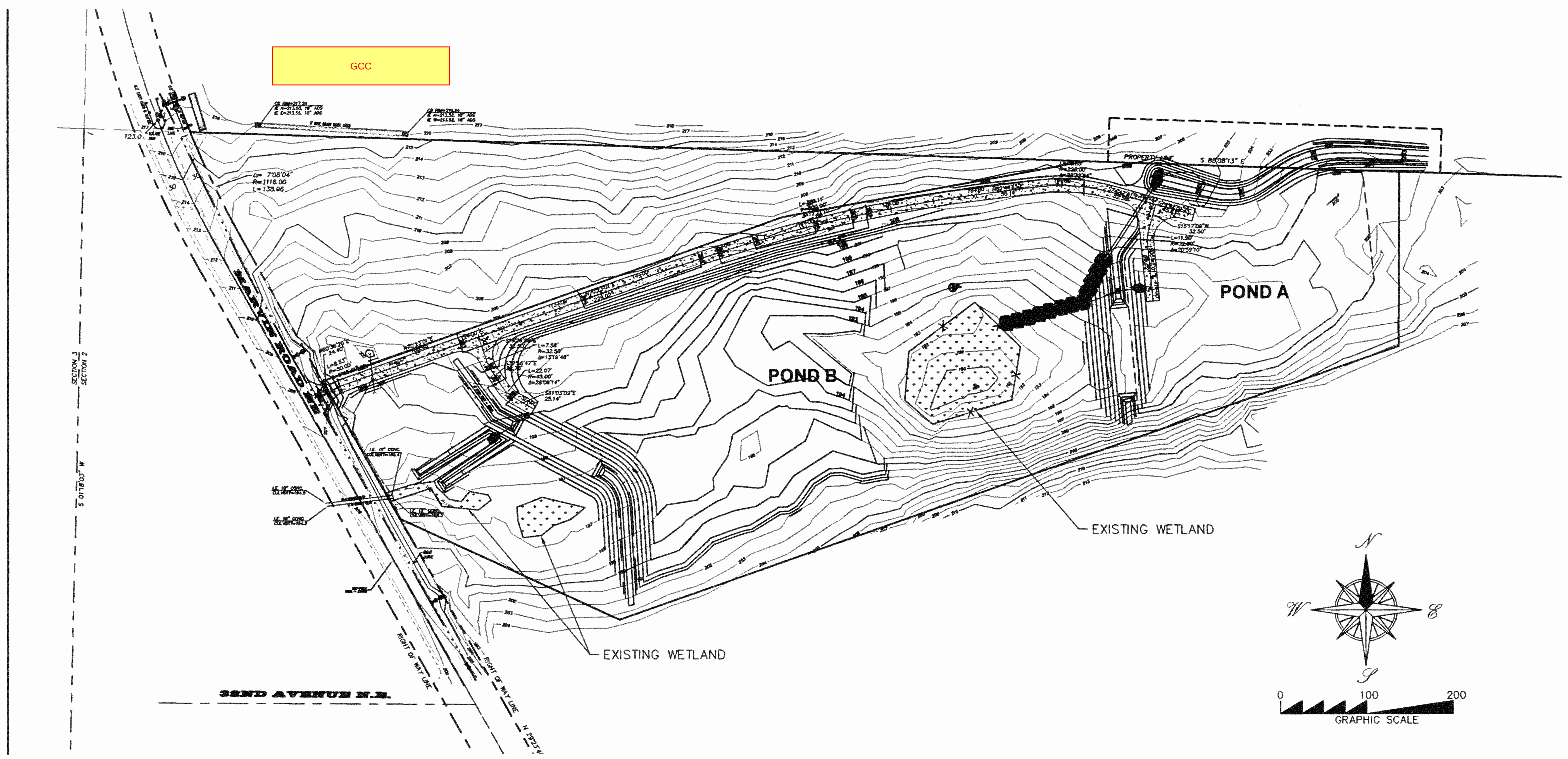
DRAINAGE CONTROL PLAN

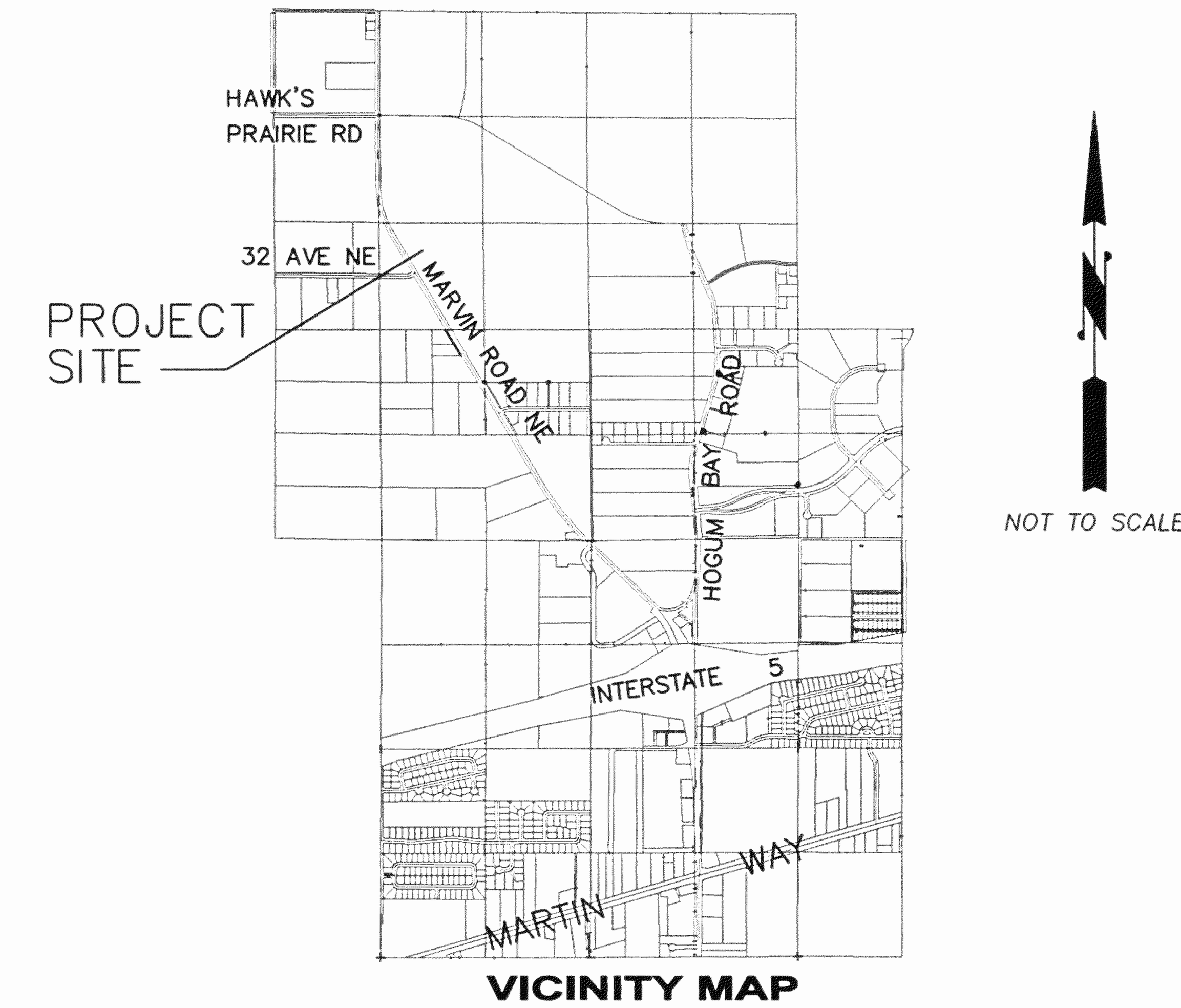
Attachment 5

Properties Approved to Drain to Regional Stormwater Facility

D-05-18/1

MERIDIAN GROUP I - STORM POND





VICINITY MAP

PROJECT PROPONENT

MERIDIAN GROUP 1
1800 43RD AVE. E.
APARTMENT 105
SEATTLE, WA 98112
CONTACT: CLIFFORD MULBERG
PHONE: (206)324-0424

PROJECT ENGINEER

PATRICK HARRON AND ASSOCIATES, LLC
JOSEPH M. SMEBY, P.E.
(360) 459-1102

PROJECT SITE

NE OF MARVIN ROAD NE & 32ND AVE. NE
LACEY, WA 98516

TABLE OF CONTENTS

LEGEND

BENCH MARK	TRAFFIC SIGNAL POLE
MONUMENT IN CASE	TRAFFIC SIGNAL POLE W/LUMINAIRE
SURFACE MONUMENT	TELEPHONE VAULT
REBAR & CAP	TELEPHONE RISER
PK NAIL / TACK IN LEAD	STORM DRAIN MANHOLE
HUB & TACK	CATCH BASIN
GAS METER	CURB INLET
GAS VALVE	SIGN
BGM BURIED GAS MARKER	FP FLAGPOLE
WATER METER	LIGHT STANDARD
WATER VALVE	CONIFEROUS TREE
FIRE HYDRANT	DECIDUOUS TREE
GUARD POST	POST POST
P POWER VAULT	FENCE LINE
PAD MOUNTED TRANSFORMER	RAILROAD TRACK
UTILITY POLE	G BURIED GAS LINE
UTILITY POLE ANCHOR	W BURIED WATER LINE
GUY POLE	SD STORM DRAINAGE LINE
UTILITY JUNCTION BOX	SS SANITARY SEWER LINE
MANHOLE	P BURIED POWER LINE
HH HANDHOLE	T BURIED TELEPHONE LINE
STP STANDPIPE	EXISTING CONTOURS
STREET LIGHT ASSEMBLY	PROPOSED CONTOURS

HORIZONTAL DATUM:

CITY OF LACEY BM#727 FOUND 1/2" IRON PIPE AT INTERSECTION OF 32ND AVE NE AND MARVIN RD NE CITY OF LACEY GROUND SCALE COORDINATES: N: 644314.26, E: 72791.54

NORTHWEST CORNER SECTION 2, TOWNSHIP 18 NORTH, RANGE 1 WEST: FOUND THURSTON COUNTY BRASS CAP IN CONCRETE WITH PUNCH MARK (THURSTON COUNTY HIGH PRECISION NETWORK CONTROL POINT GPS 105). CITY OF LACEY GROUND SCALE COORDINATES: N: 646357.05, E: 72370.97

WEST ONE-QUARTER CORNER SECTION 2, TOWNSHIP 18 NORTH, RANGE 1 WEST: FOUND 2" DISK ON REBAR STAMPED "S3/S2, 1/4, T18N, R1W, L.S. 7397". CITY OF LACEY GROUND SCALE COORDINATES: N: 643650.51, E: 72309.51

VERTICAL DATUM:

NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29)

CONTROLLING BENCHMARK:

CITY OF LACEY BM# 104
RAIL ROAD SPIKE IN EAST SIDE OF POWER POLE AT THE SW CORNER OF THE INTERSECTION OF MARVIN RD NE AND 32ND AVE NE, ELEV 206.27

PRIOR TO CONSTRUCTION, CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF ALL EXISTING UNDERGROUND UTILITIES.

APPROVED FOR CONSTRUCTION FOR THE CITY OF LACEY
BY: [signature] *DATE: 10/8/04*
DIRECTOR OF PUBLIC WORKS
Approval Expires Two Years from Above Date

THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL EXISTING UTILITIES. THE CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION BY CALLING THE UNDERGROUND LOCATE LINE AT 1-800-424-5555 A MINIMUM OF 48 HOURS PRIOR TO ANY EXCAVATION.

R#	DATE	DESCRIPTION	BY
1	2/26/04	REVISIONS PER CITY COMMENTS	CMC
2	7/22/04	REVISIONS PER CITY COMMENTS	CMC
3	9/15/04	REVISIONS PER CITY COMMENTS	CMC
4	9/28/04	REVISIONS PER CITY COMMENTS	CMC

JOSEPH M. SMEBY
STATE OF WASHINGTON
38835
PROFESSIONAL ENGINEER
EXPIRES 6/04/05

COVER

PATRICK HARRON & ASSOCIATES, LLC

Patrick Harron & Associates, LLC
Engineering
Planning
14900 Interurban Ave. S.
Suite Number 279
Seattle, WA 98168
T 206.674.4659
F 206.674.4660

PROJ. NO.	DSN. BY:
02508	JMS
DWN. BY:	CHK. BY:
CMC	JMS

MERIDIAN GROUP I
STORM POND
LACEY, THURSTON COUNTY, WASHINGTON
PORTION OF SECTION 2, TOWNSHIP 18 NORTH, RANGE 1 WEST, W.M.

DATE: 9/04
SCALE: 1" = 100'
DRAWING NO. 1 OF 6

D-05-18/2

MERIDIAN GROUP I - STORM POND

General Notes: (Silt Fences)

1. Filter fabric shall be purchased in a continuous roll cut to the length of the barrier to avoid use of joints. When joints are necessary, filter cloth shall be spliced together only at a support post, with a minimum 6-inch overlap, and securely fastened at both ends to post.

2. Posts shall be spaced a maximum of 6 feet apart and driven securely into the ground (minimum of 30 inches).

3. A trench shall be excavated approximately 8 inches wide and 12 inches deep along the line of posts and upslope from the barrier.

4. When standard strength filter fabric is used a wire mesh support fence shall be fastened securely to the upslope side of the posts using heavy-duty wire staples at least 1 inch long, tie wires or hog rings. The wire shall extend into the trench a minimum of 4 inches and shall not extend more then 36 inches above the original ground surface.

5. The standard strength filter fabric shall be stapled or wired to the fence, and 20 inches of the fabric shall be extended into the trench. The fabric shall not extend more then 36 inches above the original ground surface. Filter fabric shall not be stapled to existing trees.

6. When extra-strength filter fabric and closer post spacing is used, the wire mesh support fence may be eliminated. In such case, the filter fabric is stapled or wired directly to the posts with all other provisions of above notes applying.

7. Filter fabric fences shall not be removed before the upslope area has been permanently stabilized.

8. Filter fabric fences shall be inspected immediately after each rainfall and at least daily during prolonged rainfall. Any required repairs shall be made immediately.

General Notes: (Mulching)

1. Mulch materials used shall be straw, and shall be applied at a rate of 2-3 inches thick and 2-3 bales per 1000 square feet.

2. Mulches shall be applied in all areas with exposed slopes greater then 2:1.

3. Mulching shall be used immediately after seeding or in areas which cannot be seeded because of the season.

4. All areas needing mulching shall be covered by November 1.

General Notes: (Seeding)

1. Seed mixture shall be Chewings or red fescue: 40% weight, 98% purity, and 90% germination; Annual or perennial rye: 40% weight, 98% purity, and 90% germination; Redtop or colonial bentgrass 10% weight, 92% purity, 85% germination; and white dutch clover: 10% weight, 98% purity, and 90% germination. Mixture shall be applied at a rate of 120 lbs per acre.

2. Seed beds planted between May 1 and October 31 will require irrigation and other maintenance as necessary to foster and protect the root structure.

3. For seed beds planted between October 31 and April 30, armoring of the seed bed will be necessary. (e.g., geotextiles, jute mat, clear plastic covering).

4. Before seeding, install needed surface runoff control measure such as gradient terraces, interceptor dikes, swales, level spreaders and sediment basins.

5. The seedbed shall be firm with a fairly fine surface, following surface roughening. Perform all cultural operations across or at right angles to the slope.

6. Fertilizers are to be used according to suppliers recommendations. Amounts used should be minimized, especially adjacent to water bodies and wetlands.

General Notes: (Sod)

1. Sod shall be machine cut at a uniform soil thickness of 3/4 inch at the time of curing. Measurements for thickness shall exclude top growth and thatch.

2. Standard size sections of sod shall be strong enough to support their own weight and shall retain their size and shape when suspended by the end of a 3 foot section.

3. Sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect it's survival.

4. Sod shall be harvested, delivered and installed within a period of 36 hours.

Construction Entrance Notes

1. Material shall be 4" to 8" quarry spalls and may be top-dressed with 1" to 3" rock. (Standard Specifications).

2. The rock pad shall be at least 12 inches thick and 100 feet long. Width shall be full width of the vehicle ingress and egress area. Smaller pads may be approved for single-family residential and small commercial sites.

3. Additional rock shall be added periodically to maintain proper function of the pad.

4. If the pad does not adequately remove the mud from the vehicle wheels, the wheels shall be hosed off before the vehicle enters a paved street. The washing shall be done on an area covered with crushed rock and wash water shall drain to a sediment retention facility or through silt fence.

Inspection of Erosion Control Facilities:

1. Temporary drainage and erosion control facilities shall not be allowed to fall into disrepair. Prior to any construction on site the project engineer or contractor shall designate an individual to conduct periodic inspection of all erosion and sedimentation control facilities. The individual responsible shall maintain a record of all inspections made and of any corrective measures undertaken during construction.

2. During periods of construction activity, the individual responsible for inspection of the erosion control facilities shall make daily inspections of said facilities. Additional inspections may be necessary based on weather conditions and/or site-specific areas of concern. During periods of inactivity, erosion control facilities shall be fully maintained and inspected a minimum of once per week, during and after rainfall events, or as requested by the city inspector. The contractor shall make repairs as soon as practicable following the identification of facility deficiencies and shall maintain adjacent properties and public roads free of silt, dust, soil, and debris. The contractor shall immediately comply when requested by the city inspector to make correction or to remove said materials.

3. The project engineer shall inspect drainage and erosion control facilities periodically during construction. The project engineer shall provide, at a minimum, inspection certification for the drainage and erosion control facilities following any storm event with precipitation equal to or exceeding 2 inches in a 24-hour period. Failure to submit certification to the city within 24 hours following such an event may result in a stop work placed on the project.

General Notes (Standard Stormwater Notes – Appendix S)

1. All workmanship and materials shall be in accordance with the City of Lacey standards and the most current copy of the WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction . In case of conflict, the most stringent standard shall apply.

2. Temporary erosion/water pollution measures shall be required in accordance with Section 1-07.15 of the Standard Specifications and the Drainage Design and Erosion Control Manual ("Drainage Manual").

3. Proponent shall comply with all other permits and other requirements of the governing authority or agency.

4. A preconstruction meeting shall be held prior to the start of construction or staking of the site.

5. All storm mains and retention/detention areas shall be staked for grade and alignment by and engineering or survey firm licensed to perform such work.

6. Storm drain pipe shall be as specified in the Drainage Manual.

7. Special structures, oil/water separators, and outlet controls shall be installed per plans and manufacturers recommendations.

8. Provide traffic control plan(s) as required in accordance with MUTCD.

9. Call underground locate line 1-800-424-5555 minimum 48 hours prior to any excavations.

10. All surveying and staking shall be performed by an engineering or surveying firm capable of performing such work. The engineer or surveyor directing such work shall be licensed by the State of Washington.

11. The minimum staking of storm sewers systems shall be as follows:

A. Stake location of all catch basins/manholes and other fixtures for grade and alignment.

B. Stake location, size, and depth of retention/detention facility.

C. Stake finished grade of all stormwater features, including but not limited to catch basin/manhole rim elevations, overflow structures, weirs, and invert elevations of all pipes in catch basins, manholes, and those pipes that daylight.

12. Pipe materials used for stormwater conveyance shall be as approved by the jurisdiction. Pipe size, slope, cover, etc., shall be as specified in the Drainage Manual.

13. All driveway culverts shall be of sufficient length to provide a minimum of 3:1 slope from the edge of the driveway to the bottom of the ditch. Culverts shall be beveled end sections to match the side slope.

14. If drainage outlets (stub-outs) are to be provided for each individual lot, the stub-outs shall conform to the following:

A. Each outlet shall be suitably located at the lowest elevation on the lot, so as to service all future roof downspouts and footing drains, driveways, yard drains, and any other surfaces or subsurface drains necessary to render the lots suitable for their intended use. Each outlet shall have free-flowing, positive drainage to an approved storm water conveyance system or to an approved outfall location.

B. Outlets on each lot shall be located with a five-foot-high, 2"x4" stake marked "storm" or "drain." The stub-out shall visibly extend above surface level and be secured to the stake.

C. Pipe material shall be approved by the jurisdiction.

D. Drainage easements are required for drainage systems designed to convey flows through individual lots.

E. The developer and/or contractor is responsible for coordinating the locations of all stub-out conveyance lines with respect to the utilities (e.g., power, gas, telephone, television.)

F. All individual stub-outs shall be privately owned and maintained by the lot home owner.

15. The storm drainage system shall be constructed according to approved plans on file with the jurisdiction. Any material deviation from the approved plans will require written approval from the jurisdiction.

16. A copy of the approved storm water plans must be on the job site whenever construction is in progress.

17. All disturbed areas shall be seeded and mulched or similarly stabilized to the satisfaction of the jurisdiction. For sites where grass has been planted through hydroseeding, the performance bond will not be released until the grass has been thoroughly established, unless otherwise approved by the jurisdiction.

18. All building downspouts on commercial sites shall be connected to the storm drainage system, unless otherwise approved by the jurisdiction.

19. All erosion control and stormwater facilities shall be regularly inspected and maintained by the contractor during the construction phase of the development project.

20. The contractor shall be responsible for providing adequate safeguards, safety devices, protective equipment, flaggers, and any other needed actions to protect the life, health, and safety of the public, and to protect property in connection with the performance of work covered by the contract. Any work within the traveled right-of-way that may interrupt normal traffic flow shall require at least one flagger for each lane of traffic affected. All sections of the current W.S.D.O.T. Standard Specifications for Traffic Control shall apply.

21. It shall be be the sole responsibility of the contractor to obtain street use and other related or required permits prior to any construction activity in the jurisdiction's right-of-way. It shall also be the responsibility of the contractor to obtain all required permits prior to any construction.

22. No final cut or fill slope shall exceed two (2) horizontal to one (1) vertical without stabilization by rockery or by a structural retaining wall.

23. The project engineer shall verify the locations, widths, thicknesses, and elevations of all existing pavements and structures, including utilities and other frontage improvements, that are to interface with new work, provide all the trimming, cutting, saw cutting, grading, leveling, sloping, coating, and other work, including materials as necessary to cause the interface with existing works to be proper, without conflict, acceptable to the engineer and the jurisdiction, complete in place and ready to use.

24. Compaction of all fill areas shall be per current APWA specifications. Fill shall be provided in 6" maximum lifts and shall be compacted to 95 percent of it maximum relative density.

General Notes (Storm Drain Construction)

1. All workmanship and materials shall be in accordance with the City of Lacey standards and the most current copy of the WSDOT/APWA Standard Specifications for Road, Bridge and Municipal Construction . In case of conflict, the most stringent standard shall apply.

2. The contractor shall be in compliance with all safety standards and requirements as set forth by OSHA, WISHA and the State of Washington, Department of Labor and Industries.

3. The contractor shall be responsible for all traffic control in accordance with the WSDOT/APWA Standard Plans for Road, Bridge and Municipal Construction (all applicable "K" plans) and/or the Manual on Uniform Traffic Control Devices (MUTCD). Prior to disruption of any traffic, a traffic control plan shall be prepared and submitted to the City for approval. No work shall commence until all traffic control is in place.

4. All approvals and permits required by the City of Lacey shall be obtained by the contractor prior to the start of construction. A grading permit for storm pond construction may be required.

5. If construction is to take place in the County right-of-way, the contractor shall notify the County and obtain all the required approvals and permits.

6. A preconstruction meeting shall be held with the City of Lacey Construction Inspector prior to the start of construction.

7. The contractor shall be fully responsible for the location and protection of all existing utilities. The contractor shall verify all utility locations prior to construction by calling the Underground Locate line at 1-800-424-5555 a minimum of 48 hours prior to any excavation.

8. It shall be the responsibility of the contractor to have a copy of an approved set of plans on the construction site at all times.

9. All surveying and staking shall be performed per the corresponding chapter of the City of Lacey Development Guidelines and Public Works Standards

10. Temporary erosion control/water pollution measures shall be required in accordance with Section 1-07.15 of the WSDOT/APWA Standard Specifications and the Drainage Design and Erosion Control Manual for Lacey. At no time, will silts and debris be allowed to drain into an existing or newly installed facility unless special provisions have been designed.

11. Storm drain pipe shall be on the WSDOT Qualified Products list for the specification listed below:

A. Plain concrete Storm Sewer Pipe or Reinforced Concrete Storm Sewer Pipe per WSDOT Standard Specifications 9-05.7.

B. Solid Wall PVC Storm Sewer Pipe per WSDOT Standard Specification 9-05.12(1).

C. Ductile Iron Sewer Pipe per WSDOT Standard Specification 9-05.13.

12. All storm drainage systems are required to be air testable at 4 psi except concrete pipe which shall be tested per WSDOT/APWA standard for concrete storm pipe. All flexible pipe shall be mandrel tested per WSDOT/APWA standards. Testing shall be done by the contractor.

13. Testing of the storm sewer shall include video taping of the main by the contractor. Immediately prior to video taping, enough water shall be run down the line so it comes out the lower catch basin. A copy of the video tape shall be submitted to the City of Lacey. Acceptance of the line will not be made until after the tape has been reviewed and approved by the City. Testing shall take place after all underground utilities are installed and compaction of the roadway subgrade is complete.

14. Special structures, oil/water separators and outlet controls shall be installed per plans and manufacturers recommendations.

15. All disturbed areas shall be seeded and mulched in accordance with the Drainage Design and Erosion Control Manual for Lacey, Section 9.4, Wet Season, Dry Season Requirements For Site Stabilization and Section 9.14.16, Erosion Control Seeding. For sites where vegetation has been planted through hydroseeding, the financial guarantee will not be released until the vegetation has been thoroughly established.

16. Where connections require "field verifications", connection points will be exposed by contractor and fittings verified 48 hours prior to distributing shut-down notices.

17. All catch basins/manholes, shall have pads per Lacey detail 5-5.

18. Any changes to the design shall first be reviewed and approved by the project engineer and the City of Lacey.

Erosion Control Note:

Erosion control measures are not limited to the items on these plans. The contractor is responsible for the installation and maintenance of all erosion control measures. No siltation of existing or proposed drainage facilities shall be allowed. Care shall be taken to prevent migration of silts to off-site properties.

Infiltration Note:

Infiltration area shall be protected during construction. Contractor shall not allow sediment laden water to enter infiltration gallery. Additionally 4' manhole riser to be added to gallery inlets, above pond bottom, during construction to allow for additional infiltration and settling.

* Contractor shall complete mass grading of the site prior to excavation and installation of the infiltration gallery.

Contractor shall pump pond as necessary, to protect infiltration gallery and dispose of water on-site in vegetative areas or city approved location.

PRIOR TO CONSTRUCTION, CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF ALL EXISTING UNDERGROUND UTILITIES.

APPROVED FOR CONSTRUCTION FOR THE CITY OF LACEY

BY: [signature] DATE: 10/8/04

DIRECTOR OF PUBLIC WORKS

Approval Expires Two Years from Above Date

THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL EXISTING UTILITIES. THE CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION BY CALLING THE UNDERGROUND LOCATE LINE AT 1-800-424-5555 A MINIMUM OF 48 HOURS PRIOR TO ANY EXCAVATION.

R#	DATE	DESCRIPTION	BY
1	2/26/04	REVISIONS PER CITY COMMENTS	CMC
2	7/22/04	REVISIONS PER CITY COMMENTS	CMC
3	9/15/04	REVISIONS PER CITY COMMENTS	CMC
4	9/28/04	REVISIONS PER CITY COMMENTS	CMC

JOSEPH M. SMEBY, PROFESSIONAL ENGINEER

EXPIRES 6/04/05

NOTES

PATRICK HARRON & ASSOCIATES, LLC

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Seattle, WA 98168
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F 206.674.4660

PROJ. NO: 02508	DSN. BY: JMS
DWN. BY: CMC	CHK. BY: JMS

MERIDIAN GROUP I STORM POND

LACEY, THURSTON COUNTY, WASHINGTON
PORTION OF SECTION 2, TOWNSHIP 18 NORTH, RANGE 1 WEST, W.M.

