DECCIO Engineering Inc.

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Bothell, WA. 98012
(206) 390-8374
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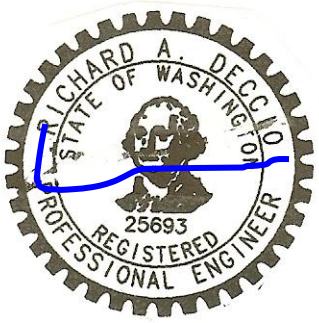
Lacey Gas Station and Retail
City of Lacey

Drainage Design Report

Property Location:
Campus Glen Drive NE
Lacey, WA



February 2, 2021

Prepared for:

Northwest Investors LLC

Gas Station and Retail
STORMWATER DRAINAGE REPORT

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"I hereby state that this Drainage Control Plan for Lacy Gas Station and Retail 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."

2-3-21

Section 1: Proposed Project Description

This report has been prepared at the request of Northwest Investors LLC in support of a commercial building permit for a site located at the intersection of Willamette Drive NE & Campus Glen Drive NE, Lacy Washington in the SE ¼ Section 36, Township 19 North, Range 01 East W.M. Parcel #11936340200. (Refer to **Site Location and Vicinity Map**).

This report addresses the drainage report contents and organization of "City of Lacy" 2016 Stormwater Design Manual as supplemented by the DOE 2014 Stormwater Management Manual as adopted by the City of Lacy. Specifically we have designed the drainage using a review of the ***Core Requirement applications as outlined in Chapter 2.1.1 , Figure 2.1 of the*** City of Lacy Stormwater Design Manual.

The project consists of construction of gas station and retail space on a 1.50 acre site. The existing lot is vacant with a cover of trees and brush.

Once developed, the site will add a gas station and retail shop with a total of 32,293 sf of new impervious area as follows:

Impervious Areas:

- Retail Building Roof Area: 8,060 SF
- Gas Pump Roof Area: 3,735 SF
- Parking & Walks: 20,498 SF
    - **Total Impervious Area: 32,293 SF**

Pervious Areas:

- Landscape Area: 10,779 SF
- Native Area To Remain: 22,268 SF (Includes exist frontage improvements)
    - Total Perv Area: 33,047 Sf

Area of Disturbance: 43,150 SF

No frontage improvements are required except for the construction of two driveway approaches located at the south and east sides of the site. The runoff from the proposed site improvements will be intercepted by catch basins and storm pipes, where the runoff will pass through a StormFilter catch basin for water quality, then detained in a detention vault before being released to the roadway storm system.

To the north end of the site is 22,268 sf or 0.51 acres containing trees and natural vegetation. No construction or disturbance of this area is proposed.

The "Geotechnical Engineering Report" prepared by ZipperGeo shows the site soils are not suitable for any LID measures. Therefore, detention is required.

Minimum Requirements

- **Minimum Requirement #1:** Preparation of Stormwater Plans
    - The civil plans and Section 5 of this report addresses the preparation of the stormwater plans required for this project.

- **Minimum Requirement #2:** Construction Stormwater Pollution Prevention Narrative.
    - The SWPPP Report prepared for the site addresses all 13-elements of a SWPP Plan

- **Minimum Requirement #3:** Source Control of Pollution
    - Since the project is for a small commercial site , the SWPPP Report prepared for the site addresses all further details for Source Control of Pollution.

- **Minimum Requirement #4:** Preservation of Natural Drainage Systems and Outfalls
    - All runoff currently leaves the site along the south side of the property and into the street. The proposed discharge location for the site improvements is a catch basin located to the south-west, thereby maintaining the natural discharge location.

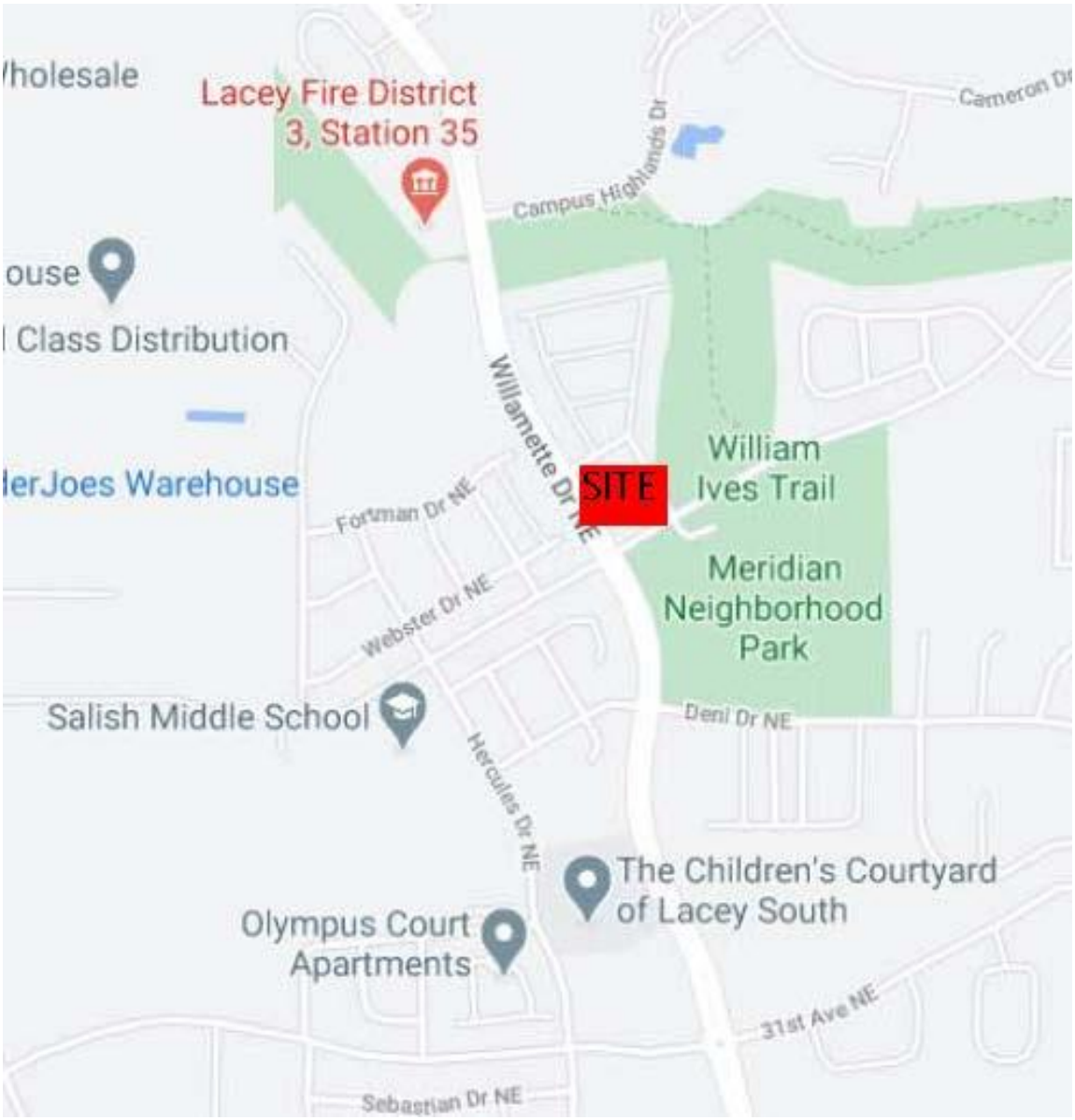
- **Minimum Requirement #5:** On-Site Stormwater Management BMP's
    - Section 4 of this report addresses the on-site bmps and the justification of why they cannot be used.

- **Minimum Requirement #6**: Runoff Treatment
    - Since the PGIS area is over 5,000 sf, runoff treatment will be provided through the use of a StormFilter 360 Catch Basin to provide the necessary runoff treatment.
    - The gas pumps contain their own separate oil/water separator which will discharge to the sanitary sewer system.

- **Minimum Requirement #7**: Flow Control
    - Since the site is not able to use LID measures and the impervious area is over 5,000 sf, detention and flow control is required.

- **Minimum Requirement #8:** Wetlands Protection
    - There are no wetlands or other sensitive areas on site.

- **Minimum Requirement #9:** Operations and Maintenance.
    - A separate Operations and Maintenance Manual has been prepared to address the specific requires for the site



VICINITY MAP

Section 2: Existing Site Conditions

The existing site is a vacant lot 1.50 acres in size. The site is surrounded by existing streets on the south, east and west sides. To the north are residential homes. The site cover is trees, meadow and brush. The site contains modest slopes ranging from 5 to 18-percent with all runoff draining towards the south end of the site. The drainage from the site is basically limited to the site itself with all off site runoff being intercepted by the adjacent streets.