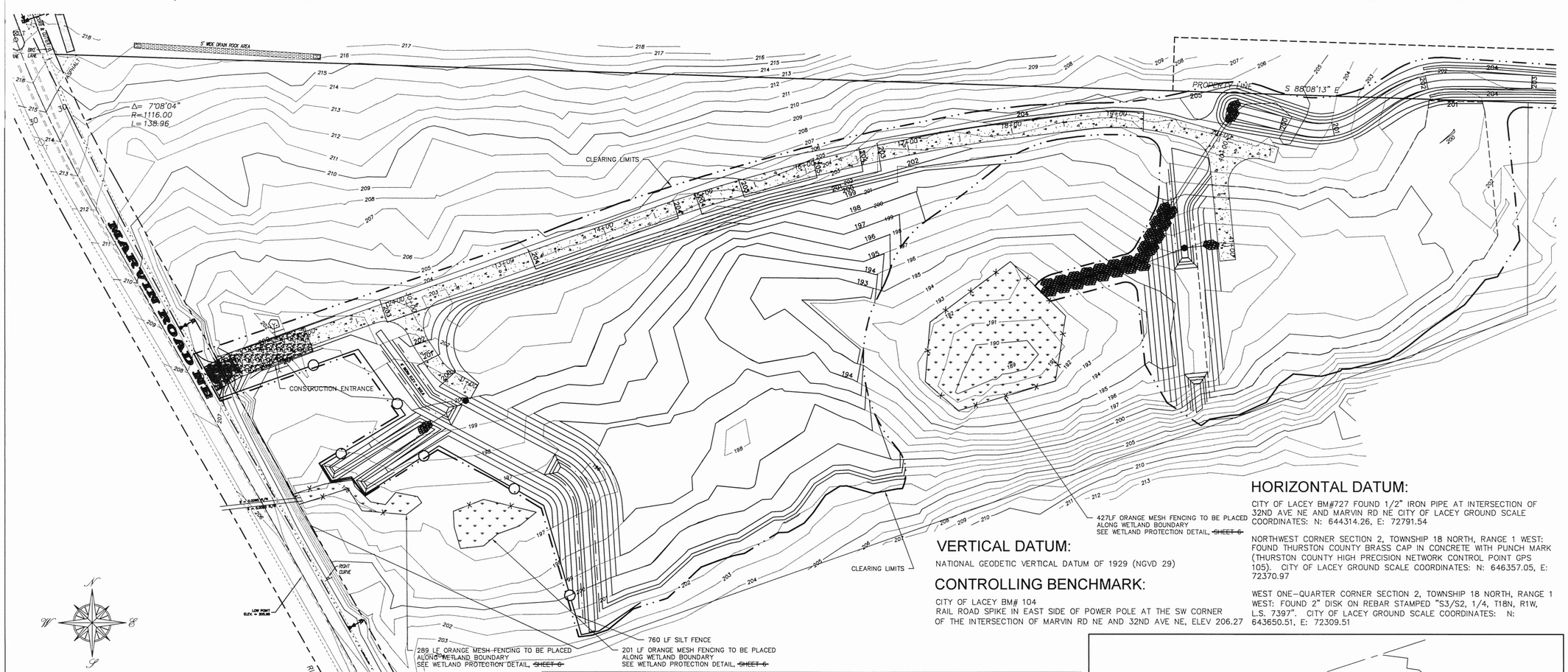
DATE: 9/04

SCALE: NONE

DRAWING NO. 2 OF 6

D-05-18/3

MERIDIAN GROUP I - STORM POND



VERTICAL DATUM:

NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29)

CONTROLLING BENCHMARK:

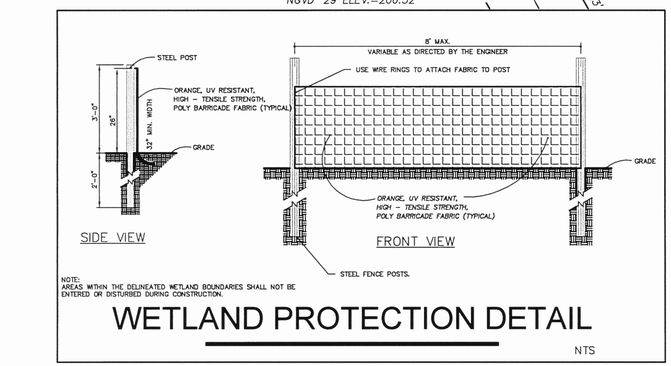
CITY OF LACEY BM# 104
RAIL ROAD SPIKE IN EAST SIDE OF POWER POLE AT THE SW CORNER OF THE INTERSECTION OF MARVIN RD NE AND 32ND AVE NE, ELEV 206.27

HORIZONTAL DATUM:

CITY OF LACEY BM#727 FOUND 1/2" IRON PIPE AT INTERSECTION OF 32ND AVE NE AND MARVIN RD NE CITY OF LACEY GROUND SCALE COORDINATES: N: 644314.26, E: 72791.54

NORTHWEST CORNER SECTION 2, TOWNSHIP 18 NORTH, RANGE 1 WEST: FOUND THURSTON COUNTY BRASS CAP IN CONCRETE WITH PUNCH MARK (THURSTON COUNTY HIGH PRECISION NETWORK CONTROL POINT GPS 105). CITY OF LACEY GROUND SCALE COORDINATES: N: 646357.05, E: 72370.97

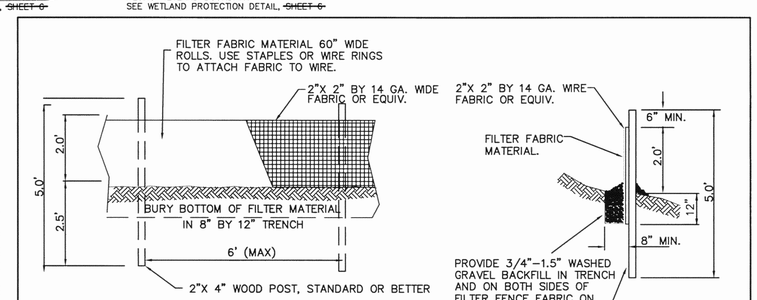
WEST ONE-QUARTER CORNER SECTION 2, TOWNSHIP 18 NORTH, RANGE 1 WEST: FOUND 2" DISK ON REBAR STAMPED "S3/S2, 1/4, T18N, R1W, L.S. 7397". CITY OF LACEY GROUND SCALE COORDINATES: N: 643650.51, E: 72309.51



NOTE:
AREAS WITHIN THE DELINEATED WETLAND BOUNDARIES SHALL NOT BE ENTERED OR DISTURBED DURING CONSTRUCTION.

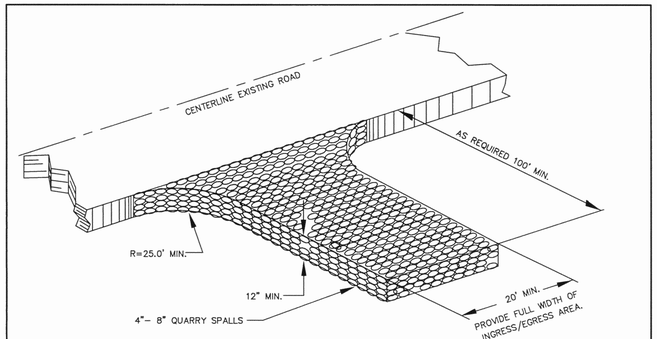
WETLAND PROTECTION DETAIL

NTS



SILT FENCE DETAIL

NTS



STABILIZED CONSTRUCTION ENTRANCE

N.T.S.

SEE SHEET 2 FOR EROSION CONTROL NOTES

PRIOR TO CONSTRUCTION, CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF ALL EXISTING UNDERGROUND UTILITIES.

THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL EXISTING UTILITIES. THE CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION BY CALLING THE UNDERGROUND LOCATE LINE AT 1-800-424-5555 A MINIMUM OF 48 HOURS PRIOR TO ANY EXCAVATION.

APPROVED FOR CONSTRUCTION FOR THE CITY OF LACEY

BY: _____ DATE: 10/8/04

DIRECTOR OF PUBLIC WORKS

Approval Expires Two Years from Above Date

R#	DATE	DESCRIPTION	BY
1	6/26/04	REVISIONS PER CITY COMMENTS	CMC
2	7/22/04	REVISIONS PER CITY COMMENTS	CMC
3	9/15/04	REVISIONS PER CITY COMMENTS	CMC
4	9/28/04	REVISIONS PER CITY COMMENTS	CMC

JOSEPH M. SMEBY — REGISTERED PROFESSIONAL ENGINEER — EXPIRES 6/7/04

ESC PLAN

PATRICK HARRON & ASSOCIATES, LLC

Patrick Harron & Associates, LLC
Engineering
Planning
14900 Interurban Ave. S.
Suite Number 279
Seattle, WA 98168
T 206.674.4659
F 206.674.4660

PROJ. NO.	DSN. BY:
02508	JMS
DWN. BY:	CHK. BY:
CMC	JMS

MERIDIAN GROUP I
STORM POND
LACEY, THURSTON COUNTY, WASHINGTON
PORTION OF SECTION 2, TOWNSHIP 18 NORTH, RANGE 1 WEST, W.M.

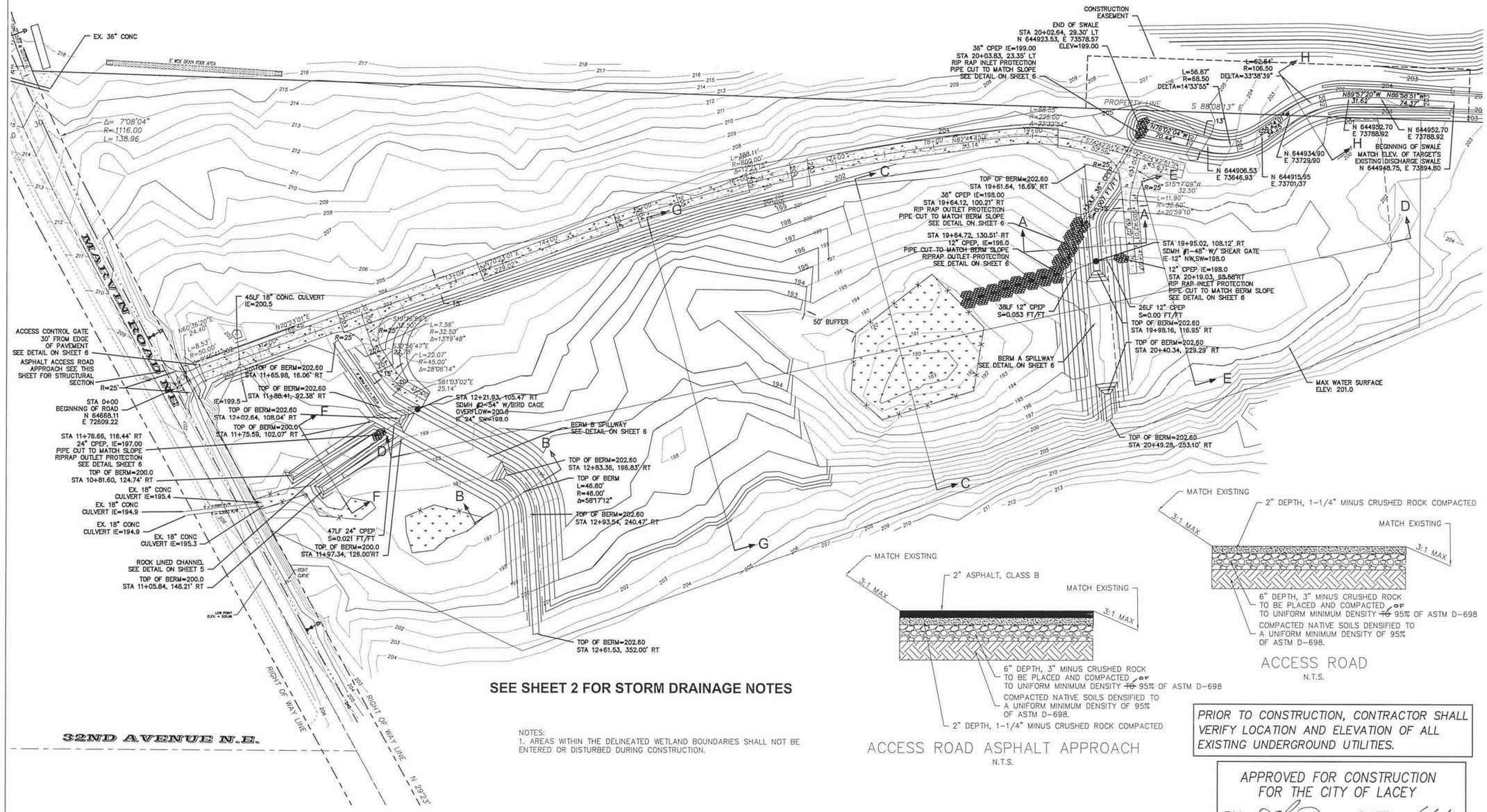
DATE: 9/04

SCALE: 1" = 50'

DRAWING NO. 3 OF 6

D-05-18/4

MERIDIAN GROUP I - STORM POND



SEE SHEET 2 FOR STORM DRAINAGE NOTES

NOTES:
1. AREAS WITHIN THE DELINEATED WETLAND BOUNDARIES SHALL NOT BE ENTERED OR DISTURBED DURING CONSTRUCTION.

VERTICAL DATUM:

NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29)

CONTROLLING BENCHMARK:

CITY OF LACEY BM# 104
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HORIZONTAL DATUM:

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PRIOR TO CONSTRUCTION, CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF ALL EXISTING UNDERGROUND UTILITIES.

APPROVED FOR CONSTRUCTION FOR THE CITY OF LACEY
BY: _____ DATE: 10/6/04
DIRECTOR OF PUBLIC WORKS
Approval Expires Two Years from Above Date

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R#	DATE	DESCRIPTION	BY
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2	7/22/04	REVISIONS PER CITY COMMENTS	CMC
3	9/15/04	REVISIONS PER CITY COMMENTS	CMC
4	9/28/04	REVISIONS PER CITY COMMENTS	CMC

JOSEPH M. SMEBY — REGISTERED PROFESSIONAL ENGINEER — STATE OF WASHINGTON
EXPIRES 6/04

STORM DRAINAGE PLAN

PATRICK HARRON & ASSOCIATES, LLC

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PROJ NO	DSN BY
02508	JMS
DWN BY:	CHK BY:
CMC	JMS

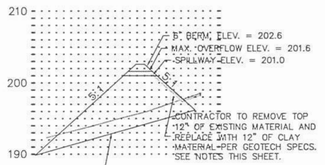
MERIDIAN GROUP I STORM POND

LACEY, THURSTON COUNTY, WASHINGTON
PORTION OF SECTION 2, TOWNSHIP 18 NORTH, RANGE 1 WEST, W.M.

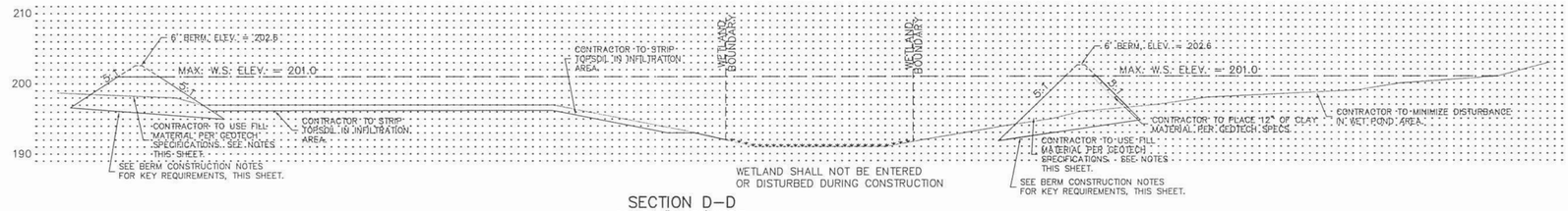
DATE: 9/04
SCALE: 1" = 50'
DRAWING NO. 4 OF 6

MERIDIAN GROUP I - STORM POND

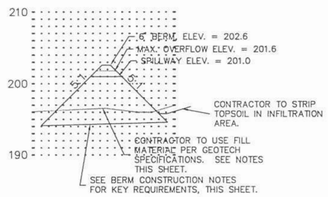
D-05-18/5



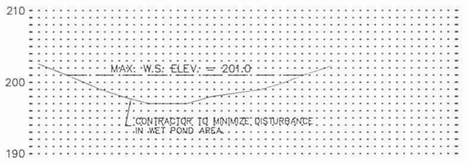
SECTION A–A
SCALE: 1" = 50' HORIZ.
= 10' VERT.



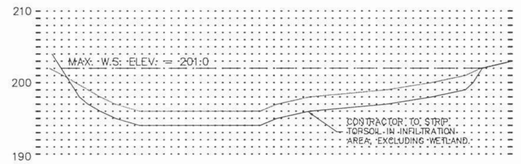
SECTION D–D
SCALE: 1" = 50' HORIZ.
= 10' VERT.



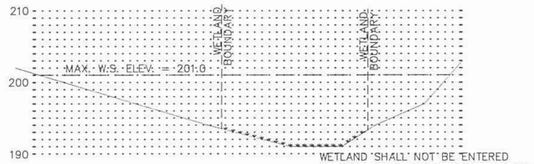
SECTION B–B
SCALE: 1" = 50' HORIZ.
= 10' VERT.



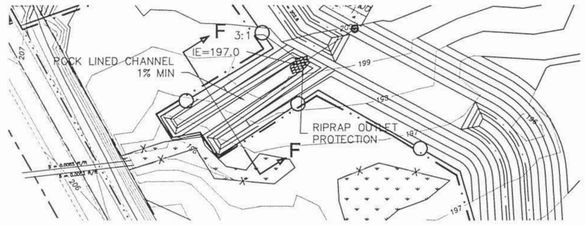
SECTION E–E
SCALE: 1" = 50' HORIZ.
= 10' VERT.



SECTION G–G
SCALE: 1" = 50' HORIZ.
= 10' VERT.



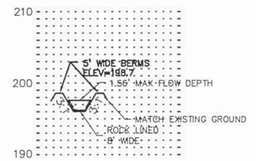
SECTION C–C
SCALE: 1" = 50' HORIZ.
= 10' VERT.



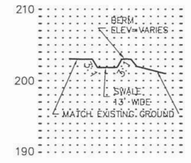
ROCK LINED CHANNEL DETAIL
SCALE: 1" = 50' HORIZ.

ROCK LINING SHALL BE QUARRY SPALLS WITH GRADATION AS FOLLOWS:
PASSING 8 INCH SQUARE SIEVE: 100%
PASSING 3 INCH SWUARE SIEVE: 0%

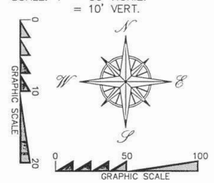
RIPRAP SHALL BE REASONABLY WELL GRADED WITH GRADATION AS FOLLOWS:
MAXIMUM STONE SIZE: 24 INCHES (NOMINAL DIAMETER)
MEDIAN STONE SIZE: 16 INCHES
MINIMUM STONE SIZE: 4 INCHES



SECTION F–F
SCALE: 1" = 50' HORIZ.
= 10' VERT.



SECTION H–H
SCALE: 1" = 50' HORIZ.
= 10' VERT.



RECOMMENDED GRADING SPECIFICATIONS:

IN AREAS UNDER STRUCTURES, PAVING SECTIONS, AND SIDEWALKS, STRIP ALL TOPSOIL AND ORGANIC MATERIAL. FOR STRUCTURAL FILL IN AREAS UNDER FOOTINGS AND SLABS ON GRADE, THE GEOTECH RECOMMENDS THAT ALL SOILS BE COMPACTED TO A MINIMUM DENSITY OF 95% OF ASTM D–1557. THIS INCLUDES PROOF–ROLLING NATIVE SOILS EXPOSED IN THE BOTTOM OF THE EXCAVATION PRIOR TO PLACEMENT OF FILL. MATERIALS UNDER THE PAVING SECTION SHOULD ALSO BE COMPACTED TO THE MINIMUM DENSITY BY PROOF–ROLLING PRIOR TO PLACEMENT OF THE PAVING SECTION. THIS INCLUDES PROOF–ROLLING IN–PLACE SOILS, SOILS THAT HAVE BEEN DISTURBED DURING CONSTRUCTION, AND ALL STRUCTURAL FILL MATERIALS.

FOR IMPORTED STRUCTURAL FILL, THE GEOTECH RECOMMENDS THAT A CLEAN, SIX–INCH MINUS, WELL GRADED GRAVEL OR GRAVELLY SAND (CLASSIFYING AS GW OR SW AS DETERMINED BY ASNI/ASTM TEST METHOD D–2487) BE USED. ON SITE MATERIAL PROPOSED FOR USE TO CONSTRUCT STRUCTURAL FILL SECTION WILL REQUIRE THE APPROVAL BY THE SOILS ENGINEER OR ENGINEERING GEOLOGIST PRIOR TO PLACEMENT. THE GEOTECH ALSO RECOMMENDS THAT NO MORE THEN 7% BY WEIGHT PASS THE #200 SCREEN AS TESTED BY ANSI/ASTM D–1140 TEST PROCEDURE. OTHER MATERIAL MAY BE SUBSTITUTED WITH PRIOR WRITTEN APPROVAL FOR USE BY SOILS ENGINEER OR ENGINEERING GEOLOGIST.

ALL FILL SHOULD BE PLACED IN UNIFORM HORIZONTAL LIFTS OF SIX TO EIGHT INCHES LOOSE THICKNESS, CONDITIONED TO THE OPTIMUM MOISTURE CONTENT, AND COMPACTED TO THE SPECIFIED MINIMUM DENSITY BEFORE PLACING THE NEXT LIFT. IT IS THE CONTRACTOR'S RESPONSIBILITY TO ENSURE THAT SUFFICIENT DENSITY TESTS OR FIELD VERIFICATION OF THE FILL HAS BEEN PERFORMED TO ENSURE THAT THAT REQUIRED MINIMUM DENSITY HAS BEEN UNIFORMLY ACHIEVED PRIOR TO PLACEMENT OF ADDITIONAL STRUCTURAL FILL MATERIAL. THE GEOTECH FURTHER RECOMMENDS THAT ALL UTILITY TRENCH BACKFILL BE COMPACTED AS SPECIFIED ABOVE. EARTHWORK SHOULD BE PERFORMED BY AN APPROVED TESTING LABORATORY UNDER THE SUPERVISION OF BRADLEY–NOBLE TO ENSURE COMPLIANCE WITH THE COMPACTION REQUIREMENTS.

PLACEMENT OF FILL SECTIONS ON SLOPES GREATER THEN 4:1 (HORIZONTAL TO VERTICAL) WILL BE BENCHED AS DIRECTED INTO NATIVE SOILS. HEIGHT AND WIDTH OF THE BENCH WILL BE DETERMINED IN THE FIELD BY THE SOILS ENGINEER OR ENGINEERING GEOLOGIST.

UNRESTRICTED SLOPES SHALL NOT EXCEED 2:1 (HORIZONTAL TO VERTICAL) FOR FILL EMBANKMENTS AND CUTS THAT EXPOSE NATIVE SOILS WITHOUT WRITTEN APPROVAL BY BRADLEY–NOBLE GEOTECHNICAL SERVICES. ALL FILL SLOPES WILL BE ROLLED. THE PROJECT'S CIVIL ENGINEER IS RESPONSIBLE FOR THE PROTECTION OF THE CONSTRUCTED FILL SLOPES FROM UNCOLLECTED RUNOFF. ALL FILL SLOPES WILL BE COMPACTED BY TRACT ROLLING OR OTHER APPROVED METHODS TO DENSIFY THE SURFACE OF THE FILL SLOPE. THE GEOTECH RECOMMENDS THAT ALL CUT AND FILL SLOPES BE SEEDED AS SOON AS POSSIBLE AFTER CONSTRUCTION TO ALLOW THE ESTABLISHMENT OF VEGETATION TO PROTECT THE SLOPE FROM SHEET WASHING.

PLACEMENT OF FILL WILL BE SUSPENDED DURING PERIODS OF UNFAVORABLE WEATHER. NO FILL IS TO BE PLACED WHILE THE FILL IS FROZEN OR THAWING. WHEN WORK IS STOPPED BY RAIN, THE PLACEMENT OF FILL WILL NOT RESUME UNTIL THE SOILS ENGINEER OR ENGINEERING GEOLOGIST DETERMINES THAT THE MOISTURE CONTENT IS SUITABLE FOR COMPACTIVE EFFORT AND THAT THE PREVIOUSLY PLACED FILL HAS NOT BEEN LOOSENED. THE CONTRACTOR WILL TAKE APPROPRIATE MEASURES DURING UNFAVORABLE WEATHER TO PROTECT THE FILL ALREADY IN PLACE. MEASURES THAT MAY BE REQUIRED INCLUDE THE LIMITING OF WHEELED TRAFFIC AND GRADING TO PROVIDE TEMPORARY DRAINAGE OF THE FILL. AT THE DIRECTION OF THE SOILS ENGINEER OR ENGINEERING GEOLOGIST, THE CONTRACTOR WILL BE RESPONSIBLE FOR THE REMOVAL OR REWORKING OF FILL THAT HAS SOFTENED TO LESS THEN THE REQUIRED COMPACTION.

BERM CONSTRUCTION NOTES:

PLACEMENT AND COMPACTION OF THE BERMS WILL REQUIRE THAT THE MATERIAL BE COMPACTED TO A MINIMUM UNIFORM DENSITY OF 95% OF ASTM D–1557.

TO PREPARE THE BERM SITES FOR CONSTRUCTION, ALL ORGANIC MATERIAL AND TOPSOIL MUST BE REMOVED. THE EXPOSED MINERAL SOIL IS TO BE COMPACTED TO THE ABOVE MINIMUM DENSITY. THIS MAY REQUIRE SCARIFICATION OF THE SURFACE OF THE SOILS AND CONDITIONING THESE SOILS WITH WATER TO THE OPTIMUM MOISTURE CONTENT PRIOR TO PROOF–ROLLING.

TO CONSTRUCT THE KEY FOR THE BERMS INTO THE NATIVE DENSIFIED SOILS, THE GEOTECH RECOMMENDS A MINIMUM KEY DEPTH OF TWO FEET AND A WIDTH OF A DOZER BLADE. SOILS EXPOSED IN THE BOTTOM OF THE KEYWAY ARE TO BE COMPACTED AS SPECIFIED.

HORIZONTAL DATUM:

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NORTHWEST CORNER SECTION 2, TOWNSHIP 18 NORTH, RANGE 1 WEST: FOUND THURSTON COUNTY BRASS CAP IN CONCRETE WITH PUNCH MARK (THURSTON COUNTY HIGH PRECISION NETWORK CONTROL POINT GPS 105). CITY OF LACEY GROUND SCALE COORDINATES: N: 646357.05, E: 72370.97

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M. SMEBY JOSEPH REGISTERED PROFESSIONAL ENGINEER
EXPIRES 6/04/05

STORM DRAINAGE PROFILES

PATRICK HARRON & ASSOCIATES, LLC

Patrick Harron & Associates, LLC
Engineering Planning
14900 Interurban Ave. S.
Suite Number 279
Seattle, WA 98168
T 206.674.4659
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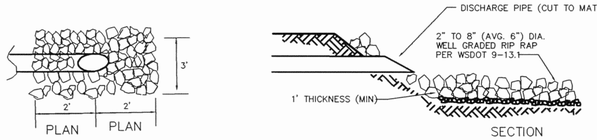
PROJ. NO.	DSN. BY:
02508	JMS
DWN. BY:	CHK. BY:
CMC	JMS

MERIDIAN GROUP I
STORM POND
LACEY, THURSTON COUNTY, WASHINGTON
PORTION OF SECTION 2, TOWNSHIP 18 NORTH, RANGE 1 WEST, W.M.

DATE: 9/04
SCALE: 1" = 50'
DRAWING NO. 5 OF 6

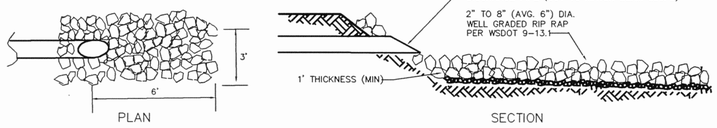
MERIDIAN GROUP I - STORM POND

D-05-18/6



RIP RAP INLET PROTECTION

N.T.S.