Existing Drainage Characteristics and Site Conditions

Section: 3 Vicinity Analysis and Subbasin Description

Per Section 2.5, Stormwater site plans and SWPP Plans have been prepared for the site and are included with this storm drainage report. Detention is proposed for the site since the runoff from the roof, and driveways are not suitable for LID methods and the impervious area is over 5,000 sf.

OFF SITE ANALYSIS AND MITIGATION

An Off Site Analysis and Mitigation Study meeting requirements outlined in Section 2.5.1 was performed on January 30, 2021 The weather was partly cloudy and cool at the time of the field inspection. **See Downstream Analysis Map.**

TASK I: PROJECT OVERVIEW & STUDY AREA DEFINITION

Existing Site Conditions: The project consists of construction of a gas station with retail space on a 1.50 acre site. The existing lot is vacant with a site cover of trees and meadow and slopes around 5 to 18-percent. The site itself drains towards the south-west.

TASK 2: REVIEW OF AVAILABLE INFORMATION ON STUDY AREA

Resource Review:

The following is a description of the resources that were reviewed for the preparation of this Level 1 Drainage Study:

A. **Basin Recognizance Summary:** Enclosed within are downstream and upstream basin area map which clearly define the flow pass and the drainage basins related to this project. See **(Downstream Analysis Map**)

Evidence of Existing and Predicted Problems

Lack of capacity or constrictions in the existing drainage system.

- On-site: No evidence of any problem.
- Off-site: Catch Basins & Storm Pipes None noted (no evidence of capacity or any other problems)

Overtopping, Scouring, Bank, Sloughing of Sedimentation

- On-site: No evidence of any problem.
- Off-site: C 12-inch pipes: N/A

Flooding etc.

- None Noted

Significant Destruction of Aquatic Habitat or Organisms

- None Noted

B. **Adopted Basin Plans:** None Known

C. **Floodplain/Floodway (FEMA Maps):** Does not appear to be located within the flood plain of the stream as determined by the FEMA maps.

D. **Other Off-Site Analysis Issues:** None Noted

TASK 3 & 4: FIELD INSPECTION AND DESCRIPTION OF DRAINAGE SYSTEM WITH EXISTING AND PREDICTED PROBLEMS

A Level 1 drainage analysis and "Off Site Analysis and Mitigation Study" meeting requirements outlined in Lacy SWWM Manual was performed. **See Downstream Analysis Map.**

Level 1 Downstream Drainage Analysis:

Section 1: Upstream Drainage Analysis:
Based on the site contours nearly all upstream off-site runoff is intercepted by the streets surrounding the site. Therefore, the upstream runoff entering the site negligible and limited to the site itself.

A review of the upstream area indicated that there were no indications of problems observed.

Section 2: On-site Drainage Considerations:

All runoff from the site discharges along the south-west side of the property and into the storm drain system serving Willamette Drive NE.

Section 3: Site & Willamette Drive NE
The runoff from the site leaves the lot along the south-west property line where it is intercepted by the storm pipe and catch basin system serving Willamette Drive NE.. From here the storm pipe system flows south for a total distance of over 3,400 feet.

There appeared to be no issues with the downstream drainage system, including capacity issues or overtopping of the catch basins

With the small size of the project and the use of detention, the proposed site improvements should have little if any impact on downstream conditions.