RIP RAP OUTLET PROTECTION

N.T.S.

VERTICAL DATUM:

NATIONAL GEODETIC VERTICAL DATUM OF 1929 (NGVD 29)

CONTROLLING BENCHMARK:

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NOTES:
1. SHEAR GATE SHALL BE MADE OF ALUMINUM ALLOY IN ACCORDANCE WITH ASTM B26M AND ASTM B 275 DESIGNATION ZG32A; OR CAST IRON IN ACCORDANCE WITH ASTM A 48, CLASS 30B.

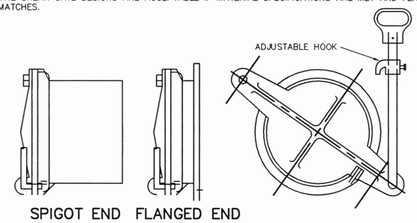
2. A NEOPRENE RUBBER GASKET IS REQUIRED BETWEEN THE MOUNTING FLANGE AND THE GATE FLANGE.

3. LIFT ROD SHALL BE MADE OF SIMILAR METAL TO THE GATE (TO PREVENT GALVANIC CORROSION), IT MAY BE OF SOLID ROD OR HOLLOW TUBING, WITH ADJUSTABLE HOOK AS REQUIRED.

4. THE MATING SURFACES OF THE LID AND THE BODY SHALL BE MACHINED FOR PROPER FIT. ALL SHEAR GATE BOLTS SHALL BE STAINLESS STEEL.

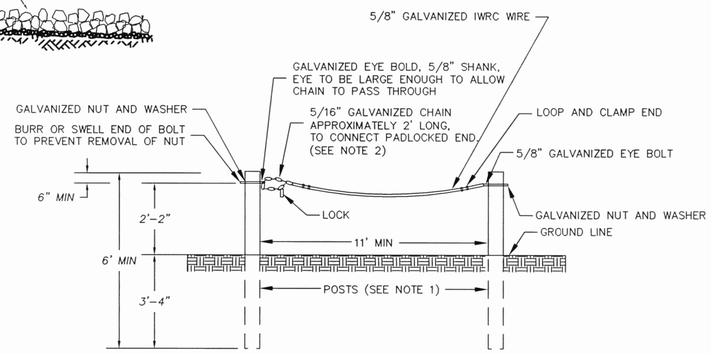
5. THE SHEAR GATE MAXIMUM OPENING SHALL BE CONTROLLED BY LIMITED HINGE MOVEMENT, A STOP TAB, OR SOME OTHER DEVICE.

6. ALTERNATE SHEAR GATE DESIGNS ARE ACCEPTABLE IF MATERIAL SPECIFICATIONS ARE MET AND FLANGE BOLT PATTERN MATCHES.



SHEAR GATE DETAIL

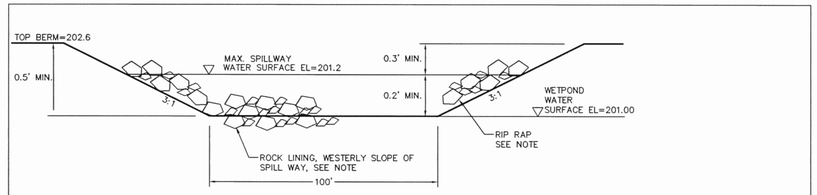
N.T.S.



NOTES:
1. POSTS SHALL BE 6x8 WOOD OR W6x9 STEEL. SEE STANDARD PLAN "BEAM GUARDRAIL POSTS AND BLOCKS".

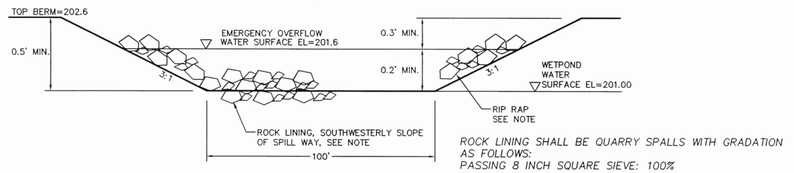
2. PADLOCKED END SHALL BE DETERMINED BY THE PROJECT ENGINEER. LOCK SHALL NOT BE PROVIDED.

ACCESS CONTROL GATE
WSDOT STD PLAN L-6



BERM A SPILLWAY

N.T.S.

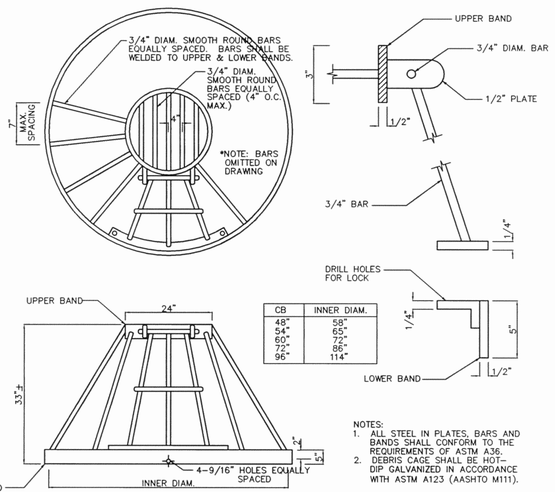


BERM B SPILLWAY

N.T.S.

ROCK LINING SHALL BE QUARRY SPALLS WITH GRADATION AS FOLLOWS:
PASSING 8 INCH SQUARE SIEVE: 100%
PASSING 3 INCH SQUARE SIEVE: 0%

RIPRAP SHALL BE REASONABLY WELL GRADED WITH GRADATION AS FOLLOWS:
MAXIMUM STONE SIZE: 24 INCHES (NOMINAL DIAMETER)
MEDIAN STONE SIZE: 16 INCHES
MINIMUM STONE SIZE: 4 INCHES

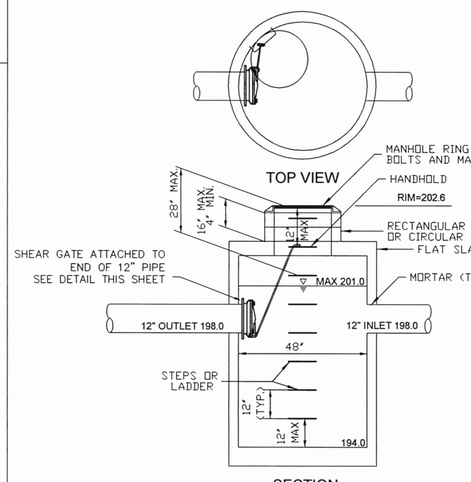


CB	INNER DIAM.
48"	58"
54"	65"
60"	72"
72"	86"
96"	114"

NOTES:
1. ALL STEEL IN PLATES, BARS AND BANDS SHALL CONFORM TO THE REQUIREMENTS OF ASTM A36.
2. DEBRIS CAGE SHALL BE HOT-DIP GALVANIZED IN ACCORDANCE WITH ASTM A123 (AASHTO M111).

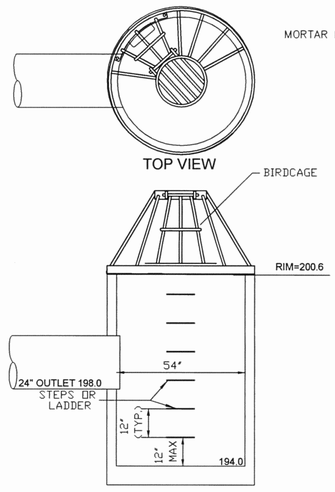
BIRDCAGE DETAIL

N.T.S.



SDMH #1 DETAIL

CATCH BASIN TYPE 2 N.T.S.
REF: WSDOT STANDARD PLAN B-1e

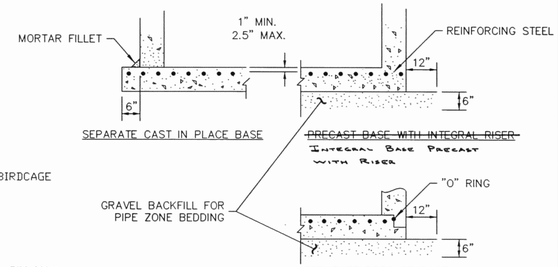


SDMH #2 DETAIL

CATCH BASIN TYPE 2 N.T.S.
REF: WSDOT STANDARD PLAN B-1e

NOTES:

1. No steps are required when height is 4' or less.
2. The bottom of the precast catch basin may be sloped to facilitate cleaning.
3. Frame and grate may be installed with flange down or cast into adjustment section.
4. Knockouts shall have a wall thickness of 2" minimum to 2.5" maximum. Provide a 1.5" minimum gap between the knockout wall and the outside of the pipe. After the pipe is installed, fill the gap with joint mortar in accordance with Std. Spec. 9-04.3.



BASE DETAIL

CATCH BASIN TYPE 2 N.T.S.

PRIOR TO CONSTRUCTION, CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF ALL EXISTING UNDERGROUND UTILITIES.

APPROVED FOR CONSTRUCTION FOR THE CITY OF LACEY
BY: _____ DATE: 9/8/04
DIRECTOR OF PUBLIC WORKS
Approval Expires Two Years from Above Date

THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL EXISTING UTILITIES. THE CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION BY CALLING THE UNDERGROUND LOCATE LINE AT 1-800-424-5555 A MINIMUM OF 48 HOURS PRIOR TO ANY EXCAVATION.

R#	DATE	DESCRIPTION	BY
1	2/26/04	REVISIONS PER CITY COMMENTS	CMC
2	7/22/04	REVISIONS PER CITY COMMENTS	CMC
3	9/15/04	REVISIONS PER CITY COMMENTS	CMC
4	9/28/04	REVISIONS PER CITY COMMENTS	CMC

EXPIRES 6/7/06

DETAILS

PATRICK HARRON & ASSOCIATES, LLC

Patrick Harron & Associates, LLC
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Planning
14900 Interurban Ave. S.
Suite Number 279
Seattle, WA 98168
T 206.674.4659
F 206.674.4660

PROJ. NO.	DSN. BY:
02508	JMS
DWN. BY:	CHK. BY:
CMC	JMS

MERIDIAN GROUP I STORM POND

LACEY, THURSTON COUNTY, WASHINGTON
PORTION OF SECTION 2, TOWNSHIP 18 NORTH, RANGE 1 WEST, W.M.

DATE: 9/04

SCALE: NONE

DRAWING NO. 6 OF 6

DRAINAGE IMPROVEMENTS

Downstream Analysis for Meridian Group 1 Storm Pond Improvements

Lacey, Washington

Prepared for:

Aho Construction
5512 NE 109TH Ct., Suite 101
Vancouver, WA 98662
(360) 254-0493

Prepared by:

Hopper Dennis Jellison, P.L.L.C.
314 W. 15th Street
Vancouver, WA 98660
(360) 695-3488

June 5, 2006

Table of Contents

Tables

Appendix

CERTIFICATE OF ENGINEER

Meridian Group 1 Storm Pond

Downstream Analysis

The technical information and data contained in this report was prepared under the direction and supervision of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

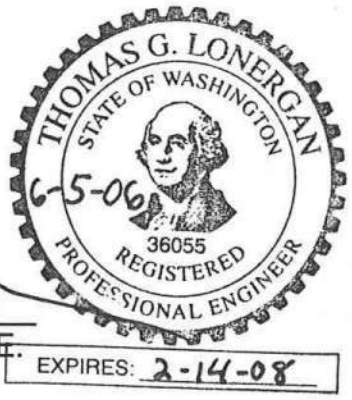
This document was:

Prepared by:

George M. Embleton

Approved by:

Thomas G. Lonergan, P.E.



EXPIRES: 2-14-08

Cursory Downstream Analysis (25-yr, 24-hr storm event) Downstream from Meridian Group 1 Storm Pond

Executive Summary

The analysis of the two conditions represented indicates that the proposed improvements at the Meridian Group 1 Storm Pond will lessen the flooding potential at the Mobile Home Park located downstream on the north side of 32nd Avenue NE.

Approach

The conveyance system was traversed from Marvin Road westerly to 32nd Avenue NE and then along 32nd Avenue NE to the outfall at Eagle Drive. The following observations and survey data was collected.

Summary of Field Observations and Survey Data

Location	Description	Remarks
NWP Driveway	12 inch CMP Culvert	Driveway is 3 to 3.5 feet above existing ground
NWP Pond	6 inch PVC pipe as outlet	Assume 2 feet of ponding depth in pond up to outlet invert. Appears that only impervious areas of site are piped to pond.
East Entrance drive to Mobile Home park	2-12 inch concrete culverts in concrete headwall	The elevation difference from the culvert inverts to the low point in the drive is 0.97 feet (i.e., backwater (flooding) occurs at about 1.0 feet above driveway culvert inverts).
West Entrance drive to Mobile Home park	2-12 inch concrete culverts	The elevation difference from the culvert inverts to the low point in the drive is 1.58 feet (i.e., backwater (flooding) occurs at about 1.65 feet above driveway culvert inverts).
Approximately 550 feet westerly	18 inch ADS culvert	Existing ground is at top of 18 inch culvert (i.e, overflow can occur at about 1.67 ft depth).
At 311 LF west, then 301 LF west, and then 220 LF west	18 inch ADS pipe extending from CB to CB to CB at low point in street (Eagle Drive)	Found small branches wrapping from pipe in to pipe out in CB at Eagle drive (approx. 90 degree turn).

Assumptions

The analysis for Pre-development and Post-development generally use the same input information. Therefore, the results are relative and comparable. The following hydrology models were developed for comparison.

Pre-development Condition

- Present condition without Jay Lee being developed
- Assume no flow from the Meridian Group 1 Storm Pond located east of Marvin Road.
- Include only the area that naturally drains to the two 18 inch culverts at Marvin Road (area assumed from GIS contours).

Post-development Condition

- Present condition with Jay Lee and Rali May developed.
- That the remaining area east of Marvin Road is developed and the pond improvements in place (i.e., as presented in the Drainage Report for Meridian Group 1 Storm Pond Improvements).

Table 2
Summary for 25-yr, 24-hr Event Modeling

Pre Condition			Post Condition	
Location	**Inflow (cfs)**	**Depth**	**Inflow (cfs)**	**Depth**
NWP Driveway	3.69 HCAD Symbol 5P	1.33	7.27 HCAD Symbol 5P	3.62 ft (based on assumed overtopping elevation)
East Entrance	7.94 HCAD Symbol E	1.18*	7.51 HCAD Symbol E	1.05* (OK)
West Entrance	10.71 HCAD Symbol W	2.40*	7.90 HCAD Symbol W	1.66* (OK)
Location	**Flow in Culvert (cfs)**	**Over-topping Flow (cfs)**	**Flow in Culvert (cfs)**	**Overtopping Flow (cfs)**
18 inch ADS Piping	8.40 HCAD Symbol 1	9.67	8.18 HCAD Symbol 1	6.92

* Flooding at Mobile Home Park. The approximate flood levels start to occur at 1.0 and 1.65 feet respectively at these points.

Observations

Please note that Table 2 lists ponding depths at culvert entrances, but does not 'directly' evaluate actual flooding depths.

- As the culvert (restriction to flow) causes ponding the flooding spreads into the Mobile Home Park and floods across the entrance drive to the downstream (west) end of the culverts and rejoins the flow in the ditch to the west.
- Therefore, it was necessary to make some assumptions as to the elevation of this 'overtopping' of the entrance drive.
- The 'overtopping' was represented in the modeling by applying a weir condition to represent this condition.

The 'overtopping' of the entrance drive may cause some of or all of the flooding experienced in the mobile Home Park. This 'overtopping' would cause flow from the of the entrance drive to 'back up' in the gutter section. The gutter section is minimal and likely allows 'spill-over' to the adjacent lots. Some of these lots appear low and may receive most of the runoff as flow passes from lot to lot, accumulating in low areas.

The culvert crossing at the NWP driveway is acting as a small 'dam' and apparently was 'overtopped this past winter. There appeared to be survey flagging in the area to the east (south side of flow path) along 32nd Ave NE. Any filling in this area would reduce storage attenuation benefits.

Conclusions

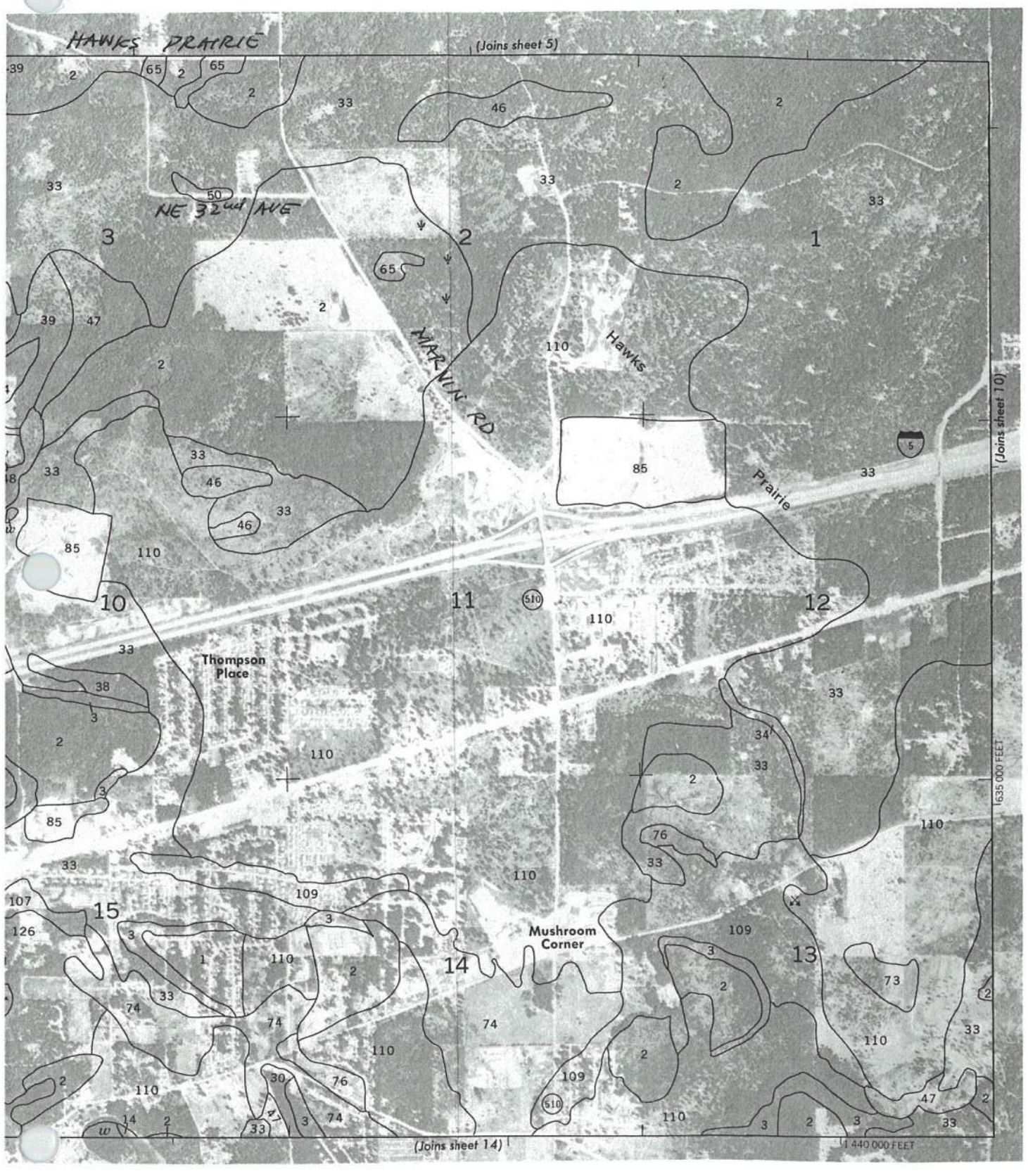
By directing runoff from Rali May to the Meridian Group 1 Storm Pond (with the proposed improvements), some improvement in the downstream condition is realized. → QUANTIFY?

An inlet and culvert could be added at each entrance to the Mobile Home Park to direct that portion of the runoff to the downstream end of the culvert system. This relieves the 'input' at the upstream end and thus lowers the headwater elevation required to pass the incoming flow.

RECOMMENDED SIZE? OF CULVERT

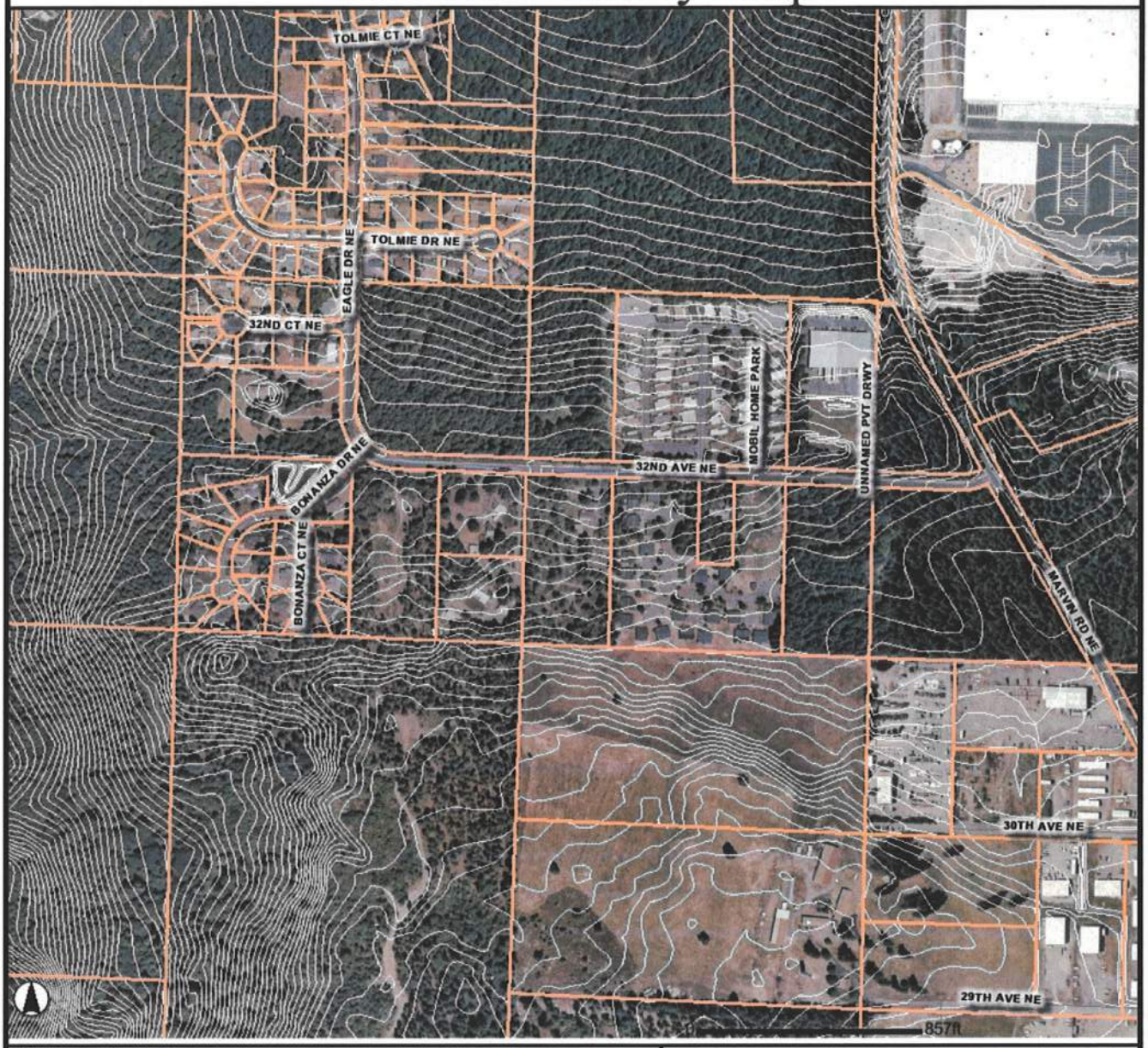
— SHEET NUMBER 9

9
N



1 2 MILES
2 KILOMETERS

Thurston County Map

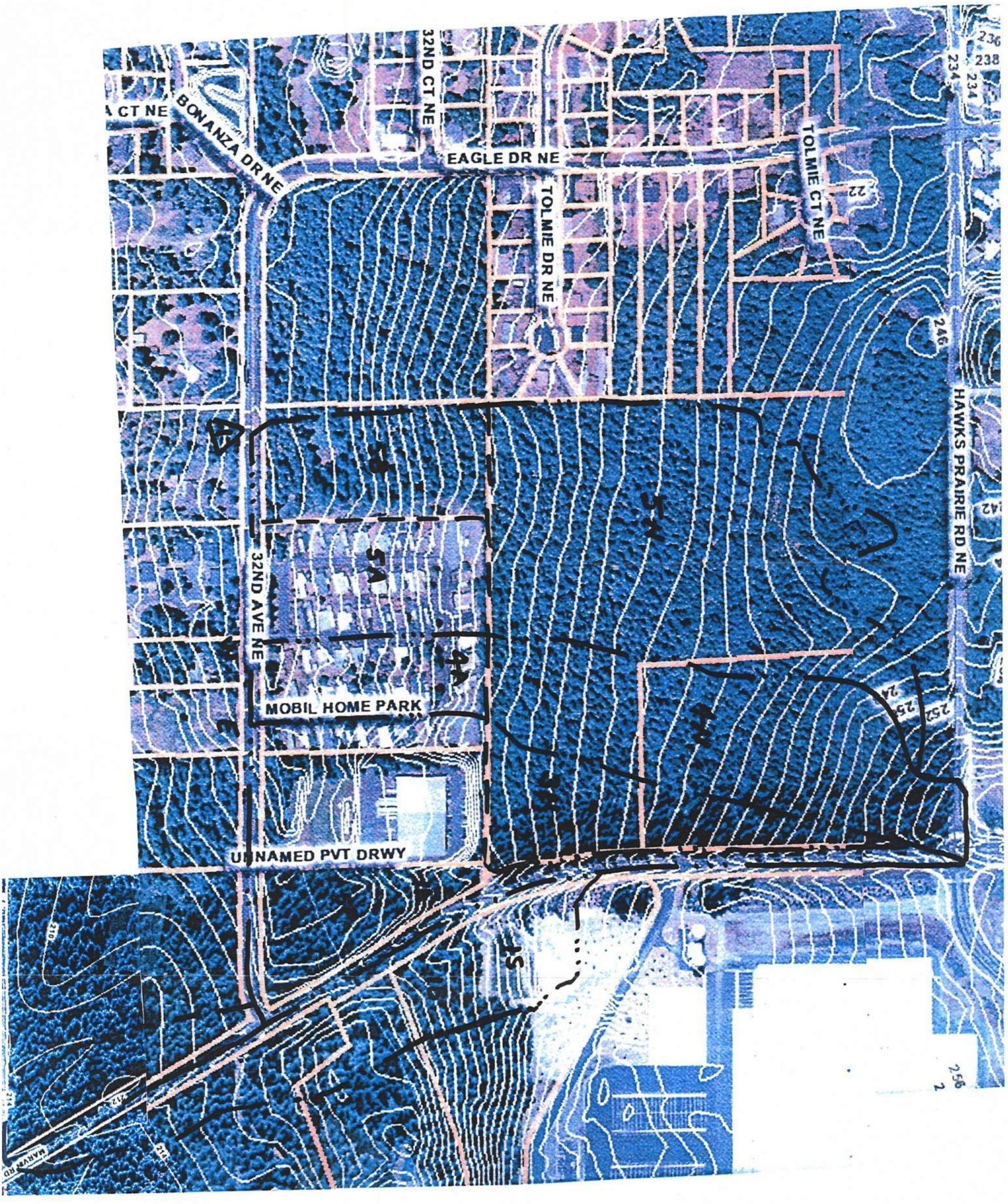


Thurston GeoData Center
© 2006 - Thurston County GeoData Center
2404 Heritage Court SW, 3rd Floor
Olympia, WA 98502-6031