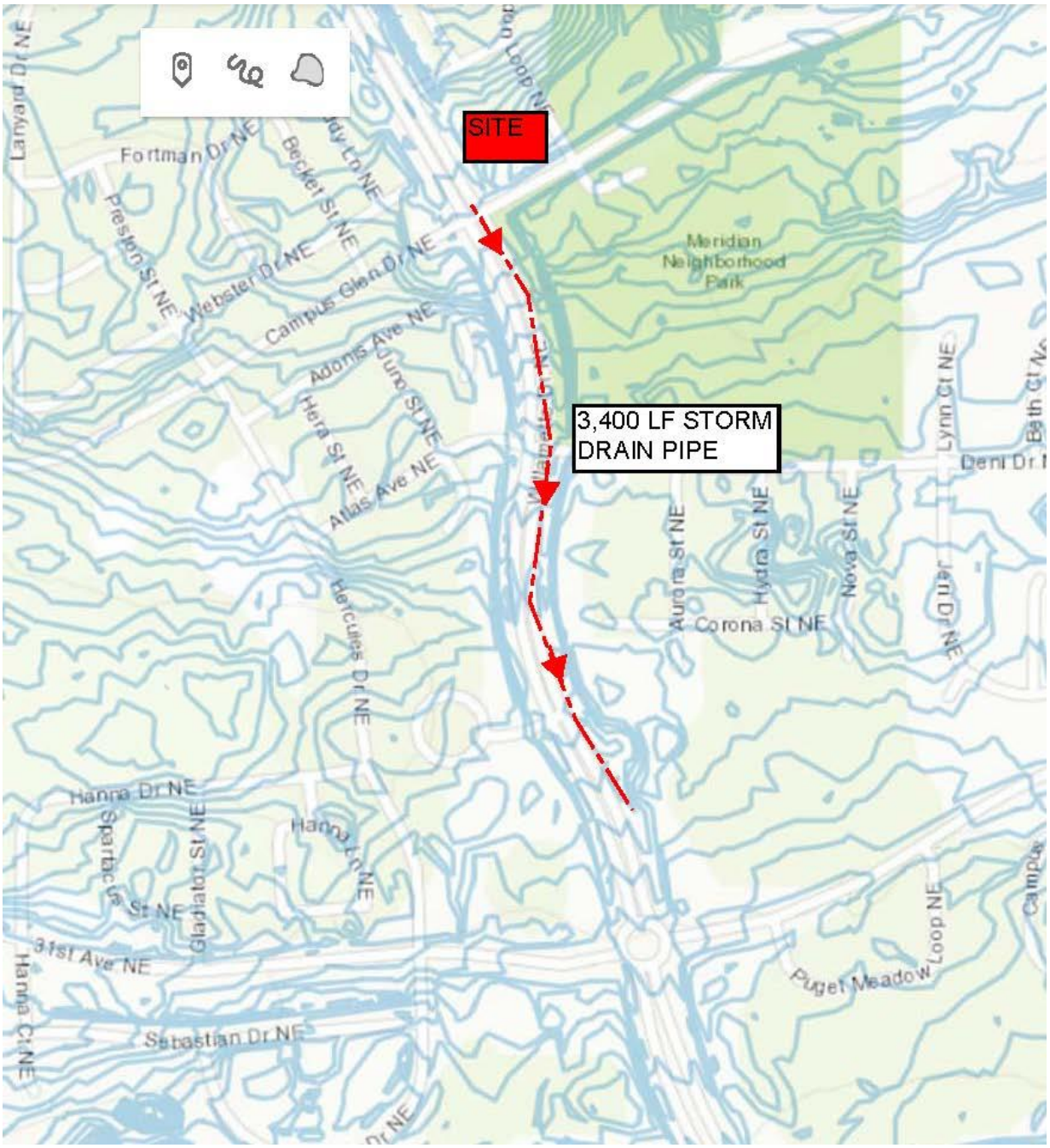
TASK 5: LEVEL 1 MITIGATION OF EXISTING PROBLEMS

Detention Vault with controlled release rates

Water Quality Requirements:
Water quality will be provided through the use of the StormFilter system.

Conclusions:

Based on the existing mitigation and lack of problems noted downstream, the site development should have little if any impact on downstream conditions.