LEGEND

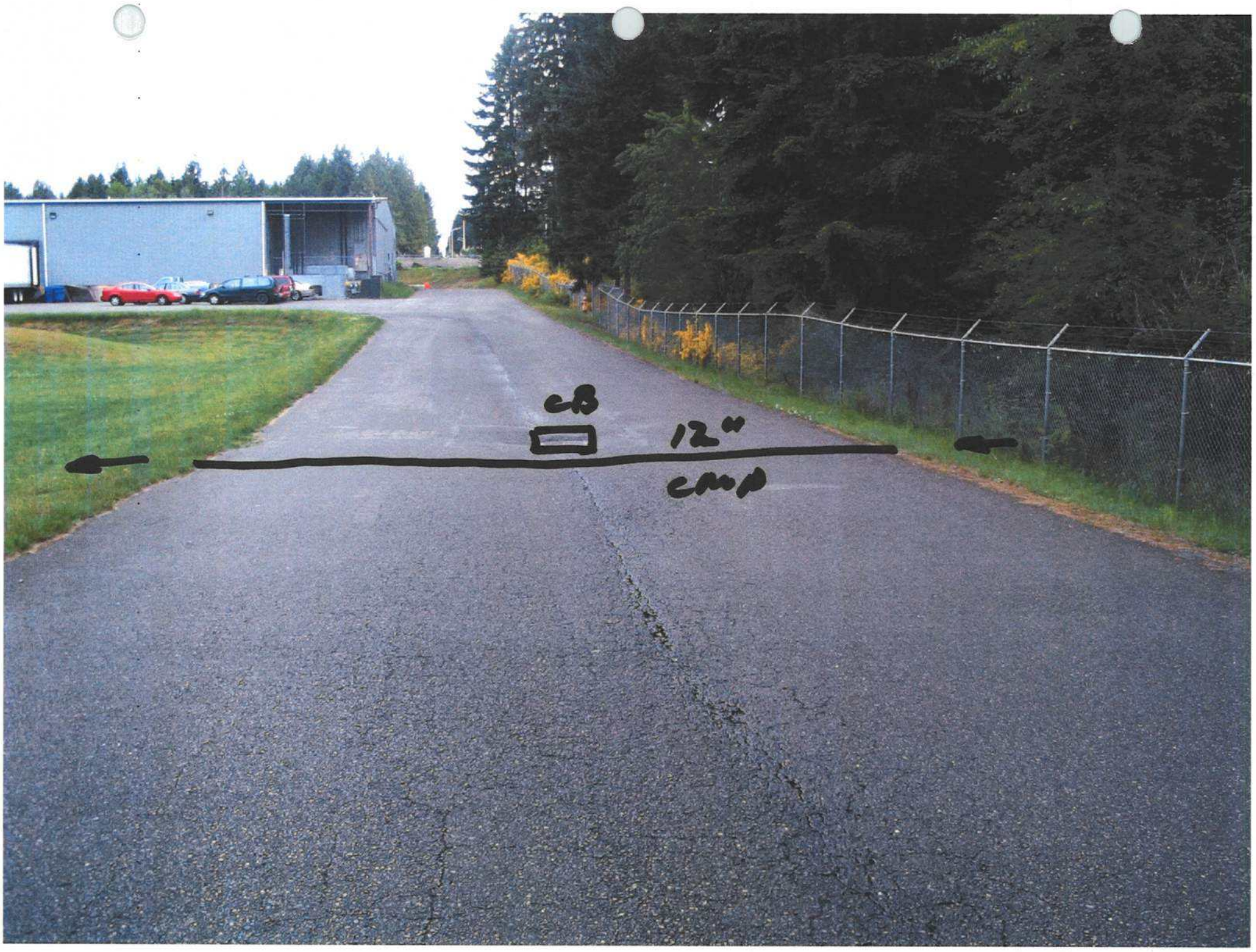
- Major Roads
- Roads
- Streams
- Contours
- Wetlands
- Wetland Buffers
- Flood Zones
- Water Bodies
- Zoning
- Cities
- Parcels


OWL LN NE
UNNAMED PVT DRWY
HAWKS PRAIRIE RD NE
MARVIN RD NE
TOLMIE DR NE
MOBIL HOME PARK


BONANZA DR NE
32ND CT NE
EAGLE DR NE
TOLMIE DR NE
TOLMIE CT NE
234
238
246
HAWKS PRAIRIE RD NE
32ND AVE NE
MOBIL HOME PARK
UNNAMED PVT DRWY
MARVIN RD
210
212
214


OUTLET END 18" CULVERTS AT MARVIN


CB
12" CMP
NWP
DRIVE


CB
12"
CMP

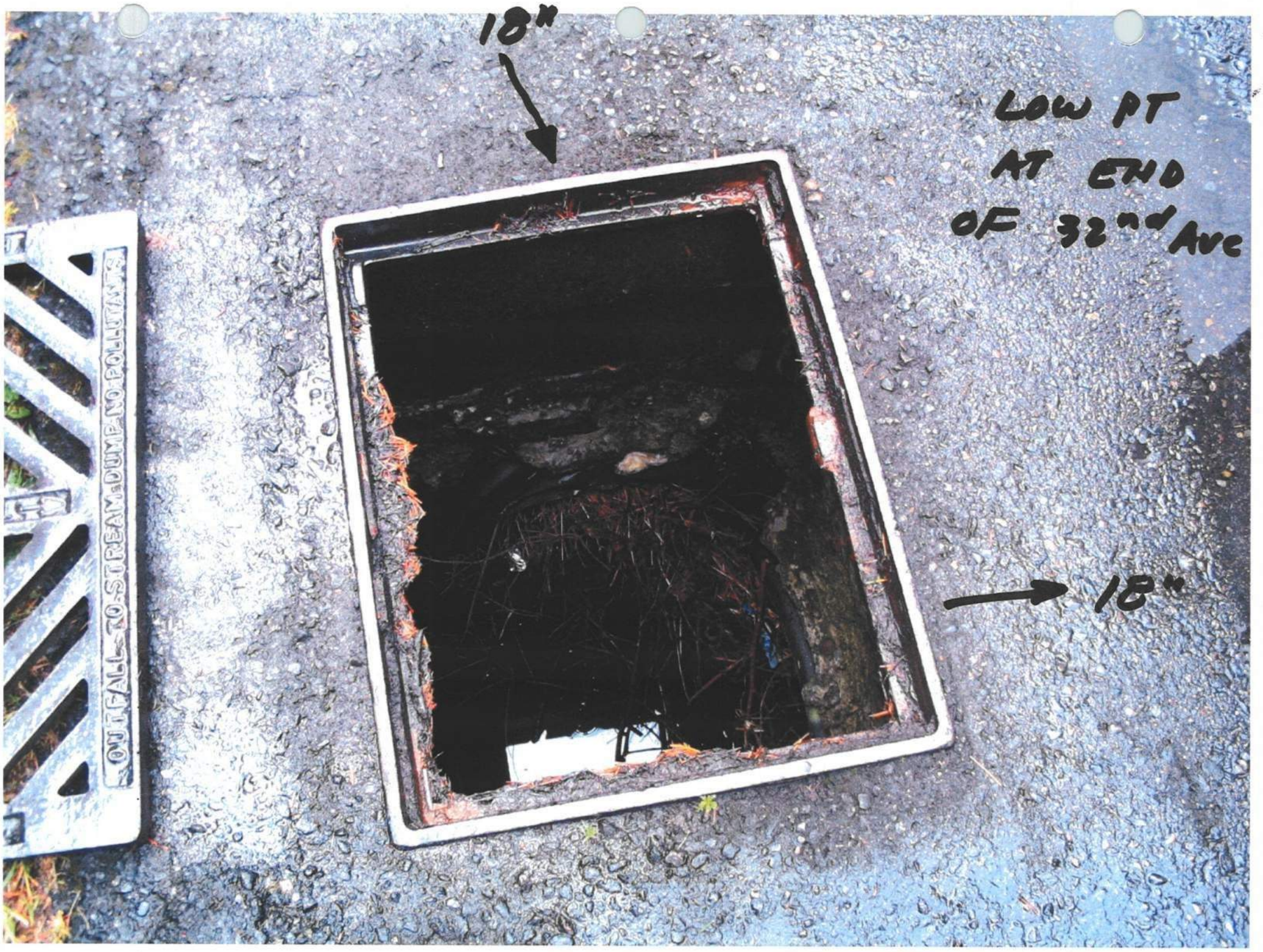

POND
NWP DRIVE
CB TO POND
12" CMP


POND
NWP


EAST ENTRANCE


WEST
ENTRANCE
PRIVATE
KEEP


START
18" RCP


18"
LOW PT
AT END
OF 32nd Ave
18"
TO STREAM. DUMP NO POLLUTANTS
OUTFALL


18" OUTFA

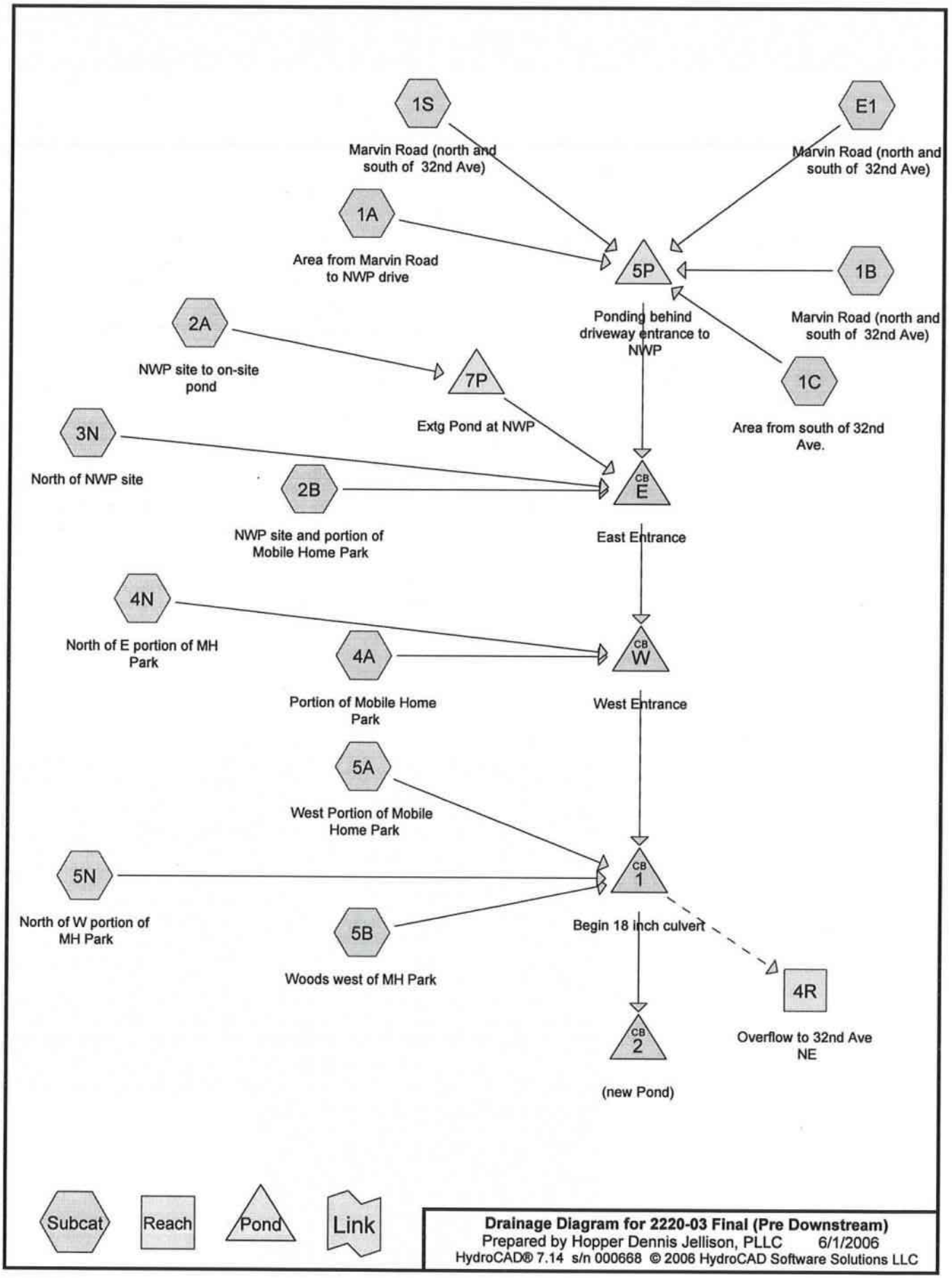
Pre-development Condition

Assumptions:

- Present condition without Jay Lee being developed
- Assume no flow from the Meridian Group 1 Storm Pond located east of Marvin Road.
- Include only the area that naturally drains to the two 18 inch culverts at Marvin Road (area assumed from GIS contours).

Notes:

1. The invert elevations for the culverts at the Mobile Home ParK and 18 inch ADS piping are based on an assumed elevation.
2. Elevations at the driveway to NWP were estimated from GIS contour information.
3. Routing at the NWP pond is an estimate only (i.e, the size of the pond, the pipe invert elevations, and the top of bank were not determined.



Drainage Diagram for 2220-03 Final (Pre Downstream)
Prepared by Hopper Dennis Jellison, PLLC 6/1/2006

Area Listing (selected nodes)

Area (acres)	CN	Description (subcats)
42.280	64	Woods (1A,1C,2B,4N,5B,5N)
8.630	64	Woods (north and south) (1S)
15.510	76	Woods (3N,3N)
1.770	80	Lawn (2B)
11.210	88	Composite for MH Park (2B,4A,5A)
0.100	98	32nd NE (1B)
0.980	98	Road (north) (1B,E1)
0.360	98	Road (south) (1B,E1)
2.330	98	Roof and pavement (2A)
83.170		

Time span=0.00-90.00 hrs, dt=0.25 hrs, 361 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: Area from Marvin Road to NWP drive Runoff Area=4.400 ac Runoff Depth=1.65"
Flow Length=300' Tc=105.4 min CN=64 Runoff=0.67 cfs 0.603 af

Subcatchment 1B: Marvin Road (north and south of 32nd Ave Runoff Area=0.770 ac Runoff Depth=4.86"
Tc=10.0 min CN=98 Runoff=1.11 cfs 0.312 af

Subcatchment 1C: Area from south of 32nd Ave. Runoff Area=2.540 ac Runoff Depth=1.65"
Tc=20.0 min CN=64 Runoff=0.88 cfs 0.348 af

Subcatchment 1S: Marvin Road (north and south of 32nd Ave Runoff Area=8.630 ac Runoff Depth=1.65"
Tc=60.0 min CN=64 Runoff=1.83 cfs 1.184 af

Subcatchment 2A: NWP site to on-site pond Runoff Area=2.330 ac Runoff Depth=4.86"
Tc=10.0 min CN=98 Runoff=3.35 cfs 0.944 af

Subcatchment 2B: NWP site and portion of Mobile Home Park Runoff Area=5.110 ac Runoff Depth=2.80"
Tc=30.0 min CN=78 Runoff=3.38 cfs 1.191 af

Subcatchment 3N: North of NWP site Runoff Area=15.510 ac Runoff Depth=2.62"
Flow Length=1,200' Slope=0.0280 '/' Tc=99.1 min CN=76 Runoff=5.21 cfs 3.384 af

Subcatchment 4A: Portion of Mobile Home Park Runoff Area=3.690 ac Runoff Depth=3.76"
Tc=15.0 min CN=88 Runoff=4.42 cfs 1.157 af

Subcatchment 4N: North of E portion of MH Park Runoff Area=10.590 ac Runoff Depth=1.65"
Flow Length=1,200' Slope=0.0280 '/' Tc=99.1 min CN=64 Runoff=1.67 cfs 1.453 af

Subcatchment 5A: West Portion of Mobile Home Park Runoff Area=5.680 ac Runoff Depth=3.76"
Tc=15.0 min CN=88 Runoff=6.81 cfs 1.782 af

Subcatchment 5B: Woods west of MH Park Runoff Area=5.010 ac Runoff Depth=1.65"
Flow Length=680' Slope=0.0400 '/' Tc=85.6 min CN=64 Runoff=0.86 cfs 0.687 af

Subcatchment 5N: North of W portion of MH Park Runoff Area=18.240 ac Runoff Depth=1.65"
Flow Length=1,200' Slope=0.0280 '/' Tc=99.1 min CN=64 Runoff=2.88 cfs 2.502 af

Subcatchment E1: Marvin Road (north and south of 32nd Ave Runoff Area=0.670 ac Runoff Depth=4.86"
Tc=15.0 min CN=98 Runoff=0.99 cfs 0.272 af

Reach 4R: Overflow to 32nd Ave NE Inflow=9.67 cfs 3.538 af
Outflow=9.67 cfs 3.538 af

Pond 1: Begin 18 inch culvert Peak Elev=102.00' Inflow=18.07 cfs 15.430 af
Primary=8.40 cfs 11.892 af Secondary=9.67 cfs 3.538 af Outflow=18.07 cfs 15.430 af

Pond 2: (new Pond) Peak Elev=102.42' Inflow=8.40 cfs 11.892 af
18.0" x 301.0' Culvert Outflow=8.40 cfs 11.892 af

Pond 5P: Ponding behind driveway entran Peak Elev=197.33' Storage=19,572 cf Inflow=3.69 cfs 2.719 af
Primary=1.98 cfs 2.719 af Secondary=0.00 cfs 0.000 af Outflow=1.98 cfs 2.719 af

Pond 7P: Extg Pond at NWP Peak Elev=102.68' Storage=23,003 cf Inflow=3.35 cfs 0.944 af
6.0" x 12.0' Culvert Outflow=0.49 cfs 0.555 af

Pond E: East Entrance Peak Elev=107.96' Inflow=8.25 cfs 7.849 af
Primary=7.80 cfs 7.824 af Secondary=0.45 cfs 0.025 af Outflow=8.25 cfs 7.849 af

Pond W: West Entrance Peak Elev=106.39' Inflow=11.00 cfs 10.459 af
Primary=9.09 cfs 10.231 af Secondary=1.91 cfs 0.228 af Outflow=11.00 cfs 10.459 af

Total Runoff Area = 83.170 ac Runoff Volume = 15.819 af Average Runoff Depth = 2.28"
95.47% Pervious Area = 79.400 ac 4.53% Impervious Area = 3.770 ac

Subcatchment 1A: Area from Marvin Road to NWP drive

Runoff = 0.67 cfs @ 9.32 hrs, Volume= 0.603 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
4.400	64	Woods
4.400		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.7	200	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.80"
52.7	100	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.80"
105.4	300	Total			

Subcatchment 1B: Marvin Road (north and south of 32nd Ave)

Runoff = 1.11 cfs @ 7.89 hrs, Volume= 0.312 af, Depth= 4.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
0.490	98	Road (north)
0.180	98	Road (south)
0.100	98	32nd NE
0.770	98	Weighted Average
0.770		Impervious Area

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

Subcatchment 1C: Area from south of 32nd Ave.

Runoff = 0.88 cfs @ 8.05 hrs, Volume= 0.348 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
2.540	64	Woods
2.540		Pervious Area

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

Subcatchment 1S: Marvin Road (north and south of 32nd Ave)

Runoff = 1.83 cfs @ 8.58 hrs, Volume= 1.184 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
8.630	64	Woods (north and south)
8.630		Pervious Area

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

Subcatchment 2A: NWP site to on-site pond

Runoff = 3.35 cfs @ 7.89 hrs, Volume= 0.944 af, Depth= 4.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
2.330	98	Roof and pavement
2.330		Impervious Area

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

Subcatchment 2B: NWP site and portion of Mobile Home Park

Runoff = 3.38 cfs @ 8.17 hrs, Volume= 1.191 af, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
1.770	80	Lawn
1.500	64	Woods
1.840	88	Composite for MH Park
5.110	78	Weighted Average
5.110		Pervious Area

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

Subcatchment 3N: North of NWP site

Runoff = 5.21 cfs @ 9.06 hrs, Volume= 3.384 af, Depth= 2.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
4.910	76	Woods
10.600	76	Woods
15.510	76	Weighted Average
15.510		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
84.1	300	0.0280	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.80"
15.0	900		1.00		**Direct Entry, Assumed at 1 fps**
99.1	1,200	Total			

Subcatchment 4A: Portion of Mobile Home Park

Runoff = 4.42 cfs @ 7.97 hrs, Volume= 1.157 af, Depth= 3.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
3.690	88	Composite for MH Park
3.690		Pervious Area

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

Subcatchment 4N: North of E portion of MH Park

Runoff = 1.67 cfs @ 9.21 hrs, Volume= 1.453 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
10.590	64	Woods
10.590		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
84.1	300	0.0280	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.80"
15.0	900		1.00		**Direct Entry, Assumed at 1 fps**
99.1	1,200	Total			

Subcatchment 5A: West Portion of Mobile Home Park

Runoff = 6.81 cfs @ 7.97 hrs, Volume= 1.782 af, Depth= 3.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
5.680	88	Composite for MH Park
5.680		Pervious Area

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

Subcatchment 5B: Woods west of MH Park

Runoff = 0.86 cfs @ 8.97 hrs, Volume= 0.687 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
5.010	64	Woods
5.010		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
72.9	300	0.0400	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.80"
12.7	380	0.0400	0.50		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.6	680	Total			

Subcatchment 5N: North of W portion of MH Park

Runoff = 2.88 cfs @ 9.21 hrs, Volume= 2.502 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
18.240	64	Woods
18.240		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
84.1	300	0.0280	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.80"
15.0	900		1.00		**Direct Entry, Assumed at 1 fps**
99.1	1,200	Total			

Subcatchment E1: Marvin Road (north and south of 32nd Ave)

Runoff = 0.99 cfs @ 7.96 hrs, Volume= 0.272 af, Depth= 4.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
0.490	98	Road (north)
0.180	98	Road (south)
0.670	98	Weighted Average
0.670		Impervious Area

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

Reach 4R: Overflow to 32nd Ave NE

Inflow = 9.67 cfs @ 8.04 hrs, Volume= 3.538 af
Outflow = 9.67 cfs @ 8.04 hrs, Volume= 3.538 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs

Pond 1: Begin 18 inch culvert

Inflow Area = 83.170 ac, Inflow Depth = 2.23" for 25-yr event
Inflow = 18.07 cfs @ 8.04 hrs, Volume= 15.430 af
Outflow = 18.07 cfs @ 8.04 hrs, Volume= 15.430 af, Atten= 0%, Lag= 0.0 min
Primary = 8.40 cfs @ 8.04 hrs, Volume= 11.892 af
Secondary = 9.67 cfs @ 8.04 hrs, Volume= 3.538 af

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 102.00' @ 8.04 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	**18.0" x 311.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 98.17' S= 0.0059 '/' Cc= 0.900 n= 0.012
#2	Secondary	101.67'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir**

Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=8.35 cfs @ 8.04 hrs HW=101.99' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 8.35 cfs @ 4.72 fps)

Secondary OutFlow Max=9.05 cfs @ 8.04 hrs HW=101.99' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 9.05 cfs @ 1.43 fps)

Pond 2: (new Pond)

Inflow Area =	83.170 ac,	Inflow Depth =	1.72"	for	25-yr event	
Inflow =	8.40 cfs @	8.04 hrs,	Volume=		11.892 af	
Outflow =	8.40 cfs @	8.04 hrs,	Volume=		11.892 af,	Atten= 0%, Lag= 0.0 min
Primary =	8.40 cfs @	8.04 hrs,	Volume=		11.892 af	

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 102.42' @ 8.04 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.87'	**18.0" x 301.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 98.68' S= 0.0006 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=8.35 cfs @ 8.04 hrs HW=102.39' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 8.35 cfs @ 4.72 fps)

Pond 5P: Ponding behind driveway entrance to NWP

Inflow Area =	17.010 ac,	Inflow Depth =	1.92"	for	25-yr event	
Inflow =	3.69 cfs @	8.04 hrs,	Volume=		2.719 af	
Outflow =	1.98 cfs @	15.21 hrs,	Volume=		2.719 af,	Atten= 46%, Lag= 430.3 min
Primary =	1.98 cfs @	15.21 hrs,	Volume=		2.719 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=		0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 197.33' @ 15.21 hrs Surf.Area= 27,794 sf Storage= 19,572 cf

Plug-Flow detention time= 136.3 min calculated for 2.712 af (100% of inflow)
Center-of-Mass det. time= 138.2 min (987.0 - 848.8)

Volume	Invert	Avail.Storage	Storage Description
#1	196.00'	164,601 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	1,625	0	0
198.00	40,961	42,586	42,586
200.00	81,054	122,015	164,601

Device	Routing	Invert	Outlet Devices
#1	Primary	196.00'	**12.0" x 30.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 195.85' S= 0.0050 '/' Cc= 0.900 n= 0.024
#2	Secondary	199.50'	**20.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=1.96 cfs @ 15.21 hrs HW=197.33' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 1.96 cfs @ 2.50 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=196.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 7P: Extg Pond at NWP

Inflow Area =	2.330 ac,	Inflow Depth =	4.86"	for	25-yr event
Inflow =	3.35 cfs @	7.89 hrs,	Volume=	0.944 af	
Outflow =	0.49 cfs @	14.63 hrs,	Volume=	0.555 af,	Atten= 85%, Lag= 404.3 min
Primary =	0.49 cfs @	14.63 hrs,	Volume=	0.555 af	

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 102.68' @ 14.63 hrs Surf.Area= 9,137 sf Storage= 23,003 cf

Plug-Flow detention time= 661.5 min calculated for 0.555 af (59% of inflow)
Center-of-Mass det. time= 432.3 min (1,079.1 - 646.8)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	25,905 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	8,000	0	0
103.00	9,270	25,905	25,905

Device	Routing	Invert	Outlet Devices
#1	Primary	102.00'	**6.0" x 12.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 101.88' S= 0.0100 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=0.49 cfs @ 14.63 hrs HW=102.68' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.49 cfs @ 2.50 fps)

Pond E: East Entrance

Assumption: Excess flow crosses drive and re-joins flow in ditch. Assume about 2 inch depth to crown of road for overflow.

Inflow Area =	39.960 ac,	Inflow Depth =	2.36"	for	25-yr event
Inflow =	8.25 cfs @	9.12 hrs,	Volume=	7.849 af	
Outflow =	8.25 cfs @	9.12 hrs,	Volume=	7.849 af,	Atten= 0%, Lag= 0.0 min
Primary =	7.80 cfs @	9.12 hrs,	Volume=	7.824 af	
Secondary =	0.45 cfs @	9.12 hrs,	Volume=	0.025 af	

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 107.96' @ 9.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	106.78'	**12.0" x 40.0' long Culvert X 2.00** RCP, groove end w/headwall, Ke= 0.200 Outlet Invert= 106.05' S= 0.0183 '/' Cc= 0.900 n= 0.013
#2	Secondary	107.89'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=7.78 cfs @ 9.12 hrs HW=107.96' (Free Discharge)
1=Culvert (Inlet Controls 7.78 cfs @ 4.95 fps)

Secondary OutFlow Max=0.41 cfs @ 9.12 hrs HW=107.96' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 0.41 cfs @ 0.62 fps)

Pond W: West Entrance

Inflow Area =	54.240 ac,	Inflow Depth =	2.31"	for 25-yr event	
Inflow =	11.00 cfs @	9.16 hrs,	Volume=	10.459 af	
Outflow =	11.00 cfs @	9.16 hrs,	Volume=	10.459 af,	Atten= 0%, Lag= 0.0 min
Primary =	9.09 cfs @	9.16 hrs,	Volume=	10.231 af	
Secondary =	1.91 cfs @	9.16 hrs,	Volume=	0.228 af	

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 106.39' @ 9.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	104.48'	**12.0" x 40.0' long Culvert X 2.00** RCP, groove end w/headwall, Ke= 0.200 Outlet Invert= 104.11' S= 0.0093 '/' Cc= 0.900 n= 0.013
#2	Secondary	106.20'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=9.08 cfs @ 9.16 hrs HW=106.38' (Free Discharge)
1=Culvert (Barrel Controls 9.08 cfs @ 5.78 fps)

Secondary OutFlow Max=1.87 cfs @ 9.16 hrs HW=106.38' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 1.87 cfs @ 1.02 fps)

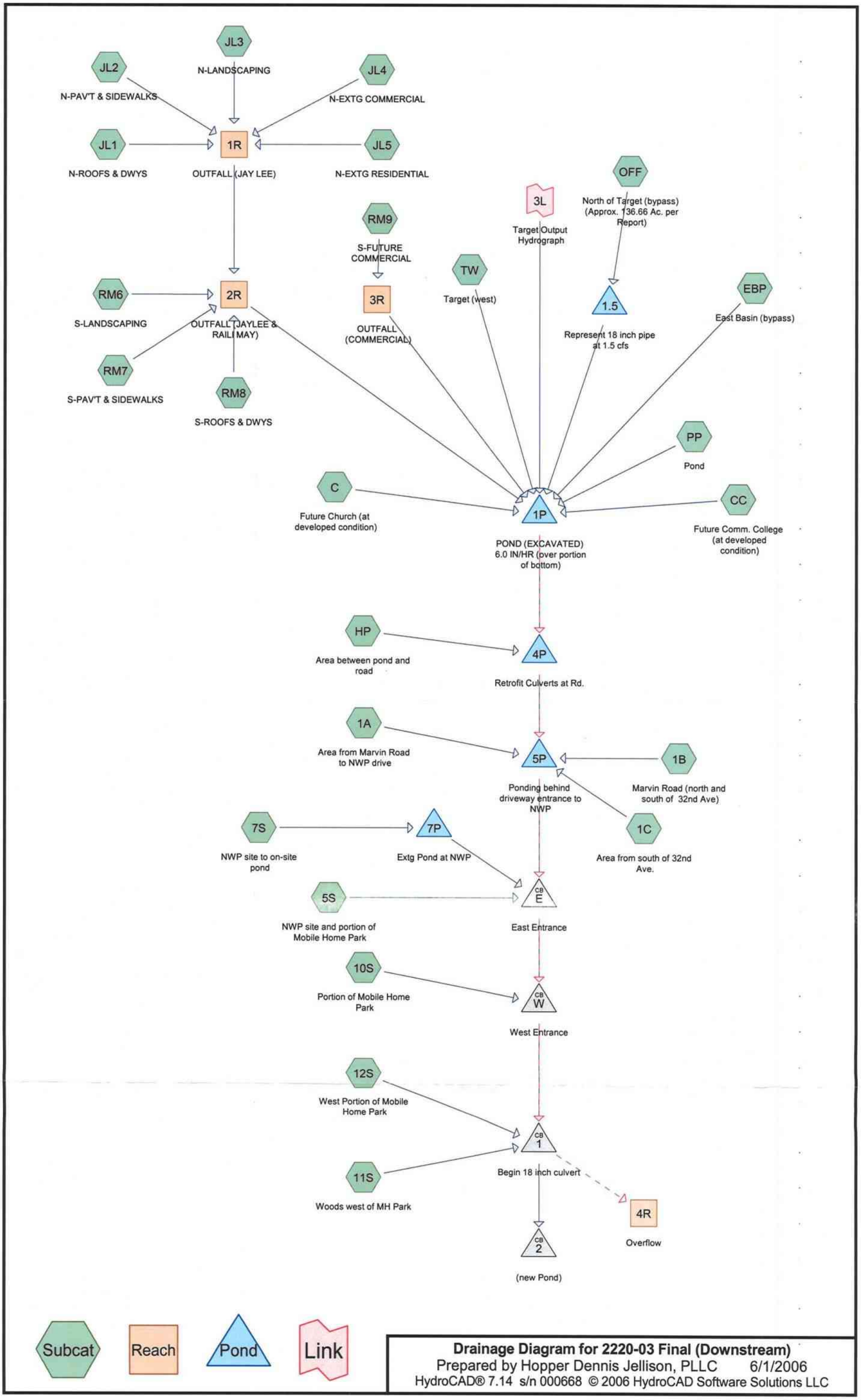
Post-development Condition

Assumptions:

- Present condition with Jay Lee and Rali May developed.
- That the remaining area east of Marvin Road is developed and the pond improvements in place (i.e., as presented in the Drainage Report for Meridian Group 1 Storm Pond Improvements).

Notes:

1. The invert elevations for the culverts at the Mobile Home ParK and 18 inch ADS piping are based on an assumed elevation.
2. Elevations at the driveway to NWP were estimated from GIS contour information.
3. Routing at the NWP pond is an estimate only (i.e, the size of the pond, the pipe invert elevations, and the top of bank were not determined.



Drainage Diagram for 2220-03 Final (Downstream)
Prepared by Hopper Dennis Jellison, PLLC 6/1/2006
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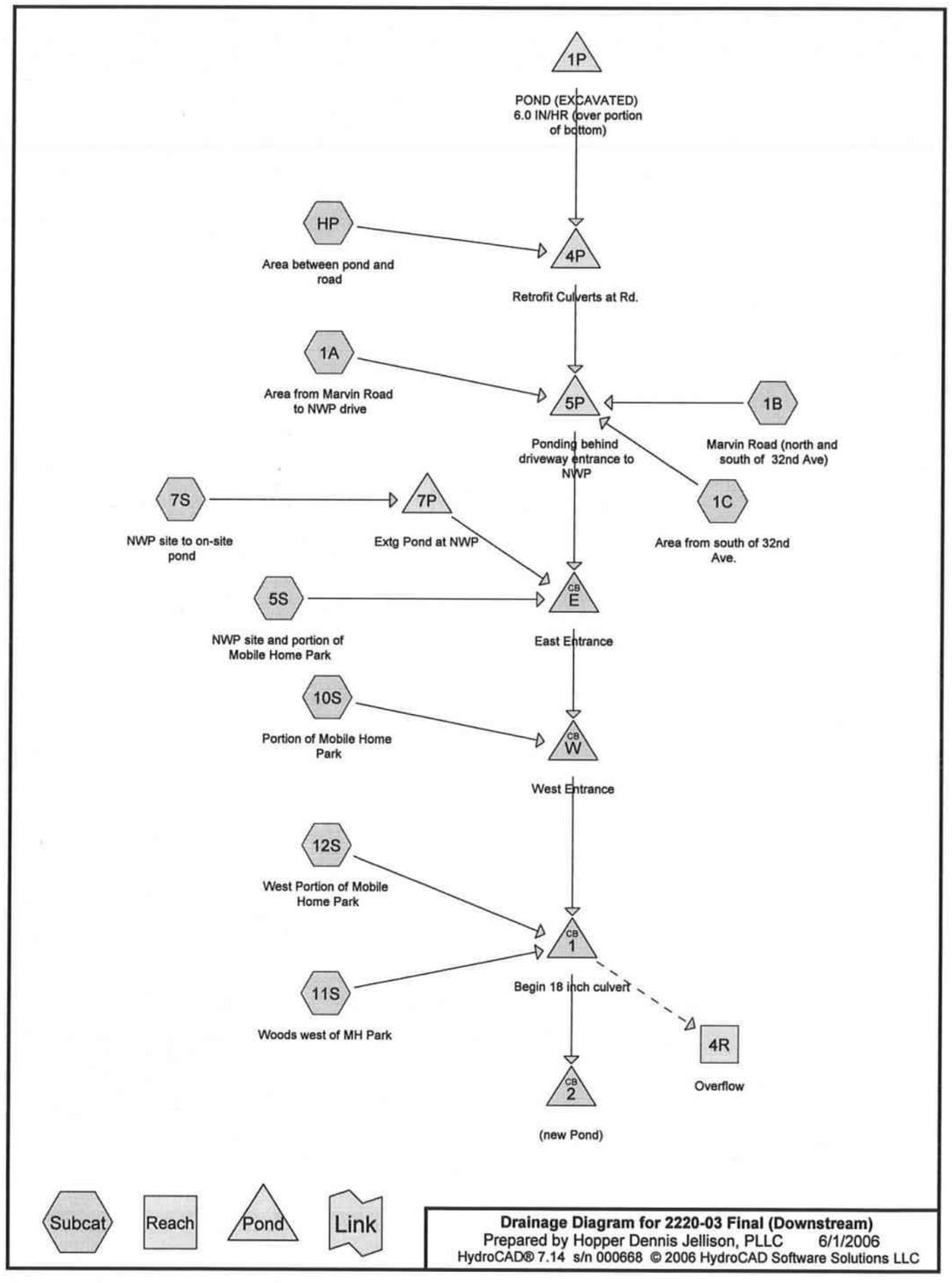
1P
POND (EXCAVATED)
6.0 IN/HR (over portion of bottom)
HP
Area between pond and road
4P
Retrofit Culverts at Rd.
1A
Area from Marvin Road to NWP drive
5P
1B
Ponding behind driveway entrance to NWP
Marvin Road (north and south of 32nd Ave)
7S
NWP site to on-site pond
7P
Extg Pond at NWP
1C
Area from south of 32nd Ave.
5S
NWP site and portion of Mobile Home Park
CB
E
East Entrance
10S
Portion of Mobile Home Park
CB
W
West Entrance
12S
West Portion of Mobile Home Park
CB
1
Begin 18 inch culvert
11S
Woods west of MH Park
4R
Overflow
CB
2
(new Pond)
Subcat
Reach
Pond
Link
Drainage Diagram for 2220-03 Final (Downstream)
Prepared by Hopper Dennis Jellison, PLLC 6/1/2006
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Area Listing (selected nodes)

Area (acres)	CN	Description (subcats)
13.450	64	Woods (1A,1C,5S,11S)
1.137	76	Woods (HP)
1.770	80	Lawn (5S)
11.210	88	Composite for MH Park (5S,10S,12S)
0.300	92	Gravel (HP)
0.100	98	32nd NE (1B)
0.300	98	Road (HP)
0.490	98	Road (north) (1B)
0.180	98	Road (south) (1B)
2.330	98	Roof and pavement (7S)
31.267		

Time span=0.00-90.00 hrs, dt=0.25 hrs, 361 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: Area from Marvin Road to NWP drive Runoff Area=4.400 ac Runoff Depth=1.65"
Flow Length=300' Tc=105.4 min CN=64 Runoff=0.67 cfs 0.603 af

Subcatchment 1B: Marvin Road (north and south of 32nd Ave Runoff Area=0.770 ac Runoff Depth=4.86"
Tc=10.0 min CN=98 Runoff=1.11 cfs 0.312 af

Subcatchment 1C: Area from south of 32nd Ave. Runoff Area=2.540 ac Runoff Depth=1.65"
Tc=20.0 min CN=64 Runoff=0.88 cfs 0.348 af

Subcatchment 5S: NWP site and portion of Mobile Home Park Runoff Area=5.110 ac Runoff Depth=2.80"
Tc=30.0 min CN=78 Runoff=3.38 cfs 1.191 af

Subcatchment 7S: NWP site to on-site pond Runoff Area=2.330 ac Runoff Depth=4.86"
Tc=10.0 min CN=98 Runoff=3.35 cfs 0.944 af

Subcatchment 10S: Portion of Mobile Home Park Runoff Area=3.690 ac Runoff Depth=3.76"
Tc=15.0 min CN=88 Runoff=4.42 cfs 1.157 af

Subcatchment 11S: Woods west of MH Park Runoff Area=5.010 ac Runoff Depth=1.65"
Flow Length=680' Slope=0.0400 '/' Tc=85.6 min CN=64 Runoff=0.86 cfs 0.687 af

Subcatchment 12S: West Portion of Mobile Home Park Runoff Area=5.680 ac Runoff Depth=3.76"
Tc=15.0 min CN=88 Runoff=6.81 cfs 1.782 af

Subcatchment HP: Area between pond and road Runoff Area=1.737 ac Runoff Depth=3.26"
Tc=60.0 min CN=83 Runoff=1.05 cfs 0.473 af

Reach 4R: Overflow Inflow=6.92 cfs 0.246 af
Outflow=6.92 cfs 0.246 af

Pond 1: Begin 18 inch culvert Peak Elev=101.94' Inflow=15.09 cfs 24.623 af
Primary=8.18 cfs 24.377 af Secondary=6.92 cfs 0.246 af Outflow=15.09 cfs 24.623 af

Pond 1P: POND (EXCAVATED) 6.0 IN Peak Elev=201.18' Storage=1,530,273 cf Inflow=167.13 cfs 95.759 af
ıcarded=11.24 cfs 54.217 af Primary=6.31 cfs 15.789 af Secondary=41.49 cfs 25.752 af Outflow=59.05 cfs 95.758 af

Pond 2: (new Pond) Peak Elev=102.31' Inflow=8.18 cfs 24.377 af
18.0" x 301.0' Culvert Outflow=8.18 cfs 24.377 af

Pond 4P: Retrofit Culverts at Rd. Peak Elev=203.15' Storage=708,005 cf Inflow=48.16 cfs 42.014 af
Discarded=10.77 cfs 24.035 af Primary=6.87 cfs 17.987 af Secondary=0.00 cfs 0.000 af Outflow=17.64 cfs 42.022 af

Pond 5P: Ponding behind driveway entra Peak Elev=199.62' Storage=135,218 cf Inflow=7.27 cfs 19.251 af
Primary=4.64 cfs 17.418 af Secondary=2.24 cfs 1.832 af Outflow=6.88 cfs 19.250 af

Pond 7P: Extg Pond at NWP Peak Elev=102.68' Storage=23,003 cf Inflow=3.35 cfs 0.944 af
6.0" x 12.0' Culvert Outflow=0.49 cfs 0.555 af

Pond E: East Entrance Peak Elev=107.83' Inflow=7.04 cfs 20.996 af
Primary=7.04 cfs 20.996 af Secondary=0.00 cfs 0.000 af Outflow=7.04 cfs 20.996 af

Pond W: West Entrance Peak Elev=106.14' Inflow=8.18 cfs 22.154 af
Primary=8.18 cfs 22.154 af Secondary=0.00 cfs 0.000 af Outflow=8.18 cfs 22.154 af

Total Runoff Area = 31.267 ac Runoff Volume = 7.498 af Average Runoff Depth = 2.88"
89.13% Pervious Area = 27.867 ac 10.87% Impervious Area = 3.400 ac

Subcatchment 1A: Area from Marvin Road to NWP drive

Runoff = 0.67 cfs @ 9.32 hrs, Volume= 0.603 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
4.400	64	Woods
4.400		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
52.7	200	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.80"
52.7	100	0.0100	0.03		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.80"
105.4	300	Total			

Subcatchment 1B: Marvin Road (north and south of 32nd Ave)

Runoff = 1.11 cfs @ 7.89 hrs, Volume= 0.312 af, Depth= 4.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
0.490	98	Road (north)
0.180	98	Road (south)
0.100	98	32nd NE
0.770	98	Weighted Average
0.770		Impervious Area

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

Subcatchment 1C: Area from south of 32nd Ave.

Runoff = 0.88 cfs @ 8.05 hrs, Volume= 0.348 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
2.540	64	Woods
2.540		Pervious Area

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

Subcatchment 5S: NWP site and portion of Mobile Home Park

Runoff = 3.38 cfs @ 8.17 hrs, Volume= 1.191 af, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
1.770	80	Lawn
1.500	64	Woods
1.840	88	Composite for MH Park
5.110	78	Weighted Average
5.110		Pervious Area

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

Subcatchment 7S: NWP site to on-site pond

Runoff = 3.35 cfs @ 7.89 hrs, Volume= 0.944 af, Depth= 4.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
2.330	98	Roof and pavement
2.330		Impervious Area

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

Subcatchment 10S: Portion of Mobile Home Park

Runoff = 4.42 cfs @ 7.97 hrs, Volume= 1.157 af, Depth= 3.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
3.690	88	Composite for MH Park
3.690		Pervious Area

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

Subcatchment 11S: Woods west of MH Park

Runoff = 0.86 cfs @ 8.97 hrs, Volume= 0.687 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
5.010	64	Woods
5.010		Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
72.9	300	0.0400	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 2.80"
12.7	380	0.0400	0.50		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
85.6	680	Total			

Subcatchment 12S: West Portion of Mobile Home Park

Runoff = 6.81 cfs @ 7.97 hrs, Volume= 1.782 af, Depth= 3.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
5.680	88	Composite for MH Park
5.680		Pervious Area

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

Subcatchment HP: Area between pond and road

Runoff = 1.05 cfs @ 8.51 hrs, Volume= 0.473 af, Depth= 3.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Thurston 24-hr 25-yr 25-yr Rainfall=5.10"

Area (ac)	CN	Description
1.137	76	Woods
0.300	92	Gravel
0.300	98	Road
1.737	83	Weighted Average
1.437		Pervious Area
0.300		Impervious Area

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

Reach 4R: Overflow

Inflow = 6.92 cfs @ 8.00 hrs, Volume= 0.246 af
Outflow = 6.92 cfs @ 8.00 hrs, Volume= 0.246 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs

Pond 1: Begin 18 inch culvert

Inflow Area = 313.103 ac, Inflow Depth = 0.94" for 25-yr event
Inflow = 15.09 cfs @ 8.00 hrs, Volume= 24.623 af
Outflow = 15.09 cfs @ 8.00 hrs, Volume= 24.623 af, Atten= 0%, Lag= 0.0 min
Primary = 8.18 cfs @ 8.00 hrs, Volume= 24.377 af
Secondary = 6.92 cfs @ 8.00 hrs, Volume= 0.246 af

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 101.94' @ 8.00 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	**18.0" x 311.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 98.17' S= 0.0059 '/' Cc= 0.900 n= 0.012
#2	Secondary	101.67'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=8.17 cfs @ 8.00 hrs HW=101.93' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 8.17 cfs @ 4.62 fps)

Secondary OutFlow Max=6.84 cfs @ 8.00 hrs HW=101.93' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 6.84 cfs @ 1.29 fps)

Pond 1P: POND (EXCAVATED) 6.0 IN/HR (over portion of bottom)

EXISTING OVERFLOW STRUCTURE AND ROCK SPILLWAY MODELED WITH PROPOSED CONTROL MH

Inflow Area = 281.836 ac, Inflow Depth > 4.08" for 25-yr event
Inflow = 167.13 cfs @ 7.99 hrs, Volume= 95.759 af
Outflow = 59.05 cfs @ 14.00 hrs, Volume= 95.758 af, Atten= 65%, Lag= 360.5 min
Discarded = 11.24 cfs @ 14.00 hrs, Volume= 54.217 af
Primary = 6.31 cfs @ 14.00 hrs, Volume= 15.789 af
Secondary = 41.49 cfs @ 14.00 hrs, Volume= 25.752 af

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 201.18' @ 14.00 hrs Surf.Area= 232,083 sf Storage= 1,530,273 cf

Plug-Flow detention time= 784.1 min calculated for 95.758 af (100% of inflow)
Center-of-Mass det. time= 784.8 min (1,678.1 - 893.3)

Volume	Invert	Avail.Storage	Storage Description
#1	185.00'	1,601,897 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	196.00'	133,055 cf	**Custom Stage Data (East Pond) (Prismatic)** Listed below (Recalc)
		1,734,952 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
185.00	54,418	0	0
194.00	74,079	578,237	578,237
195.00	78,935	76,507	654,744
196.00	87,870	83,403	738,146
197.00	111,470	99,670	837,816
198.00	128,513	119,992	957,808
199.00	144,291	136,402	1,094,210
200.00	157,394	150,843	1,245,052
201.00	180,190	168,792	1,413,844
202.00	195,916	188,053	1,601,897

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	60	0	0
197.00	1,761	911	911
198.00	5,408	3,585	4,495
199.00	17,499	11,454	15,949
200.00	28,398	22,949	38,897
201.00	43,959	36,179	75,076
202.00	72,000	57,980	133,055

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**Special & User-Defined (Infiltration)** Elev. (feet) 185.00 185.20 191.00 202.00 Disch. (cfs) 0.000 7.620 9.290 9.300
#2	Primary	195.40'	**24.0" x 240.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 195.40' S= 0.0000 '/' Cc= 0.900 n= 0.012
#3	Device 2	195.40'	**10.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#4	Secondary	200.60'	**52.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#5	Secondary	201.00'	**100.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#6	Discarded	0.00'	**Special & User-Defined (1 in/hr above 191)**
			Elev. (feet) 191.00 191.10 201.50
			Disch. (cfs) 0.000 0.100 2.000

Discarded OutFlow Max=11.24 cfs @ 14.00 hrs HW=201.18' (Free Discharge)
└─**1=Special & User-Defined (Infiltration)** (Custom Controls 9.30 cfs)
└─**6=Special & User-Defined (1 in/hr above 191)** (Custom Controls 1.94 cfs)

Primary OutFlow Max=6.31 cfs @ 14.00 hrs HW=201.18' (Free Discharge)
└─**2=Culvert** (Passes 6.31 cfs of 24.36 cfs potential flow)
└─**3=Orifice/Grate** (Orifice Controls 6.31 cfs @ 11.58 fps)

Secondary OutFlow Max=40.41 cfs @ 14.00 hrs HW=201.18' (Free Discharge)
└─**4=Orifice/Grate** (Weir Controls 19.73 cfs @ 2.49 fps)
└─**5=Broad-Crested Rectangular Weir** (Weir Controls 20.69 cfs @ 1.14 fps)

Pond 2: (new Pond)

CB top elevation is 102.58 (assumed datum)

Inflow Area =	313.103 ac,	Inflow Depth >	0.93"	for	25-yr event
Inflow =	8.18 cfs @	8.00 hrs,	Volume=	24.377 af	
Outflow =	8.18 cfs @	8.00 hrs,	Volume=	24.377 af,	Atten= 0%, Lag= 0.0 min
Primary =	8.18 cfs @	8.00 hrs,	Volume=	24.377 af	

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 102.31' @ 8.00 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.87'	**18.0" x 301.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700
			Outlet Invert= 98.68' S= 0.0006 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=8.17 cfs @ 8.00 hrs HW=102.30' (Free Discharge)
└─**1=Culvert** (Barrel Controls 8.17 cfs @ 4.62 fps)

Pond 4P: Retrofit Culverts at Rd.

Inflow Area =	283.573 ac,	Inflow Depth =	1.78"	for	25-yr event
Inflow =	48.16 cfs @	14.00 hrs,	Volume=	42.014 af	
Outflow =	17.64 cfs @	24.58 hrs,	Volume=	42.022 af,	Atten= 63%, Lag= 634.5 min
Discarded =	10.77 cfs @	24.58 hrs,	Volume=	24.035 af	
Primary =	6.87 cfs @	24.58 hrs,	Volume=	17.987 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 203.15' @ 24.58 hrs Surf.Area= 407,028 sf Storage= 708,005 cf

Plug-Flow detention time= 447.1 min calculated for 41.905 af (100% of inflow)
Center-of-Mass det. time= 447.3 min (1,689.8 - 1,242.4)

Volume	Invert	Avail.Storage	Storage Description
#1	195.40'	126,496 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#2	201.05'	1,563,071 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		1,689,567 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
195.40	50	0	0
196.00	576	188	188
197.00	11,738	6,157	6,345
198.00	22,326	17,032	23,377
199.00	32,414	27,370	50,747
201.00	43,335	75,749	126,496

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
201.05	223,525	0	0
202.00	248,577	224,248	224,248
203.00	356,387	302,482	526,730
204.00	404,407	380,397	907,127
205.00	451,120	427,764	1,334,891
205.50	461,602	228,181	1,563,071

Device	Routing	Invert	Outlet Devices
#1	Primary	195.35'	**18.0" x 77.0' long Culvert X 2.00** RCP, groove end projecting, Ke= 0.200 Outlet Invert= 194.90' S= 0.0058 '/' Cc= 0.900 n= 0.012
#2	Device 1	195.40'	**9.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#3	Device 1	203.00'	**18.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#4	Secondary	204.50'	**54.0" Horiz. Orifice/Grate** Limited to weir flow C= 0.600
#5	Discarded	0.00'	**Special & User-Defined (Infiltration in Main pond)** Elev. (feet) 201.00 201.10 205.50 Disch. (cfs) 0.000 10.670 10.880

Discarded OutFlow Max=10.77 cfs @ 24.58 hrs HW=203.15' (Free Discharge)
└─**5=Special & User-Defined (Infiltration in Main pond)** (Custom Controls 10.77 cfs)

Primary OutFlow Max=6.83 cfs @ 24.58 hrs HW=203.15' (Free Discharge)
└─**1=Culvert** (Passes 6.83 cfs of 47.57 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 5.92 cfs @ 13.41 fps)
  └─**3=Orifice/Grate** (Weir Controls 0.91 cfs @ 1.27 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=195.40' (Free Discharge)
└─**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 5P: Ponding behind driveway entrance to NWP

Inflow Area = 291.283 ac, Inflow Depth = 0.79" for 25-yr event
Inflow = 7.27 cfs @ 24.07 hrs, Volume= 19.251 af
Outflow = 6.88 cfs @ 25.39 hrs, Volume= 19.250 af, Atten= 5%, Lag= 79.3 min
Primary = 4.64 cfs @ 25.39 hrs, Volume= 17.418 af
Secondary = 2.24 cfs @ 25.39 hrs, Volume= 1.832 af

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 199.62' @ 25.39 hrs Surf.Area= 73,428 sf Storage= 135,218 cf

Plug-Flow detention time= 369.8 min calculated for 19.250 af (100% of inflow)
Center-of-Mass det. time= 368.1 min (2,076.9 - 1,708.9)

Volume	Invert	Avail.Storage	Storage Description
#1	196.00'	164,601 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	1,625	0	0
198.00	40,961	42,586	42,586
200.00	81,054	122,015	164,601

Device	Routing	Invert	Outlet Devices
#1	Primary	196.00'	**12.0" x 30.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 195.85' S= 0.0050 '/' Cc= 0.900 n= 0.024
#2	Secondary	199.50'	**20.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=4.64 cfs @ 25.39 hrs HW=199.62' (Free Discharge)
↑**1=Culvert** (Barrel Controls 4.64 cfs @ 5.91 fps)

Secondary OutFlow Max=2.21 cfs @ 25.39 hrs HW=199.62' (Free Discharge)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 2.21 cfs @ 0.93 fps)

Pond 7P: Extg Pond at NWP

Inflow Area = 2.330 ac, Inflow Depth = 4.86" for 25-yr event
Inflow = 3.35 cfs @ 7.89 hrs, Volume= 0.944 af
Outflow = 0.49 cfs @ 14.63 hrs, Volume= 0.555 af, Atten= 85%, Lag= 404.3 min
Primary = 0.49 cfs @ 14.63 hrs, Volume= 0.555 af

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 102.68' @ 14.63 hrs Surf.Area= 9,137 sf Storage= 23,003 cf

Plug-Flow detention time= 661.5 min calculated for 0.555 af (59% of inflow)
Center-of-Mass det. time= 432.3 min (1,079.1 - 646.8)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	25,905 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	8,000	0	0
103.00	9,270	25,905	25,905

Device	Routing	Invert	Outlet Devices
#1	Primary	102.00'	**6.0" x 12.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 101.88' S= 0.0100 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=0.49 cfs @ 14.63 hrs HW=102.68' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 0.49 cfs @ 2.50 fps)

Pond E: East Entrance

Assumption: Excess flow crosses drive and re-joins flow in ditch. Assume about 2 inch depth to crown of road for overflow.