Downstream Analysis Map

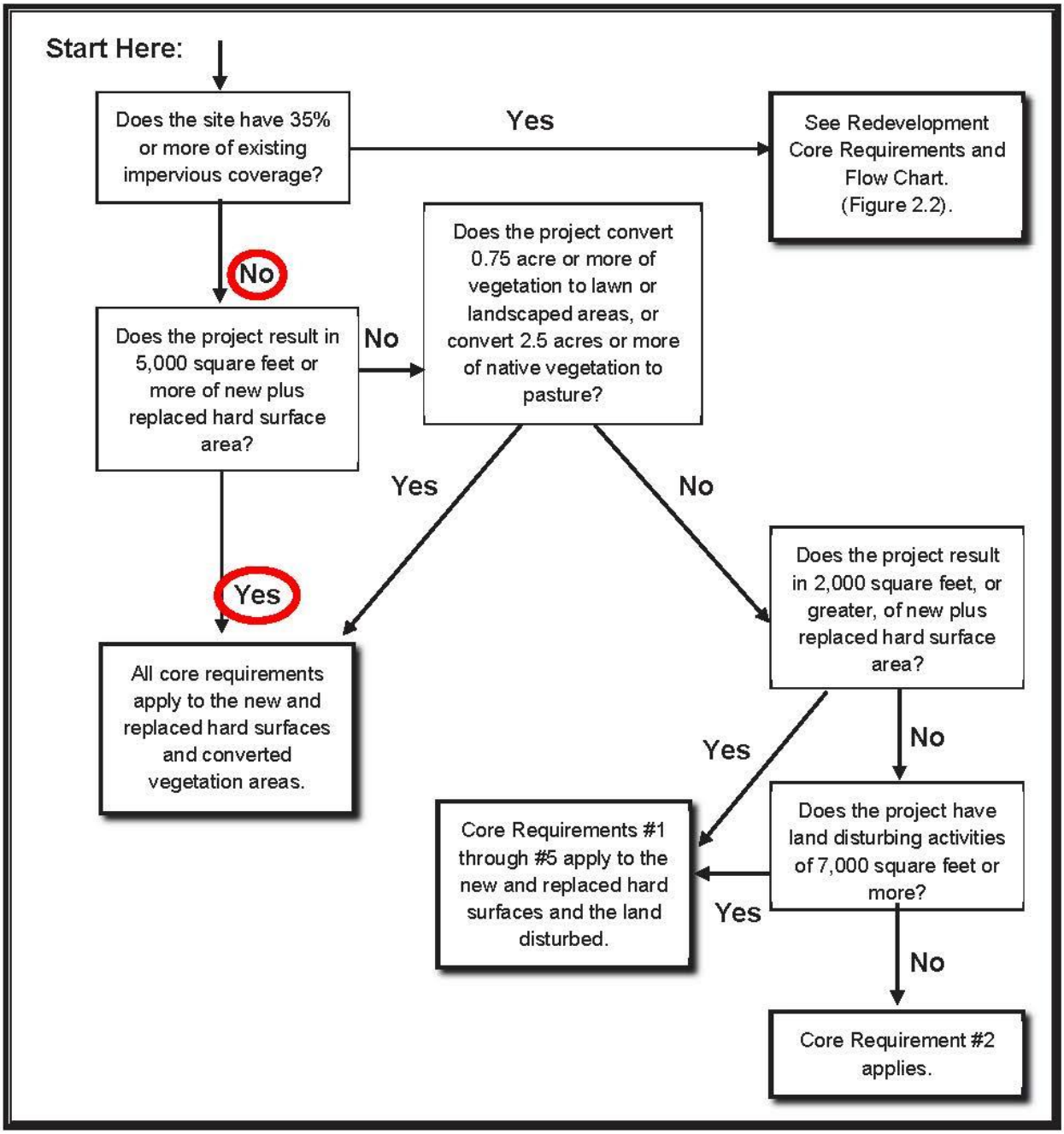


Figure 2.1. Flow Chart for Determining Requirements for New Development.

As discussed above, once developed the site will contain a gas station and retail space.

Under the **On-Site Stormwater Management Requirements"** the *"Low Impact Development Performance Standards"* specifically **List 2** of the Stormwater Management Manual, Volume 1, Chapter 2, Table 2.5.1, and BMP T5.13 requires that each item must be review and analyzed for use:

TABLE 2.5.1 LIST #2 BMP FEASIBILITY

Lawn and landscaped areas:

1. Post-Construction Soil Quality and Depth in accordance with BMP T5.13 in Volume V, Chapter 5 of this manual **(Will be used)**

Roofs:

1. Full Dispersion in accordance with BMP T5.30 in Volume V, Chapter 5 of this manual, or, for single-family residential roofs and commercial roofs determined by Snohomish County to have similar runoff pollution characteristics to single-family residential roofs, Downspout Full Infiltration Systems in accordance with BMP T5.10A in Volume III, Chapter 3 of this manual **(The geotechnical report prepared for the site found that the site soils not suitable for infiltration)**

2. Bioretention in accordance with Volume V, Chapter 7 of this manual. **(The site cannot meet the required setbacks and size required.)**

3. For single-family residential roofs and commercial roofs determined by Snohomish County to have similar runoff pollution characteristics to single-family residential roofs, Downspout Dispersion Systems in accordance with BMP T5.10B in Volume III, Chapter 3 of this manual. **(*Site cannot meet the required flow paths)***

4. For single-family residential roofs and commercial roofs determined by Snohomish County to have similar runoff pollution characteristics to single-family residential roofs, perforated Stub-out Connections in accordance with BMP T5.10C in Volume III, Chapter 3 of this manual. **(The geotechnical report prepared for the site found that the site soils are not suitable for infiltration)**

Other Hard Surfaces:

1. Full Dispersion in accordance with BMP T5.30 in Volume V, Chapter 5 of this manual**.(*The Geotech report prepared for the site show the soils* are not suitable for infiltration).**

2. Permeable pavement in accordance with BMP T5.15 in Volume V, Chapter 5 of this manual. NOTE: This is not a requirement to pave these surfaces. Where pavement is proposed, it must be permeable to the extent feasible unless full dispersion is employed. **(*The Geotech report* found that the site soils are not suitable for infiltration)**

3. Bioretention in accordance with Volume V, Chapter 7 of this manual. **(*Site can't meet the required setbacks and sizing* requirments)**.

4. Sheet Flow Dispersion in accordance with BMP T5.12, or Concentrated Flow Dispersion in accordance with BMP T5.11 in Volume V, Chapter 5 of this manual. **(*Site cannot meet the required flow paths*)**

Detention Analysis and Design

The project is required to provide detention per the "City of Lacy" 2016 Stormwater Design Manual based on the calculations below:

The **WWHM Ver.12 Hydraulic Simulation Model** was used to calculate the pre-developed and developed flows for the Hydrographs for the 2-year and 50-year, 24-hour duration design storm events for the existing and developed conditions. The control structure was sized to release of the 2-year peak flow through the 50-year flow in order to provide the required detention for the developed site runoff. The hydrographs were generated using the following information:

WWHM12 Input Information

- Regional Gage Station: Fairgrounds
- Precip Scale: 1.00
- Soils Type: Till

Existing Site Hydrology

The **existing site** is **1.50 acres** and is currently vacant. Located to the north is **0.51 acres** of native tree covered vegetation which bypasses the vault and will be excluded from the detention calculations. Therefore, the total drainage area intercepted by the vault will be 0.99 acres.

Under the existing site conditions the WWHM12 model requires a existing Land Use to be Till, Forest. The existing site covers are listed below. The **WWHM12** runoff was calculated from the existing forested conditions to determine the total allowable release rate from the Existing Site. (**See** "Existing Site and Drainage Conditions").

The site soils are identified as till Type C,

Existing Area Breakdown:

1. Proposed Total Site Area: 0.99 acres (Forested)

Total Area: 0.99 acres (Forested)

Developed Site Hydrology

The runoff from the developed site conditions including roof areas, and driveways, will be intercepted by the storm water detention pipes located in the driveway and landscape areas. Discharge from the site will be at it's current location at the south-west end of the site and into the existing storm system in the street. (**See Figure** "Developed Site Conditions")

The total area to be detained **0.99 acres**

Once developed, the site will add a gas station and retail shop with a total of 32,293 sf of new impervious area as follows:

Impervious Areas:

- Retail Building Roof Area: 8,060 SF
- Gas Pump Roof Area: 3,735 SF
- Parking & Walks: 20,498 SF
    - **Total Impervious Area: 32,293 SF (0.75 acres Impervious)**

Pervious Areas:

- Landscape Area: 10,779 SF
  - **Total Perv Area: 10,779 SF (0.24 acres landscape)**

Results of WWHM12 Computer Analysis:

Storm Event	Mitigated. Site	Predev. Site
• 2-year, return period:	0.02641 cfs	0.04430 cfs
• 50-year, return period:	0.09355 cfs	0.12281cfs
• 100-year, return period:	0.11530 cfs	0.13666 cfs