Inflow Area =	298.723 ac,	Inflow Depth >	0.84"	for	25-yr event
Inflow =	7.04 cfs @	25.28 hrs,	Volume=	20.996 af	
Outflow =	7.04 cfs @	25.28 hrs,	Volume=	20.996 af,	Atten= 0%, Lag= 0.0 min
Primary =	7.04 cfs @	25.28 hrs,	Volume=	20.996 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 107.83' @ 25.28 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	106.78'	**12.0" x 40.0' long Culvert X 2.00** RCP, groove end w/headwall, Ke= 0.200 Outlet Invert= 106.05' S= 0.0183 '/' Cc= 0.900 n= 0.013
#2	Secondary	107.89'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=7.04 cfs @ 25.28 hrs HW=107.83' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 7.04 cfs @ 4.48 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=106.78' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond W: West Entrance

Inflow Area = 302.413 ac, Inflow Depth > 0.88" for 25-yr event
Inflow = 8.18 cfs @ 8.03 hrs, Volume= 22.154 af
Outflow = 8.18 cfs @ 8.03 hrs, Volume= 22.154 af, Atten= 0%, Lag= 0.0 min
Primary = 8.18 cfs @ 8.03 hrs, Volume= 22.154 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

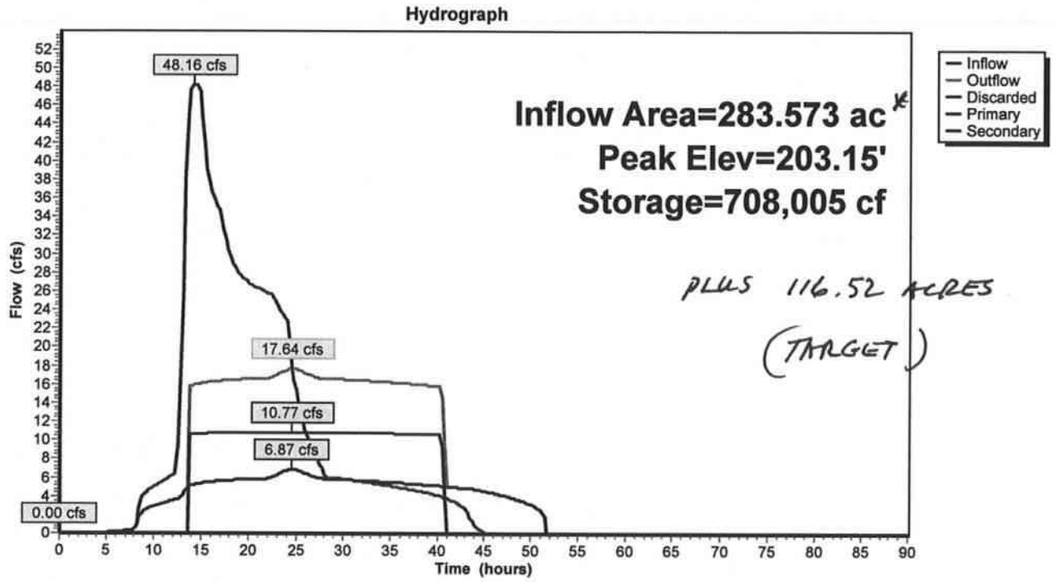
Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 106.14' @ 8.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	104.48'	**12.0" x 40.0' long Culvert X 2.00** RCP, groove end w/headwall, Ke= 0.200 Outlet Invert= 104.11' S= 0.0093 '/' Cc= 0.900 n= 0.013
#2	Secondary	106.20'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

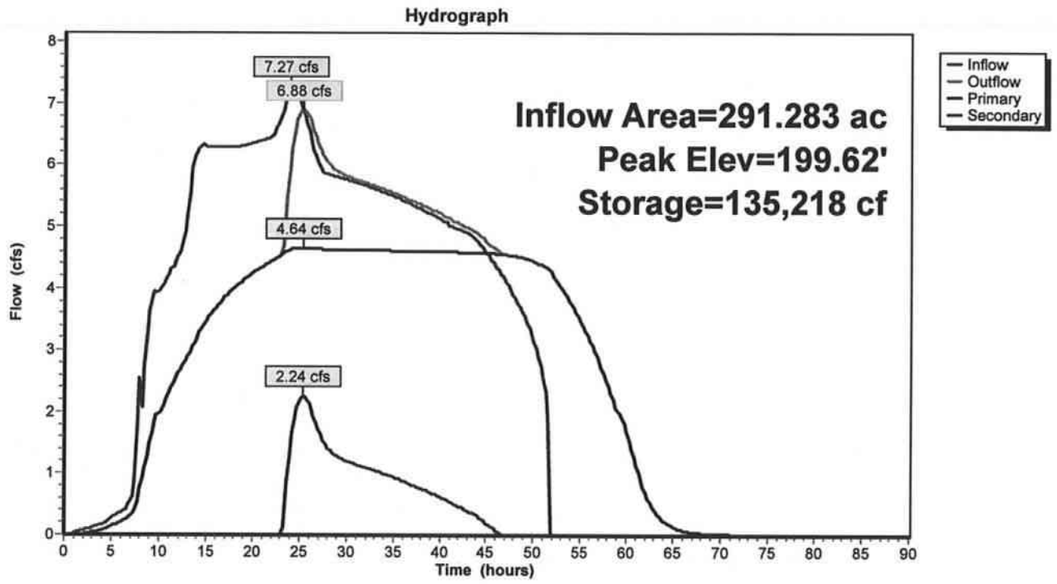
Primary OutFlow Max=7.84 cfs @ 8.03 hrs HW=106.06' (Free Discharge)
└**1=Culvert** (Barrel Controls 7.84 cfs @ 4.99 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=104.48' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

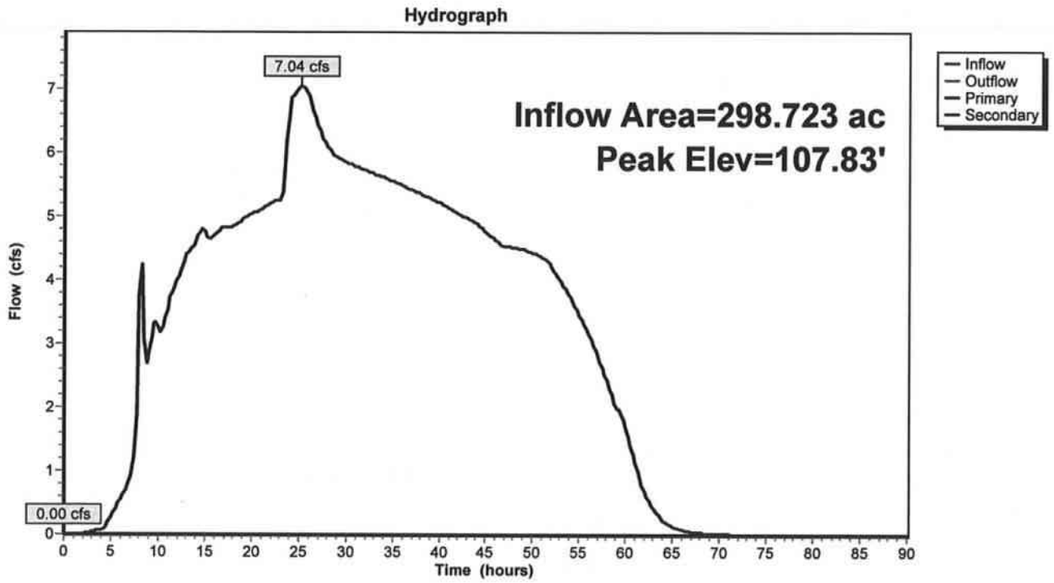
Pond 4P: Retrofit Culverts at Rd.



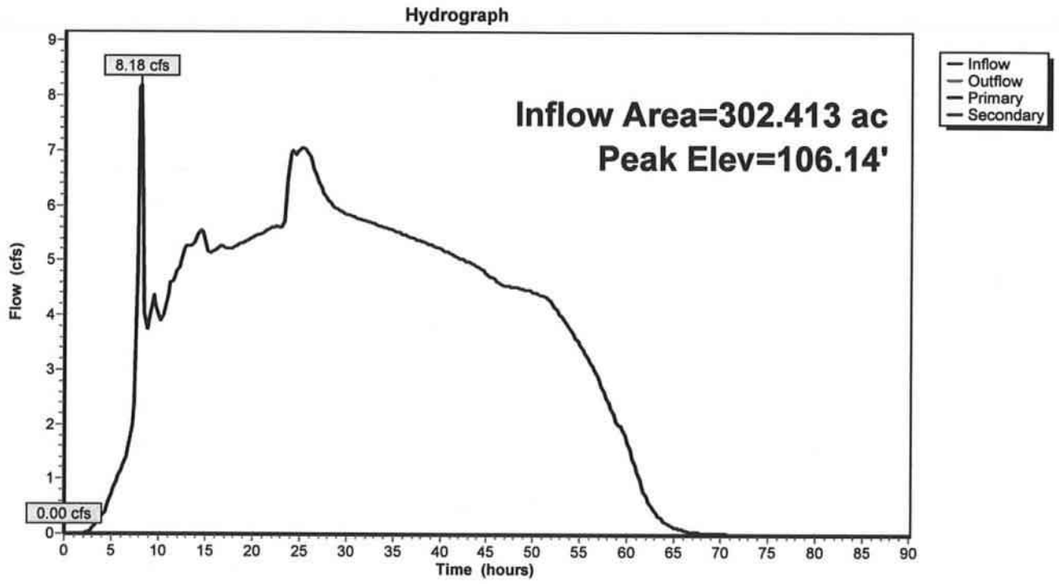
Pond 5P: Ponding behind driveway entrance to NWP



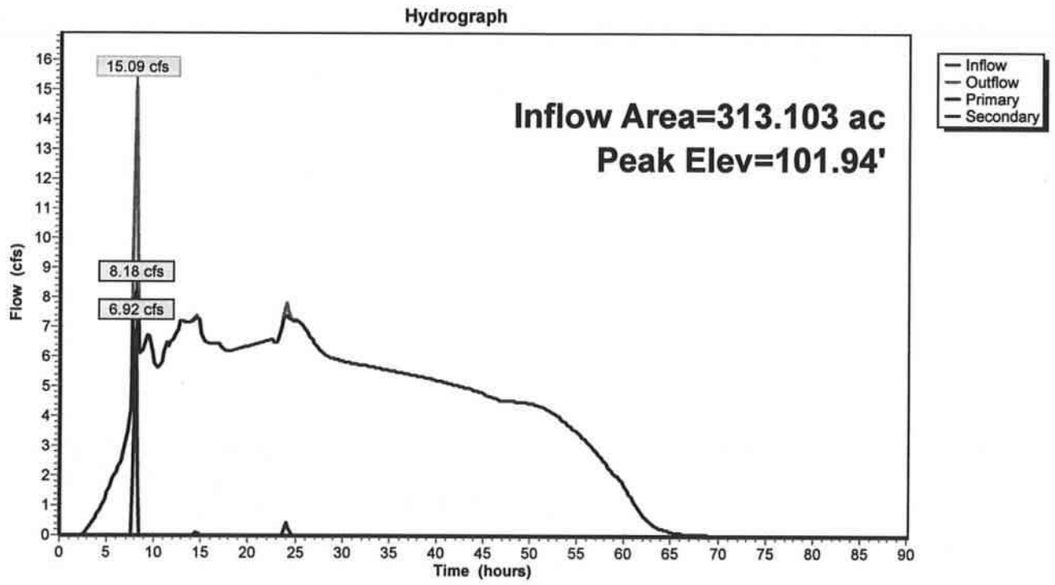
Pond E: East Entrance

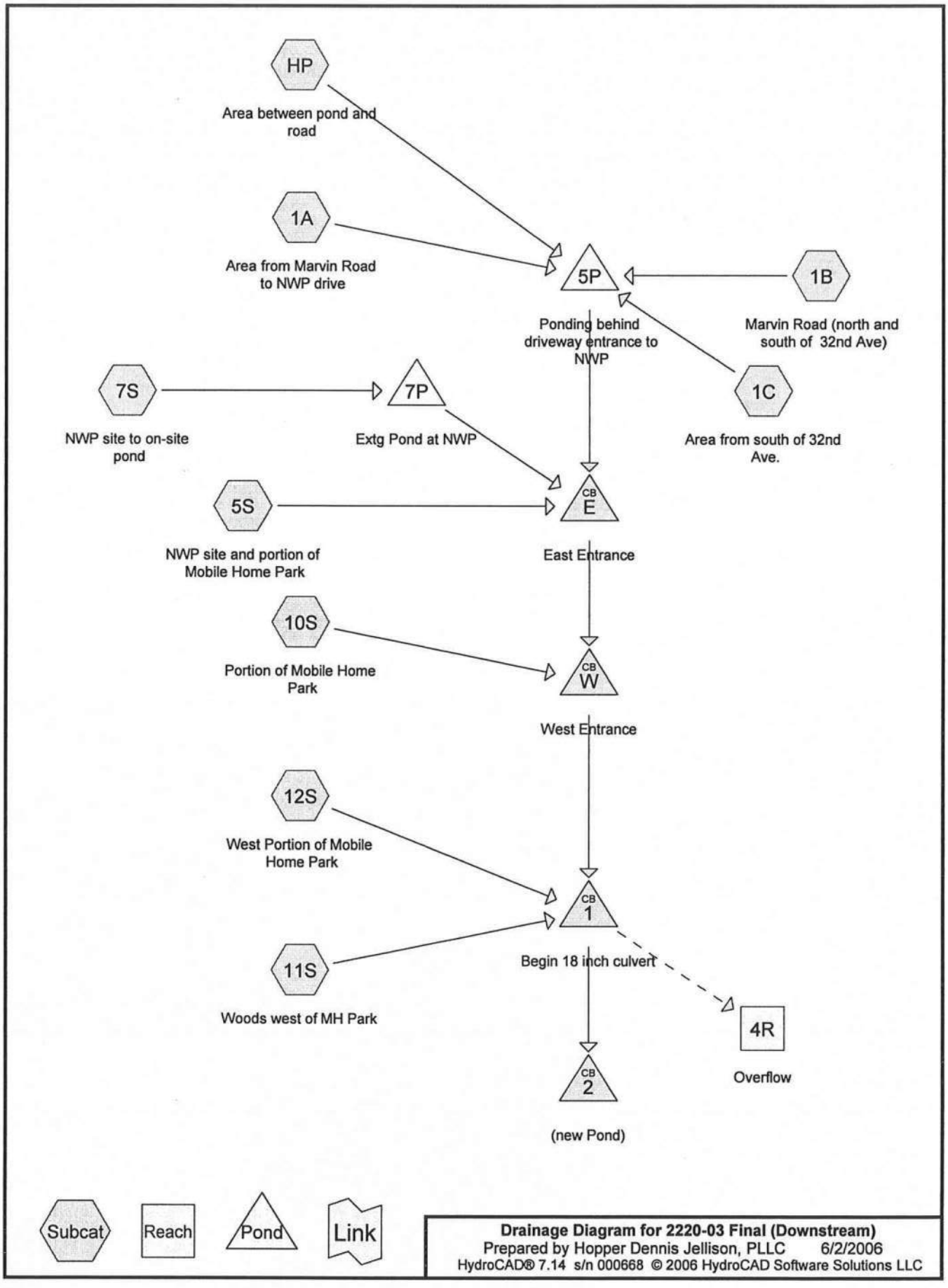


Pond W: West Entrance



Pond 1: Begin 18 inch culvert




HP
Area between pond and road
1A
Area from Marvin Road to NWP drive
5P
Ponding behind driveway entrance to NWP
1B
Marvin Road (north and south of 32nd Ave)
1C
Area from south of 32nd Ave.
7S
NWP site to on-site pond
7P
Extg Pond at NWP
5S
NWP site and portion of Mobile Home Park
CB E
East Entrance
10S
Portion of Mobile Home Park
CB W
West Entrance
12S
West Portion of Mobile Home Park
CB 1
Begin 18 inch culvert
11S
Woods west of MH Park
4R
Overflow
CB 2
(new Pond)
Subcat
Reach
Pond
Link
Drainage Diagram for 2220-03 Final (Downstream)
Prepared by Hopper Dennis Jellison, PLLC 6/2/2006
HydroCAD® 7.14 s/n 000668 © 2006 HydroCAD Software Solutions LLC

Reach 4R: Overflow

Inflow = 6.92 cfs @ 8.00 hrs, Volume= 0.223 af
Outflow = 6.92 cfs @ 8.00 hrs, Volume= 0.223 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs

Pond 1: Begin 18 inch culvert

Inflow Area = 31.267 ac, Inflow Depth = 2.73" for 25-yr event
Inflow = 15.10 cfs @ 8.00 hrs, Volume= 7.109 af
Outflow = 15.10 cfs @ 8.00 hrs, Volume= 7.109 af, Atten= 0%, Lag= 0.0 min
Primary = 8.18 cfs @ 8.00 hrs, Volume= 6.885 af
Secondary = 6.92 cfs @ 8.00 hrs, Volume= 0.223 af

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 101.94' @ 8.00 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	**18.0" x 311.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 98.17' S= 0.0059 '/' Cc= 0.900 n= 0.012
#2	Secondary	101.67'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=8.17 cfs @ 8.00 hrs HW=101.93' (Free Discharge)
↑—**1=Culvert** (Inlet Controls 8.17 cfs @ 4.62 fps)

Secondary OutFlow Max=6.84 cfs @ 8.00 hrs HW=101.93' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 6.84 cfs @ 1.29 fps)

Pond 2: (new Pond)

CB top elevation is 102.58 (assumed datum)

Inflow Area = 31.267 ac, Inflow Depth = 2.64" for 25-yr event
Inflow = 8.18 cfs @ 8.00 hrs, Volume= 6.885 af
Outflow = 8.18 cfs @ 8.00 hrs, Volume= 6.885 af, Atten= 0%, Lag= 0.0 min
Primary = 8.18 cfs @ 8.00 hrs, Volume= 6.885 af

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 102.31' @ 8.00 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	98.87'	**18.0" x 301.0' long Culvert** CPP, mitered to conform to fill, Ke= 0.700 Outlet Invert= 98.68' S= 0.0006 '/' Cc= 0.900 n= 0.012

Primary OutFlow Max=8.17 cfs @ 8.00 hrs HW=102.30' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 8.17 cfs @ 4.62 fps)

Pond 5P: Ponding behind driveway entrance to NWP

Inflow Area = 9.447 ac, Inflow Depth = 2.21" for 25-yr event
Inflow = 2.57 cfs @ 8.03 hrs, Volume= 1.736 af
Outflow = 1.39 cfs @ 10.21 hrs, Volume= 1.736 af, Atten= 46%, Lag= 130.8 min
Primary = 1.39 cfs @ 10.21 hrs, Volume= 1.736 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 196.94' @ 10.21 hrs Surf.Area= 20,096 sf Storage= 10,200 cf

Plug-Flow detention time= 119.6 min calculated for 1.732 af (100% of inflow)
Center-of-Mass det. time= 121.8 min (953.4 - 831.6)

Volume	Invert	Avail.Storage	Storage Description
#1	196.00'	164,601 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
196.00	1,625	0	0
198.00	40,961	42,586	42,586
200.00	81,054	122,015	164,601

Device	Routing	Invert	Outlet Devices
#1	Primary	196.00'	**12.0" x 30.0' long Culvert** CMP, projecting, no headwall, Ke= 0.900 Outlet Invert= 195.85' S= 0.0050 '/' Cc= 0.900 n= 0.024
#2	Secondary	199.50'	**20.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=1.39 cfs @ 10.21 hrs HW=196.94' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 1.39 cfs @ 2.36 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=196.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond E: East Entrance

Assumption: Excess flow crosses drive and re-joins flow in ditch. Assume about 2 inch depth to crown of road for overflow.

Inflow Area = 16.887 ac, Inflow Depth > 2.47" for 25-yr event
Inflow = 4.28 cfs @ 8.20 hrs, Volume= 3.483 af
Outflow = 4.28 cfs @ 8.20 hrs, Volume= 3.483 af, Atten= 0%, Lag= 0.0 min
Primary = 4.28 cfs @ 8.20 hrs, Volume= 3.483 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 107.50' @ 8.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	106.78'	**12.0" x 40.0' long Culvert X 2.00** RCP, groove end w/headwall, Ke= 0.200 Outlet Invert= 106.05' S= 0.0183 '/' Cc= 0.900 n= 0.013
#2	Secondary	107.89'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Primary OutFlow Max=4.14 cfs @ 8.20 hrs HW=107.48' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 4.14 cfs @ 4.93 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=106.78' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond W: West Entrance

Inflow Area = 20.577 ac, Inflow Depth = 2.71" for 25-yr event
Inflow = 8.18 cfs @ 8.03 hrs, Volume= 4.640 af
Outflow = 8.18 cfs @ 8.03 hrs, Volume= 4.640 af, Atten= 0%, Lag= 0.0 min
Primary = 8.18 cfs @ 8.03 hrs, Volume= 4.640 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

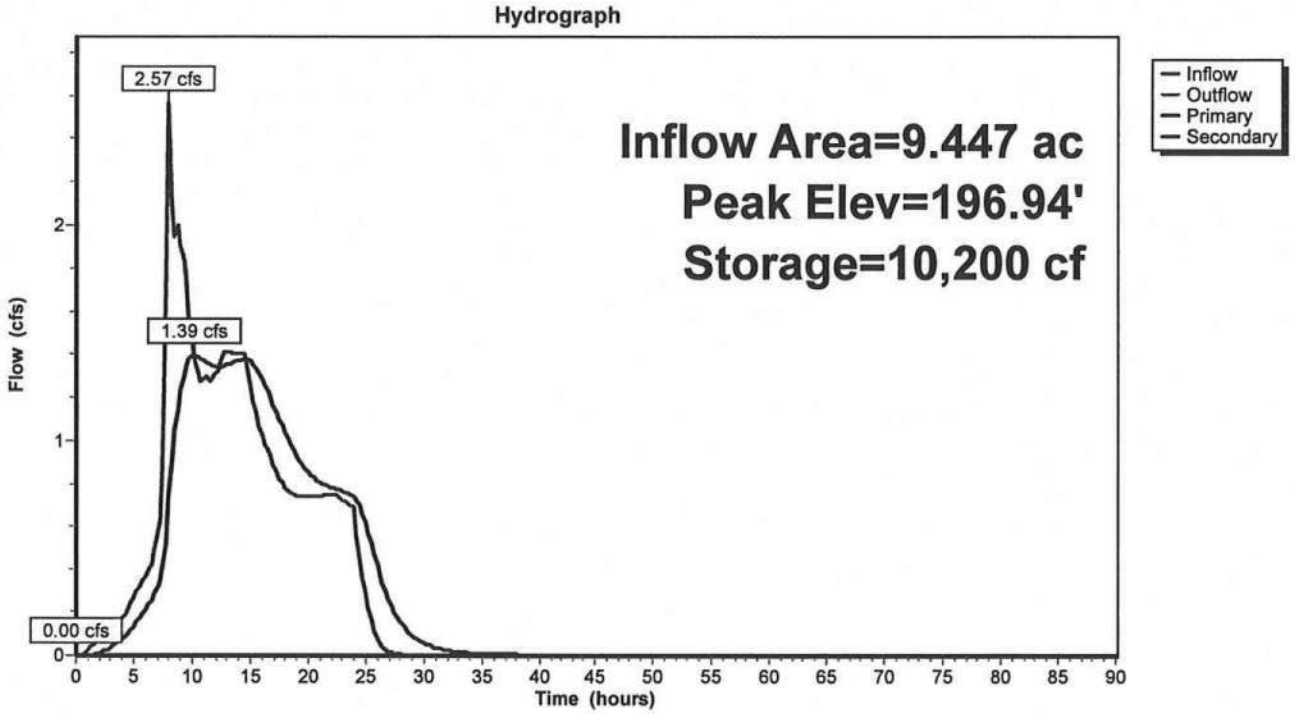
Routing by Stor-Ind method, Time Span= 0.00-90.00 hrs, dt= 0.25 hrs
Peak Elev= 106.14' @ 8.02 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	104.48'	**12.0" x 40.0' long Culvert X 2.00** RCP, groove end w/headwall, Ke= 0.200 Outlet Invert= 104.11' S= 0.0093 '/' Cc= 0.900 n= 0.013
#2	Secondary	106.20'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

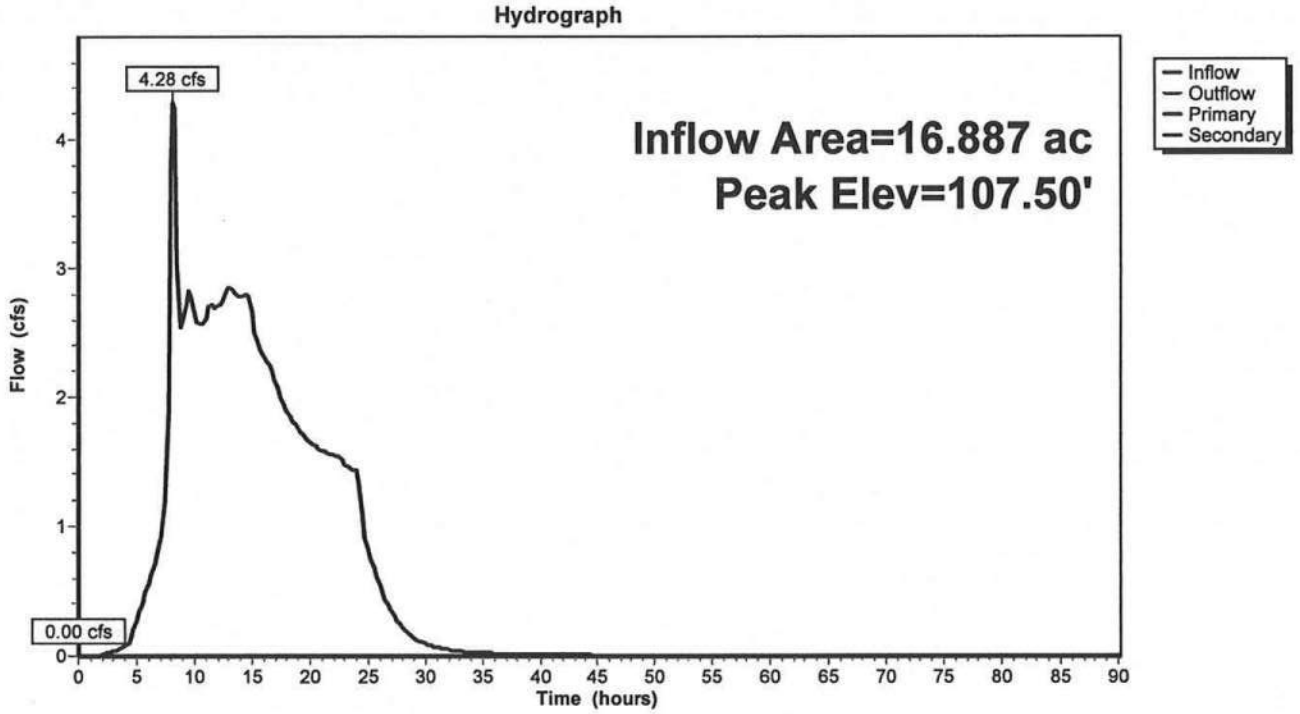
Primary OutFlow Max=7.84 cfs @ 8.03 hrs HW=106.06' (Free Discharge)
↑—**1=Culvert** (Barrel Controls 7.84 cfs @ 4.99 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=104.48' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

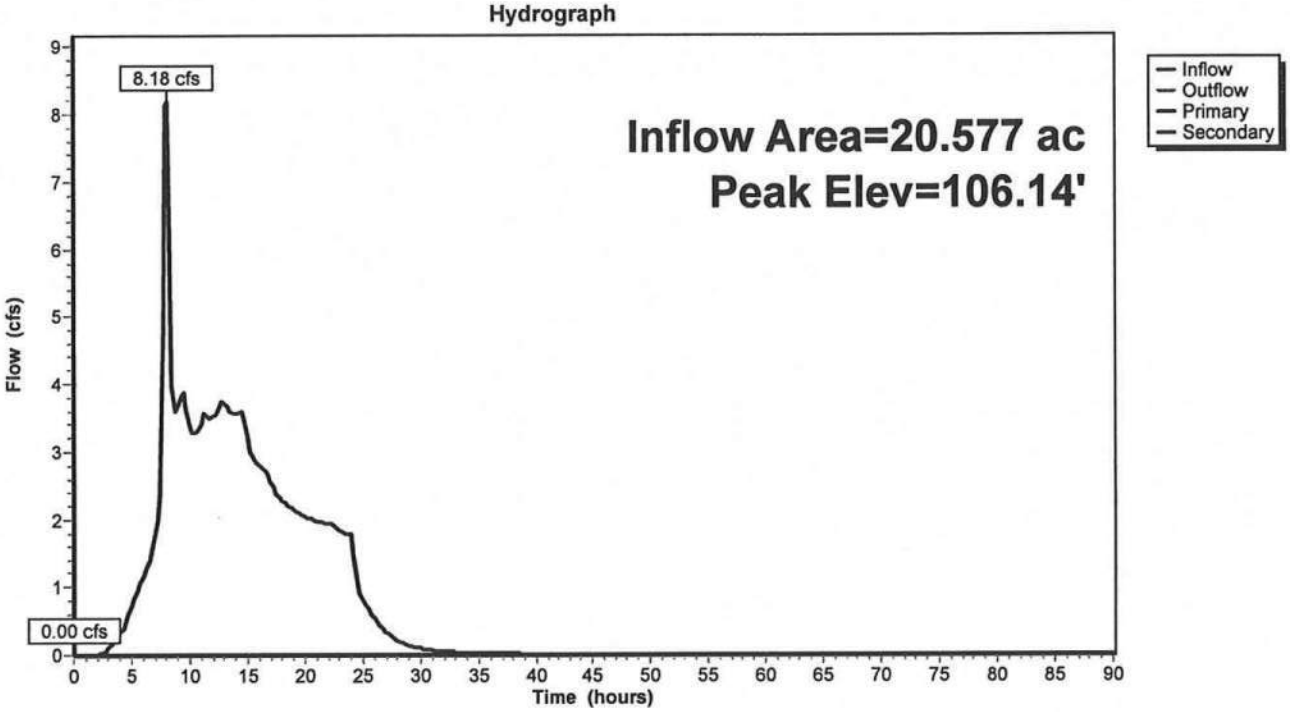
Pond 5P: Ponding behind driveway entrance to NWP



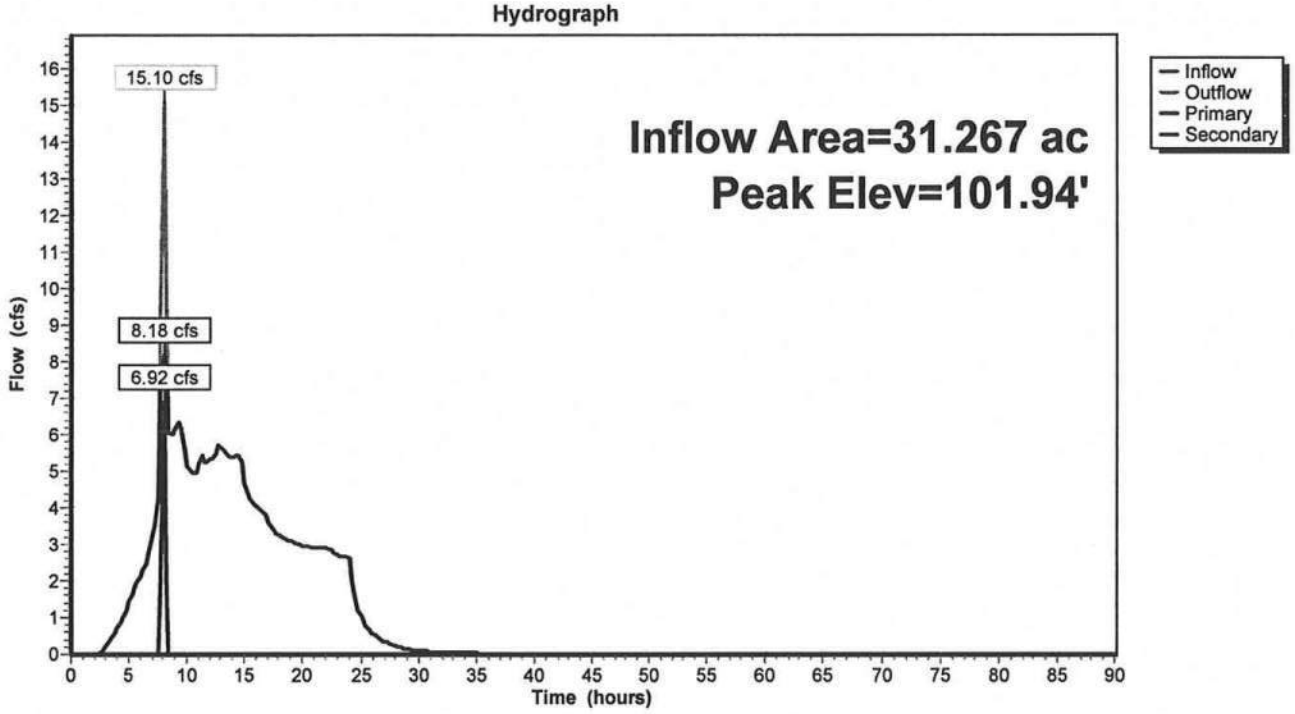
Pond E: East Entrance



Pond W: West Entrance



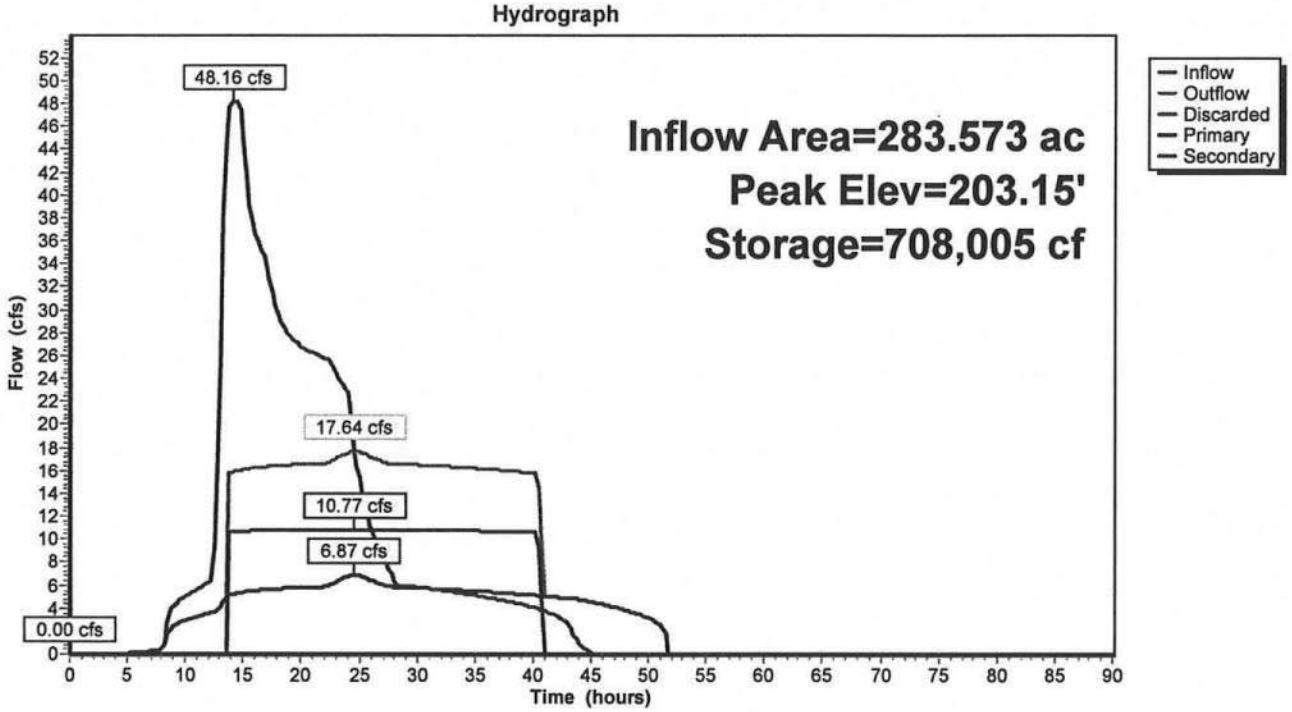
Pond 1: Begin 18 inch culvert



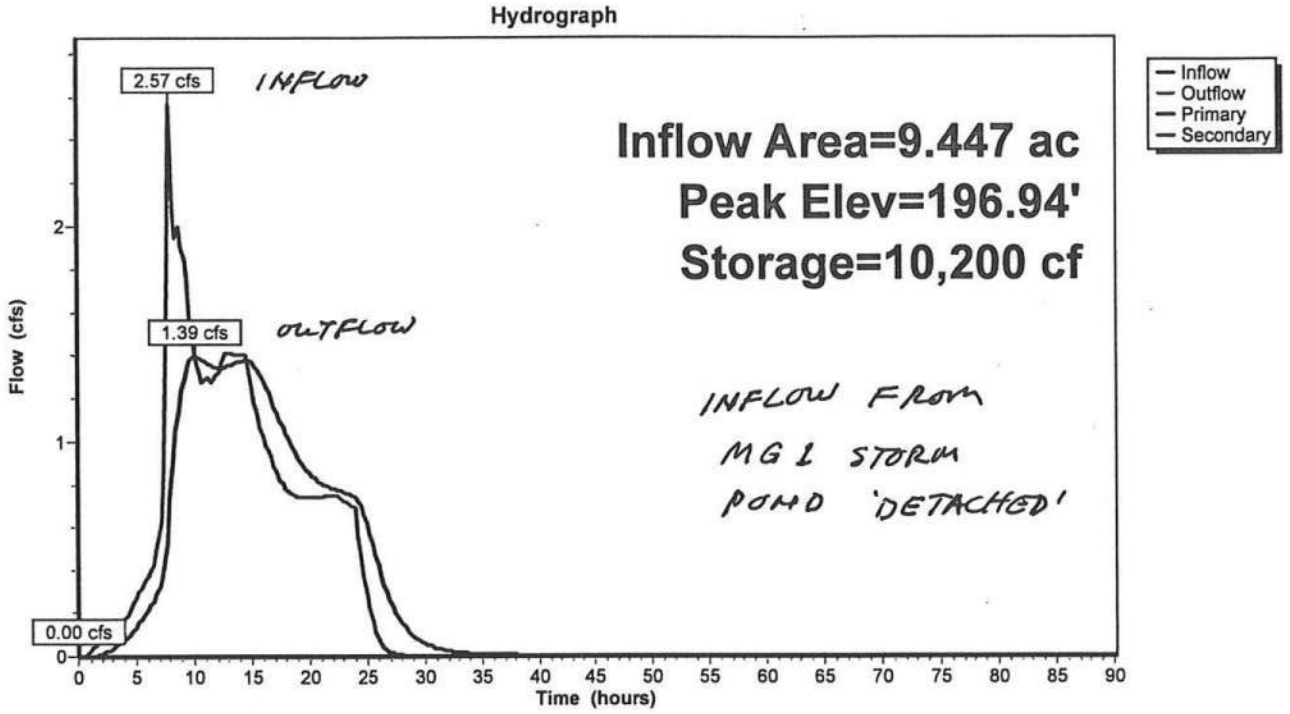
Post Condition - Compare Hydrographs

1. The hydrographs at the top of each sheet represent – no flow from the Meridian Group 1 Storm Pond
2. The hydrographs at the bottom of each sheet represent – include flow from the Meridian Group 1 Storm Pond (after improvements are made).

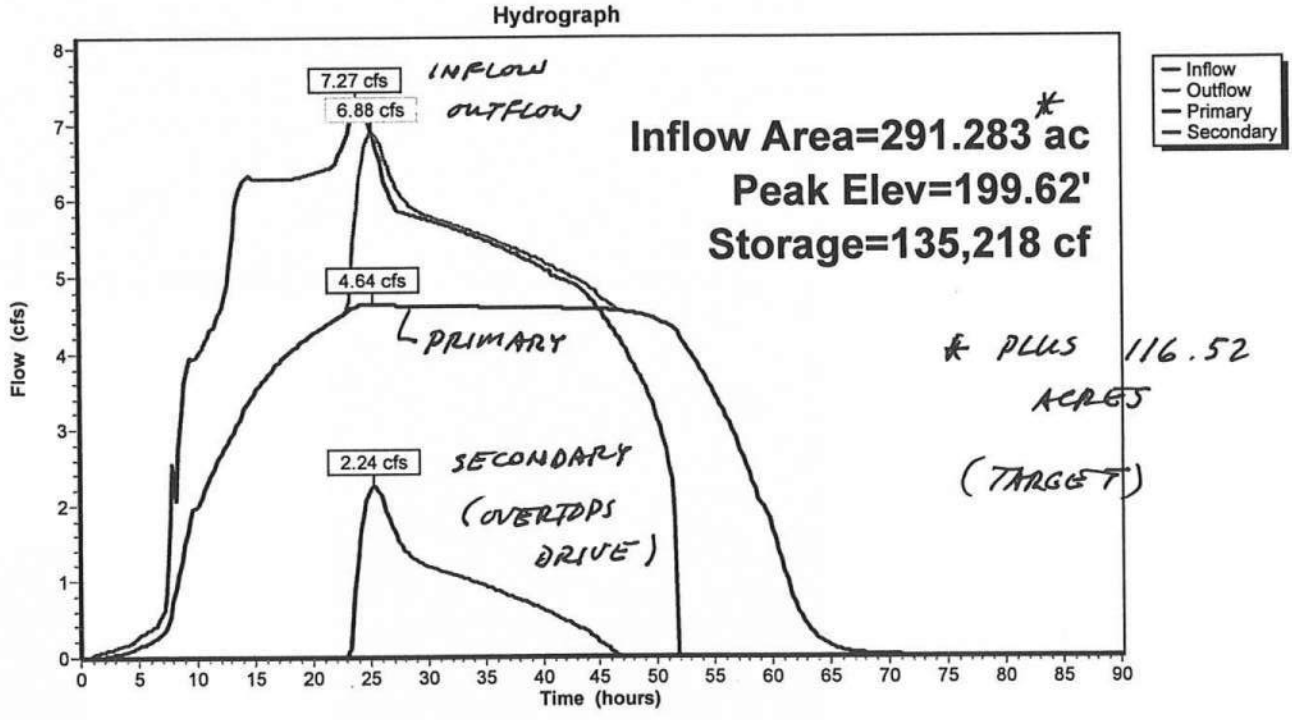
Pond 4P: Retrofit Culverts at Rd.



Pond 5P: Ponding behind driveway entrance to NWP

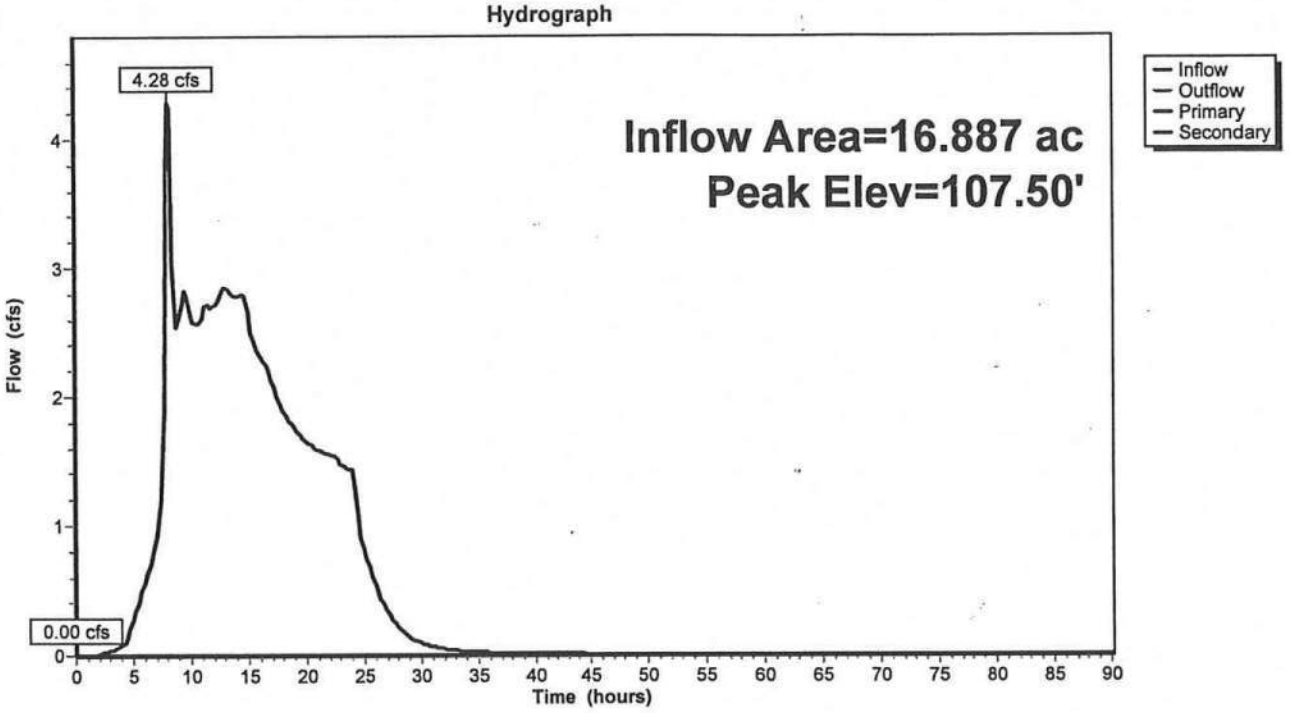


Pond 5P: Ponding behind driveway entrance to NWP



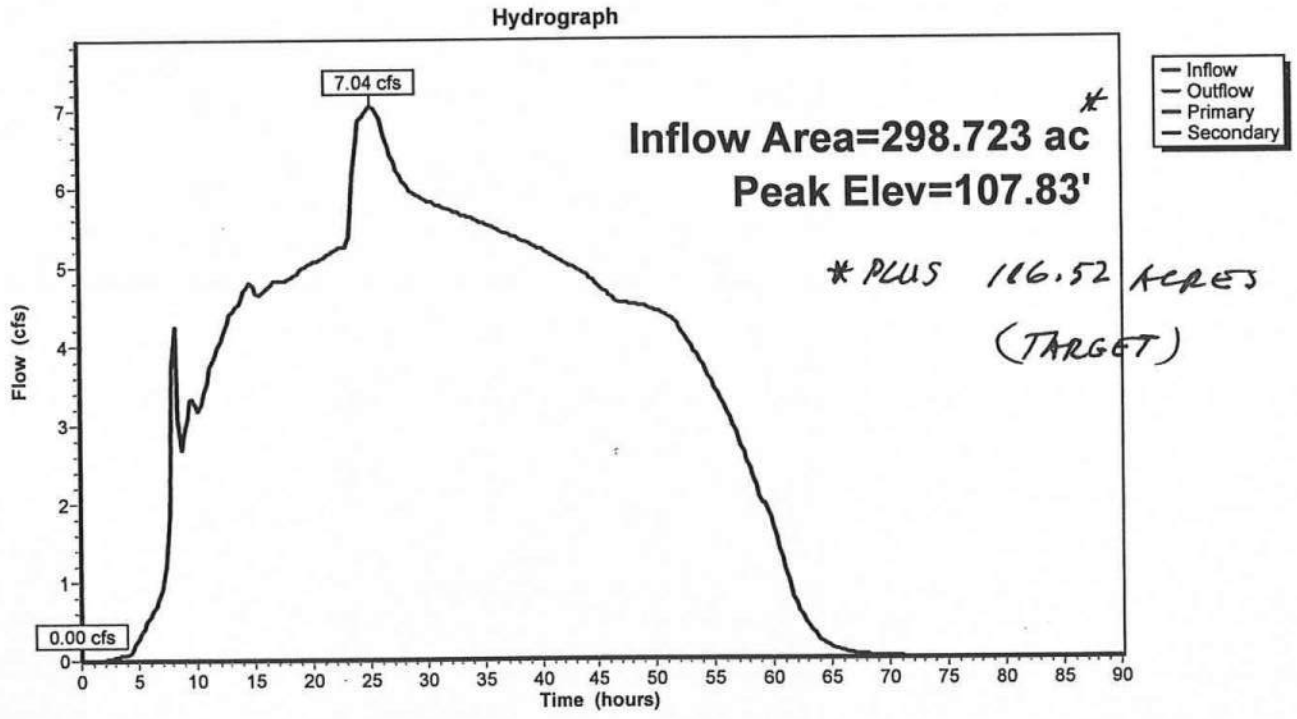
Pond E: East Entrance

Hydrograph

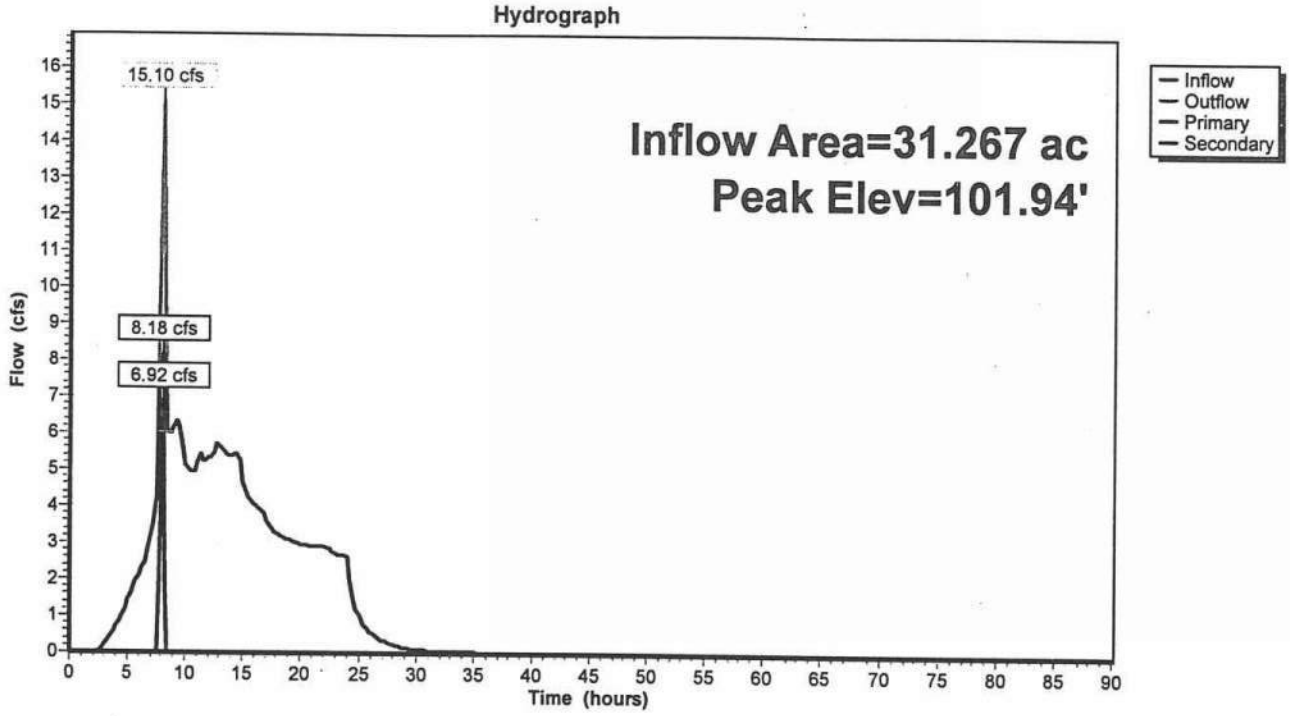


Pond E: East Entrance

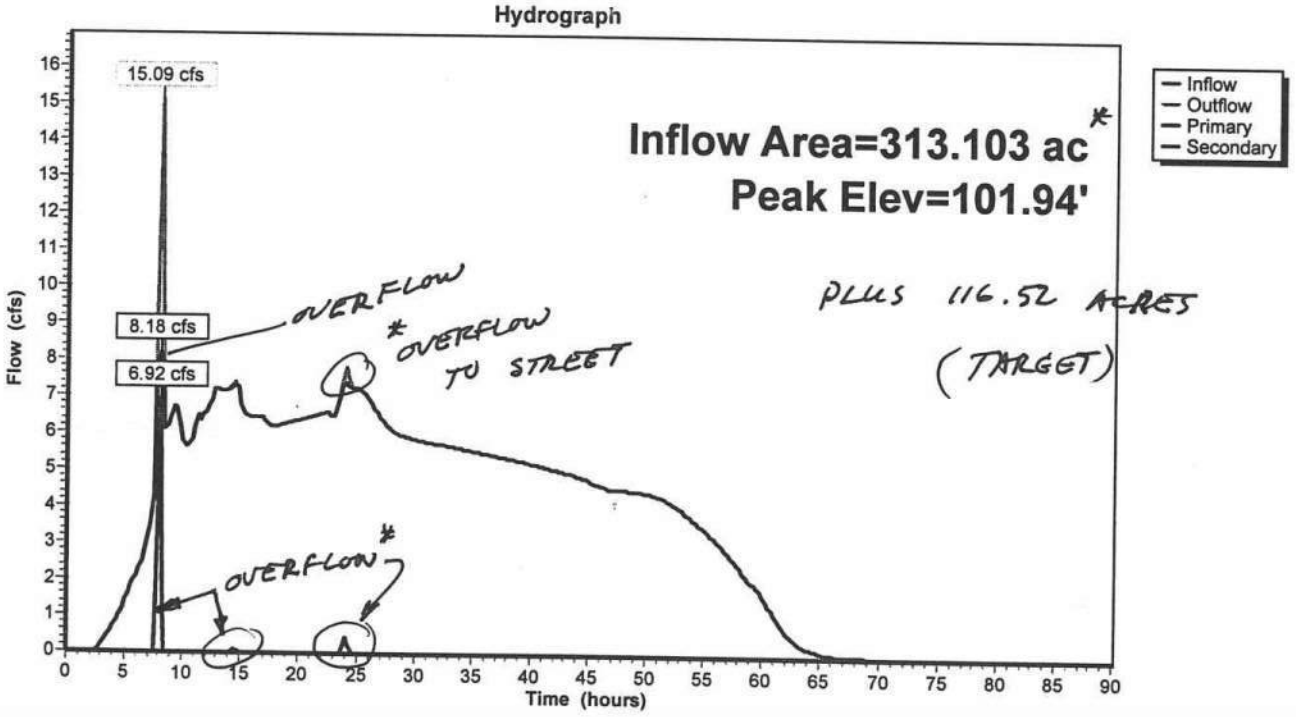
Hydrograph



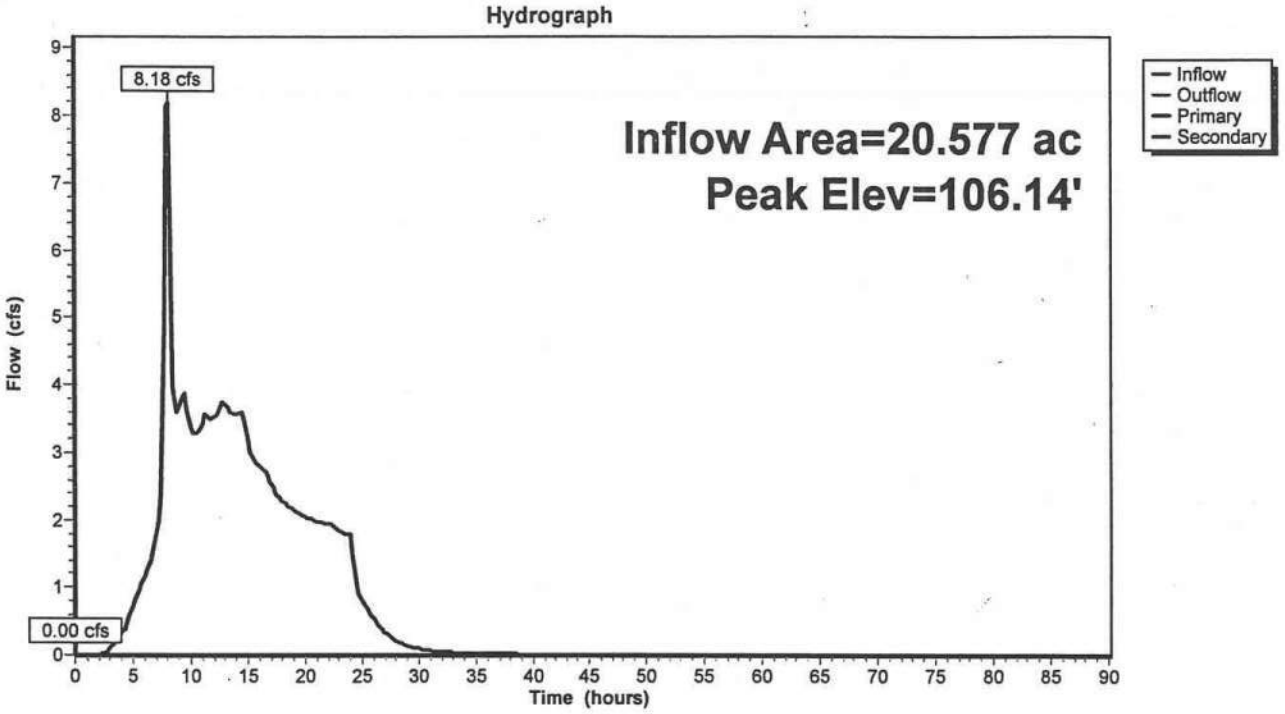
Pond 1: Begin 18 inch culvert



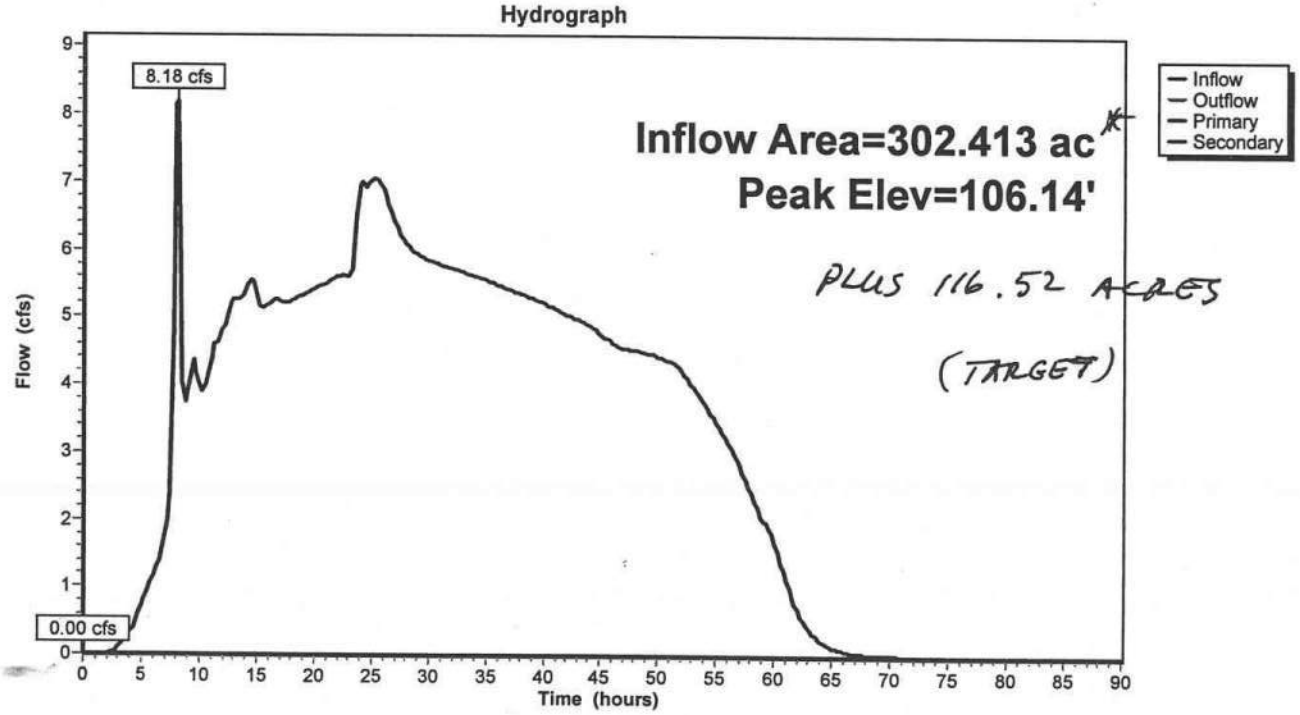
Pond 1: Begin 18 inch culvert



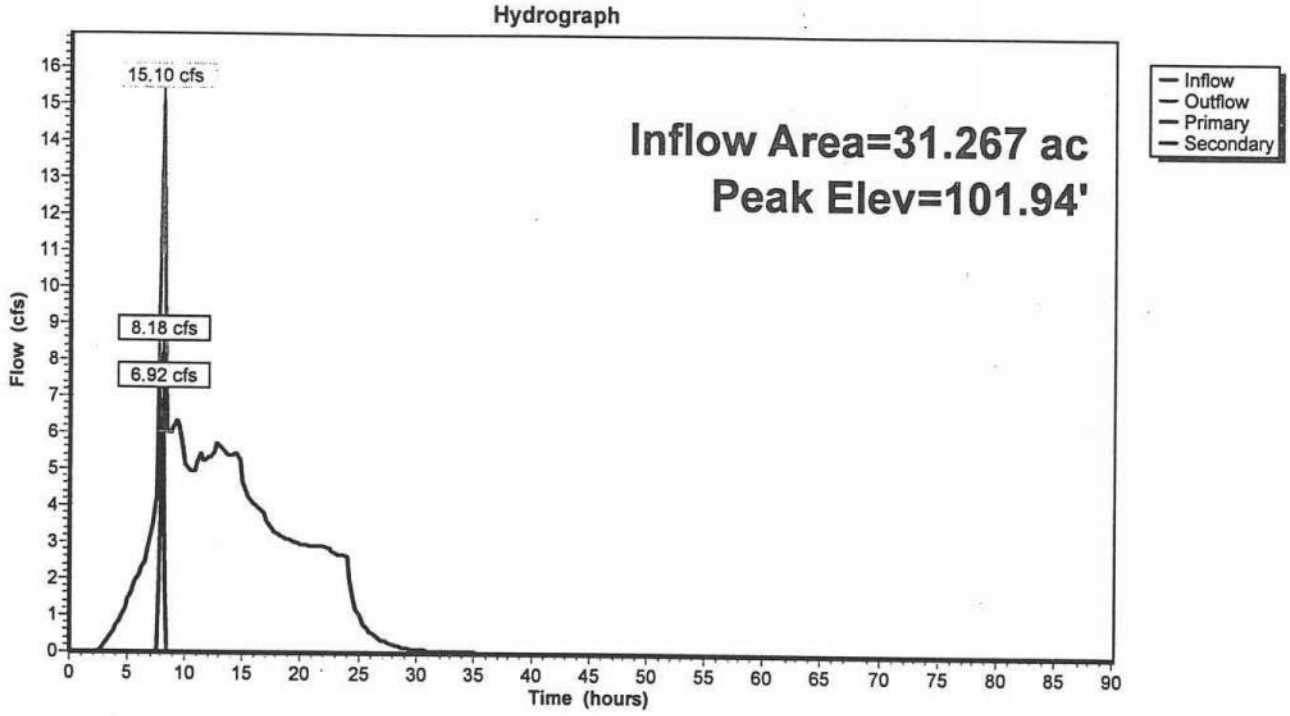
Pond W: West Entrance



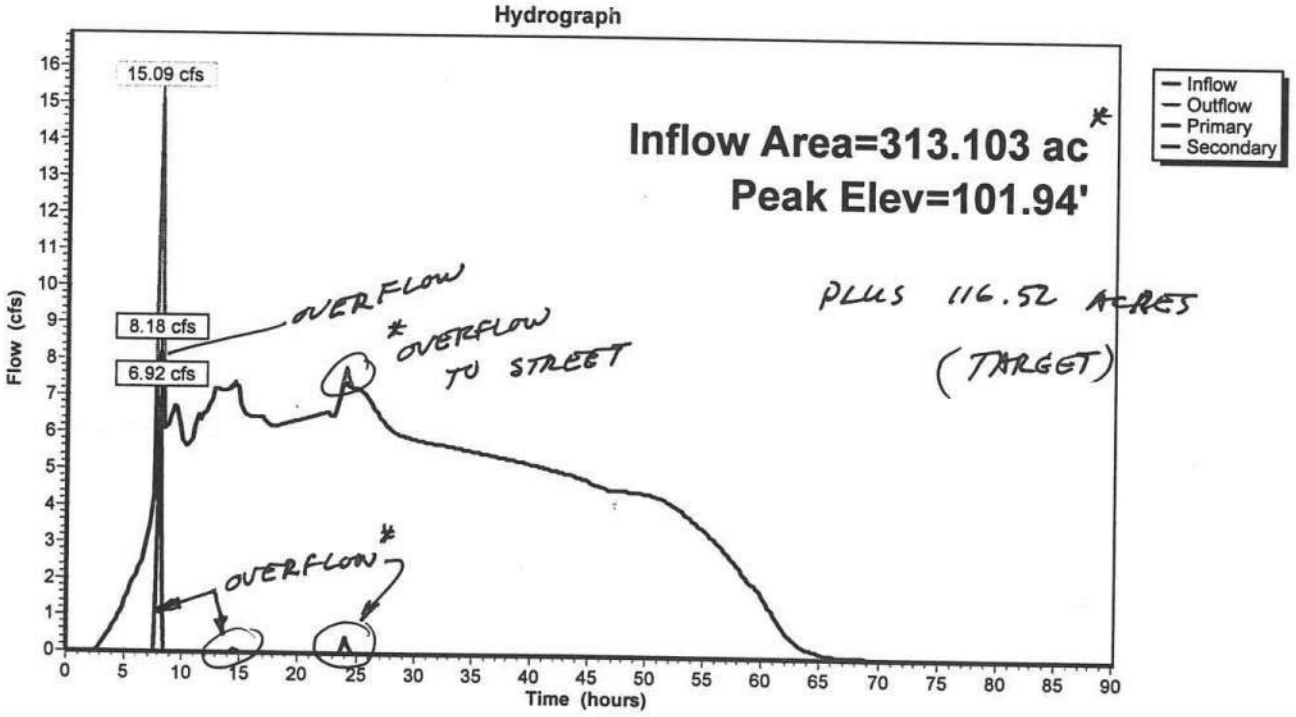
Pond W: West Entrance

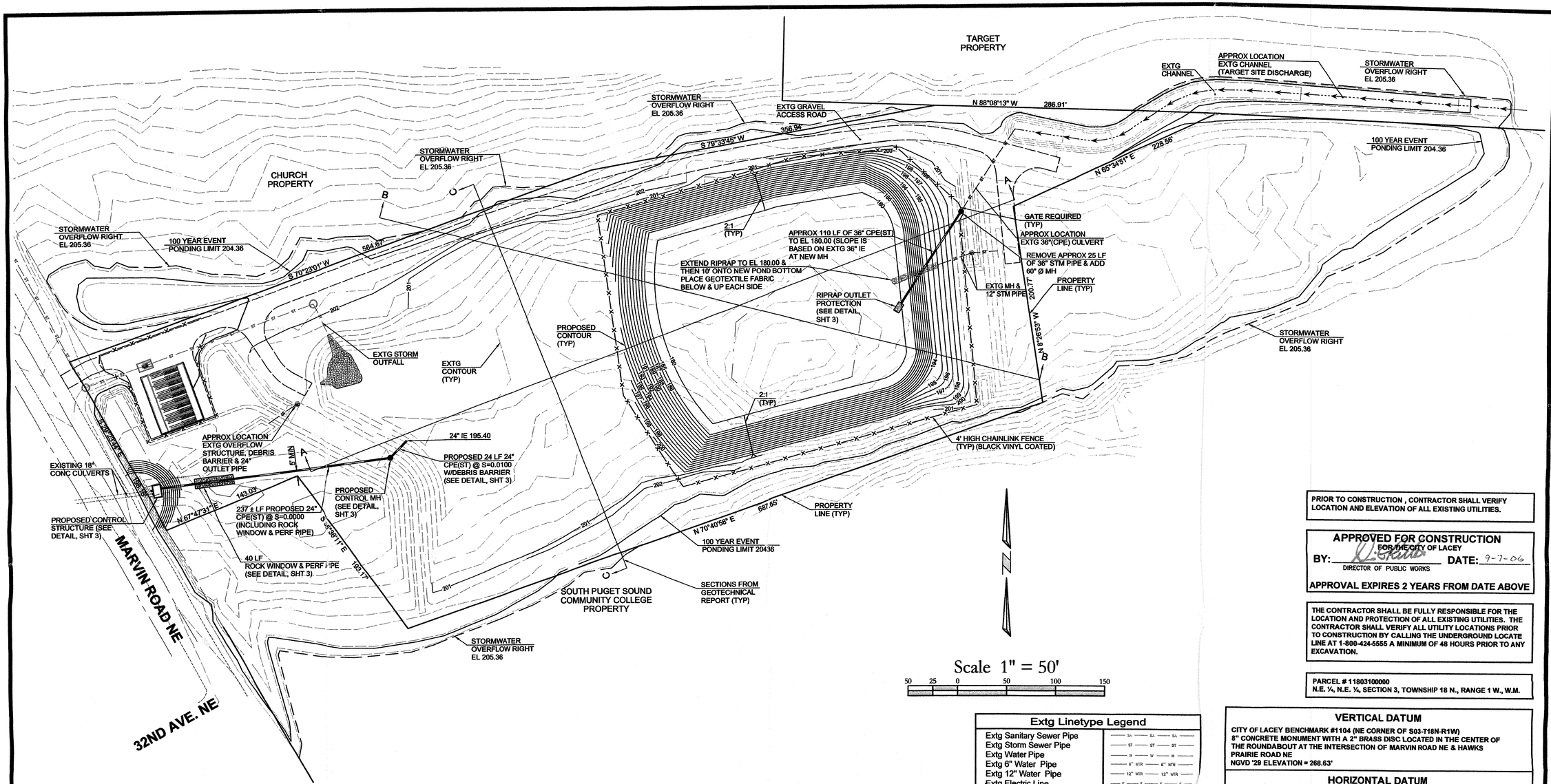


Pond 1: Begin 18 inch culvert



Pond 1: Begin 18 inch culvert





Extg Linetype Legend	
Extg Sanitary Sewer Pipe	SA SA SA
Extg Storm Sewer Pipe	ST ST ST
Extg Water Pipe	W W W
Extg 6" Water Pipe	6" WTR 6" WTR
Extg 12" Water Pipe	12" WTR 12" WTR
Extg Electric Line	E E E E
Extg Telephone Line	T T T T

PRIOR TO CONSTRUCTION , CONTRACTOR SHALL VERIFY LOCATION AND ELEVATION OF ALL EXISTING UTILITIES.

APPROVED FOR CONSTRUCTION
FOR THE CITY OF LACEY
BY: _____ DATE: 9-7-06
DIRECTOR OF PUBLIC WORKS

APPROVAL EXPIRES 2 YEARS FROM DATE ABOVE

THE CONTRACTOR SHALL BE FULLY RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL EXISTING UTILITIES. THE CONTRACTOR SHALL VERIFY ALL UTILITY LOCATIONS PRIOR TO CONSTRUCTION BY CALLING THE UNDERGROUND LOCATE LINE AT 1-800-424-5555 A MINIMUM OF 48 HOURS PRIOR TO ANY EXCAVATION.

PARCEL # 11803100000
N.E. ¼, N.E. ¼, SECTION 3, TOWNSHIP 18 N., RANGE 1 W., W.M.

VERTICAL DATUM

CITY OF LACEY BENCHMARK #1104 (NE CORNER OF S03-T18N-R1W)
8" CONCRETE MONUMENT WITH A 2" BRASS DISC LOCATED IN THE CENTER OF THE ROUNDABOUT AT THE INTERSECTION OF MARVIN ROAD NE & HAWKS PRAIRIE ROAD NE
NGVD '29 ELEVATION = 268.63'

HORIZONTAL DATUM

CONTROL POINT #1: CITY OF LACEY CONTROL POINT #149 (NORTH 1/4 CORNER OF S03-T18N-R1W)
3" SURFACE MONUMENT LOCATED IN THE CENTERLINE OF HAWKS PRAIRIE ROAD NE (125'± EAST OF DRIVEWAY #6705)
N (FT): 646446.582 E (FT): 69730.327 (CITY OF LACEY COORDINATE SYSTEM)
N: 646405.0141 E: 1069661.5148 (NAD 83/91, WASHINGTON STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, US SURVEY FEET)
CONTROL POINT #2: CITY OF LACEY CONTROL POINT #150 (NE CORNER OF S03-T18N-R1W)
8" CONCRETE MONUMENT WITH A 2" BRASS DISC LOCATED IN THE CENTER OF THE ROUNDABOUT AT THE INTERSECTION OF MARVIN ROAD NE & HAWKS PRAIRIE ROAD NE
N (FT): 646357.045 E (FT): 72370.974 (CITY OF LACEY COORDINATE SYSTEM)
N: 646315.4341 E: 1072302.0302 (NAD 83/91, WASHINGTON STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, US SURVEY FEET)
CONTROL POINT #3: CITY OF LACEY CONTROL POINT #151 (EAST 1/4 CORNER OF S03-T18N-R1W)
REBAR WITH 2" DISC (STAMPED "S3/S2 1/4 T18N R1W LS #7397") LOCATED AT A 3-WAY CHAIN LINK FENCE CORNER
N (FT): 643650.505 E (FT): 72309.514 (CITY OF LACEY COORDINATE SYSTEM)
N: 643609.1119 E: 1072240.5651 (NAD 83/91, WASHINGTON STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, US SURVEY FEET)

TO CONVERT FROM NAD 83/91, WASHINGTON STATE PLANE COORDINATE SYSTEM, SOUTH ZONE, US SURVEY FEET TO CITY OF LACEY COORDINATE SYSTEM: MULTIPLY WCS COORDINATES BY 1.000064303 AND THEN SUBTRACT 1,000,000 FROM THE EASTING.

BROOKS G. LOVEGREN — STATE OF WASHINGTON — 34055 — REGISTERED PROFESSIONAL ENGINEER
9-12-06
EXPIRES: FEB 14, 2008

HOPPER DENNIS JELLISON P.L.L.C.
ENGINEERS · PLANNERS
LANDSCAPE ARCHITECTS
314 W. 15th Street
Vancouver, WA 98660-2927
(360) 695-1385
(503) 924-4905
FAX (360) 695-8767
Internet: www.hdjengineers.com

STORM POND

STORM WATER POND PLAN FOR:
MERIDIAN GROUP I
A SITE LOCATED IN LACEY, WASHINGTON

DESIGNED: GME	
DRAWN: LRC	
CHECKED: TGL	
SCALE: H: 1"=50' V: N/A	
APR 2006 2220-03	
SHEET	2 / 3

RETURN ADDRESS

_____
_____
_____

Thurston County Treasurer

Real Estate Excise Tax paid none

By _____ Deputy

Please print neatly or type information

Document Title(s)
Amendment to Stormwater Operation, Maintenance and Easement Agreement 1

Reference Number(s) of related documents:
3699021____ 3699022____ _____ _____

Additional reference #'s on page ____

Grantor(s) (Last, First and Middle Initial)
Target Corporation
Meridian Group I

Meridian Group II

_____
_____

Additional grantors on page ____

Grantee(s) (Last, First and Middle Initial)
Target Corporation
Meridian Group I

Meridian Group II

_____
_____

Additional grantees on page ____

Legal Description (abbreviated form: i.e. lot, block, plat or section, township, range quarter/quarter)
Parcel A OF BA05-00013LA.

Additional legal is on page ____

Assessor's Property Tax Parcel/Account Number:
11802230000

Additional parcel #'s on page ____

The Auditor/Recorder will rely on the information provided on thi
accuracy of completeness of the indexing information provided h

STEWART TITLE OF WESTERN EAS $32.00
3767889
Page: 1 of 9
09/16/2005 11:53A
Thurston Co, WA

STEWART TITLE OF WESTERN AGR $40.00
3767888
Page: 1 of 9
09/16/2005 11:53A
Thurston Co, WA

AMENDMENT
to
STORMWATER OPERATION, MAINTENANCE AND EASEMENT AGREEMENT
("Agreement")

dated December 29, 2004 by and between Target Corporation, a Minnesota corporation ("Target"), Meridian Group No. 1, a Washington limited partnership ("MG1") and Meridian Group II, a Washington limited partnership ("MGII").

RECITALS:

WHEREAS, the Agreement provides for certain benefits and obligations of the Owners present and future, of the Target Tract, the MG1 Tract , and other tracts using the On-site Facilities; and

WHEREAS, Paragraph 9 of the Agreement states "The term "Owner" as used herein shall be deemed to include Target and MG1, and other users of the On-Site Facilities and any and all successors, grantees and assigns of such parties, but only during the time such party owns property whose storm water is handled by the On-Site Facilities."; and

WHEREAS, Paragraph 3 of the Agreement states "Such proportionate shares shall be based on the respective square footage amounts of land area of each Tract using the On-Site Facilities relative to the total land area of the benefited parcels, less the land area of the Storm Water Maintenance Pond"; and

WHEREAS, several parcels of land have transferred ownership and additional users are being included in the Agreement;

NOW, THEREFORE, Target, MG1 and MGII do hereby agree to amend the Agreement to include the additional users included below and specify the new proportionate shares of the users of the Pond as follows;

Target:	133.6 acres	49.2 %	Target
MG1: some of the acreages are off	9.		North Thurston Life Center aka Gateway church
South Puget Sound Community College:	54.5 acres	20.1 %	This parcel might have their own facilities
Aho Construction I, Inc.	5.0 acres	1.8 %	Turning Point Church
Raili May-Jaylee Homeowners Association	56.9 acres	21.0 %	HOA
Meridian Group II	9.8 acres	3.6 %	BP & Apartments
Donald and Susan Gerend	2.6 acres	1.0 %	Armor Storage

These amended proportionate shares shall apply to the share of on-going maintenance and repair costs as described in Paragraph 3 Pond Maintenance. It is further agreed that the owner of the MG 1 Tract may transfer the obligation to "maintain, or cause a qualified agent to maintain the Storm Water Management Pond" over to the Raili May-Jaylee Homeowners Association (when organized) of the residential community being developed by Aho Development on 29.9 acres of formerly MGII property plus approximately 27 acres on the north side of Hawks Prairie Road.

IN WITNESS WHEREOF, Target, MG1 and MGII have entered into this Amendment as of June 15, 2005.

"Target"
Target Corporation,
a Minnesota corporation

By: _____
Its: Joseph L. Nuñez
Assistant Secretary
Target Corporation

"MG1"
Meridian Group No. 1,
a WA Limited Partnership

By: _____
Its: General Partner

"MGII"
Meridian Group II,
a WA Limited Partnership

By: _____
Its: General Partner

AGREED:

South Puget Sound Community College,
Olympia WA

By: _____
Acting through the Dept.
of ~~General Administ~~ration
Its: Acquisition/Disposal Mgr.

Aho Construction I, Inc.,
a Washington corporation

By: _____
Melvin S. Aho
Its: President

Donald and Susan Gerend,
2959 224th Pl. S.E.
Sammamish, WA 98075

By: _____
Donald Gerend

By: _____
Susan Gerend

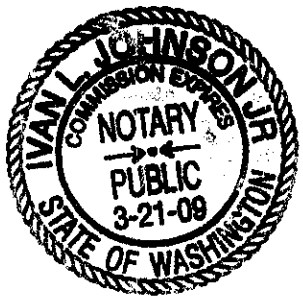
Raili May-Jaylee Homeowners Association

By: _____
Melvin S. Aho

STATE OF Washington)
) **ss.**
COUNTY OF Thurston)

I certify that I know or have satisfactory evidence that Gloria Fletcher signed this instrument, on oath stated that he was authorized to execute the instrument and acknowledged it as the Acquisition and Disposal Manager Buildings, Grounds and Real Estate Services for the State of Washington, State Board for Community and Technical Colleges, South Puget Sound Community College to be the free and voluntary act of such party for the uses and purposes mentioned in this instrument.

Dated: September 15th, 2005



Name:
Notary Public in and for the State of Washington
residing at Olympia
My appointment expires: 3-21-09

STATE OF WASHINGTON)
) SS
COUNTY OF KING)

On this 14 day of July, 2005, before me, a Notary Public within and for said County, personally appeared Clifford R. Mollberg to me personally known, being by me duly sworn, did say that he is the General Partner of Meridian Group No. I Limited Partnership and Meridian Group II Limited Partnership and that said instrument was signed on behalf of said partnership by authority of its partners, and he acknowledged said instrument to be the free act and deed of said partnership.

Notary Public

My Commission expires: 12/16/2006

Notary Public
State of Washington
TIM HAYS
My Appointment Expires Dec 16, 2006

STEWART TITLE OF WESTERN EAS $32.00
3767889
Page: 5 of 9
09/16/2005 11:53A
Thurston Co, WA

STEWART TITLE OF WESTERN AGR $40.00
3767888
Page: 5 of 9
09/16/2005 11:53A
Thurston Co, WA

STATE OF WASHINGTON)

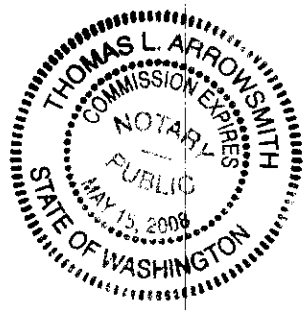
COUNTY OF CLARK)

I hereby certify that I know or have satisfactory evidence that MELVIN S. AHO is the person who appeared before me, and said person acknowledged that he signed this instrument, on oath stated that he is authorized to execute the instrument and acknowledged it as the President of AHO CONSTRUCTION I, INC. to be the free and voluntary act of such party for the uses and purposes mentioned in this instrument.

Dated this 12TH day of July, 2005.

Thomas L. Arrowsmith

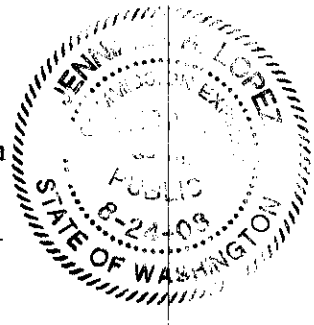
Notary Public in and for the State of Washington
Residing at Vancouver, Wa.
My appointment expires May 15, 2008



STATE OF WASHINGTON)
) SS
COUNTY OF KING)

On this 15th day of July, 2005, before me, a Notary Public within and for said County, personally appeared Susan H. Gerend to me personally known, being by me duly sworn, and said person acknowledged that she signed this instrument and acknowledge it to be her free and voluntary act for the uses and purposes mentioned in this instrument.

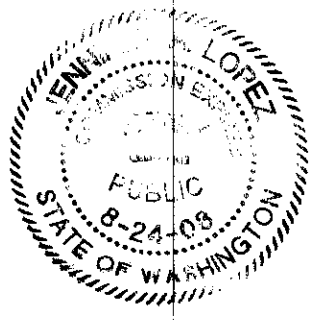
Notary Public in and for the State of Washington
Residing at Sammamish WA 98074
My appointment expires 8-24-08



STATE OF WASHINGTON)
) SS
COUNTY OF KING)

On this 15th day of July, 2005, before me, a Notary Public within and for said County, personally appeared Donald J. Gerend to me personally known, being by me duly sworn, and said person acknowledged that he signed this instrument and acknowledge it to be his free and voluntary act for the uses and purposes mentioned in this instrument.

Notary Public in and for the State of Washington
Residing at Sammamish, WA 98074
My appointment expires 8-24-08



STATE OF MINNESOTA)
) ss.
County of HENNEPIN)

On this day personally appeared before me Joseph L Nuñez, the Assistant Secretary of the corporation that executed the within and foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that he was authorized to execute the said instrument.

GIVEN under my hand and official seal this 22nd day of July, 2005.

Karen Seglem
Notary Public in and for the State of Minnesota, residing at
Apple Valley, Mn

My commission expires: 1/31/2010

KAREN SEGLEM
NOTARY PUBLIC – MINNESOTA
My Commission Expires Jan. 31, 2010

STEWART TITLE OF WESTERN EAS $32.00
3767889
Page: 8 of 9
09/16/2005 11:53A
Thurston Co, WA

STEWART TITLE OF WESTERN AGR $40.00
3767888
Page: 8 of 9
09/16/2005 11:53A
Thurston Co, WA

ADDITIONAL NOTARY FOR: Amendment

STATE OF Washington)
) **ss.**
COUNTY OF Clark)

I certify that I know or have satisfactory evidence that Melvin S. Aho signed this instrument on behalf of Raili May-Jaylee Homeowners Association, and acknowledged it to be their free and voluntary act for the uses and purposes mentioned in this instrument.

Dated: September 14, 2005

x Thomas L. Arrowsmith
Name: Thomas L. Arrowsmith
Notary Public in and for the State of Washington
residing at Vancouver, Wa.
My appointment expires: May 15, 2008