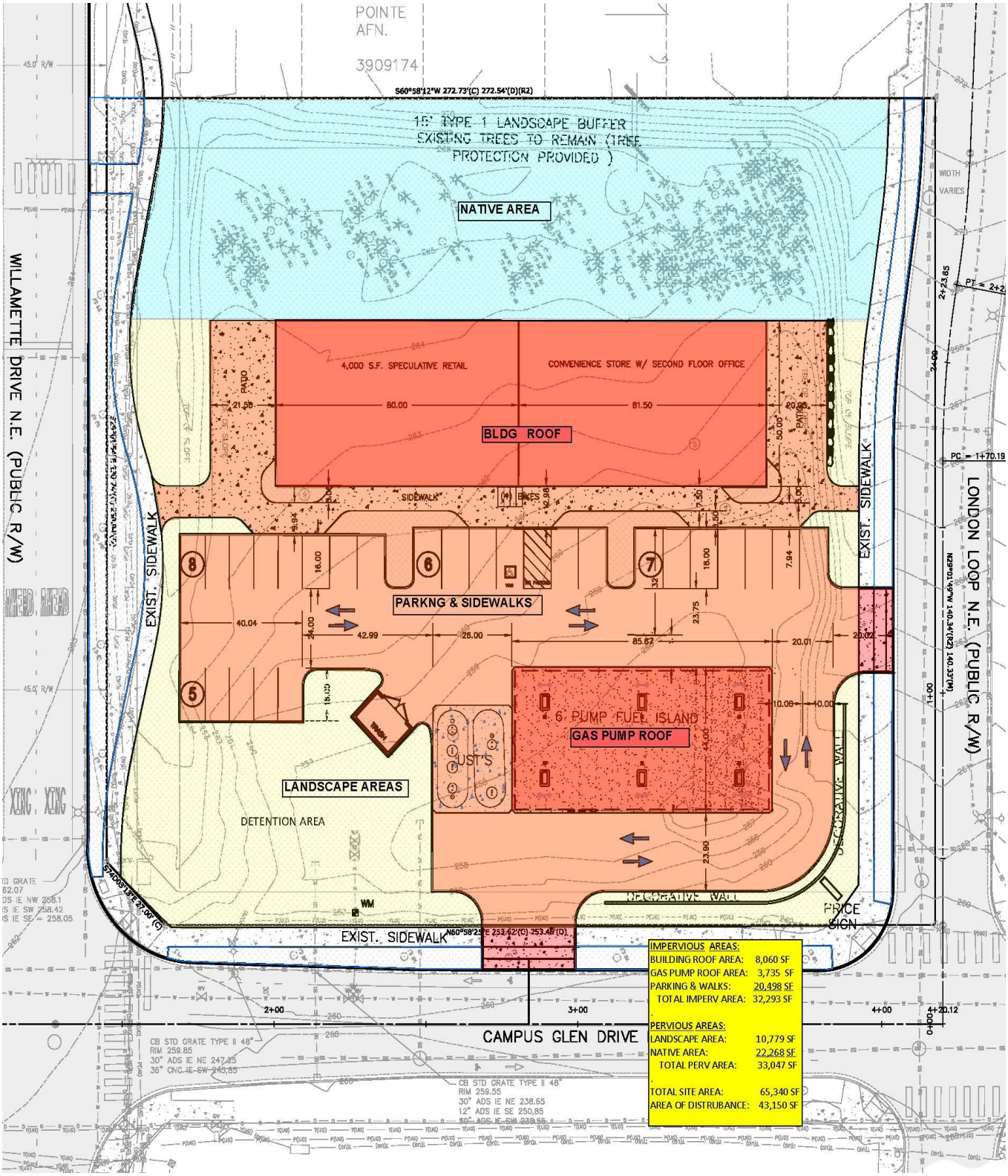
Results From WWHM12 Calculations:

Retention/Detention Facility

- Type Of Facility: Detention Vault
- Side Slopes: Vert Conc Walls
- Pond Bottom Width: 30.57-ft (32' Actual size)
- Pond Bottom Length: 61.15-ft (59' Actual Size)
- Pond Bottom Area: 1,888- sf
- Effective Live Storage Depth: 7.0-ft
- Live Storage Volume Required: 13,085 cu.-ft
- Live Storage Volume Provided: 13,216 cu.-ft (at Vault Size of 32' x 59')
- Dead Storage Volume Req'd: 934 cu.-ft (at 0.5-ft depth)
- Dead Storage Volume Provided: 944 cu.-ft (at 0.5 ft depth)
- Water Quality System: StormFilter
- Riser Head: 7.0 ft
- Riser Diameter: 12.00 inches
- Number of Orifices: 3

Orifices #	Height	Diameter	
1	0.00 ft	0.68 inches	(5/8-inch)
2	4.58 ft	1.12 inches	(1-1/8-inch)
3	5.64 ft	0.64 inches	(5/8- inch)
Over Flow 12" Dia.	7.00 ft	12.00 inches	

The results of the **WWHM12 calculations** are included in **Appendix A**



Developed Site Conditions

WATER QUALITY:

Landscape Area: BMP T5.13 "Post Construction Soil Quality and Depth"

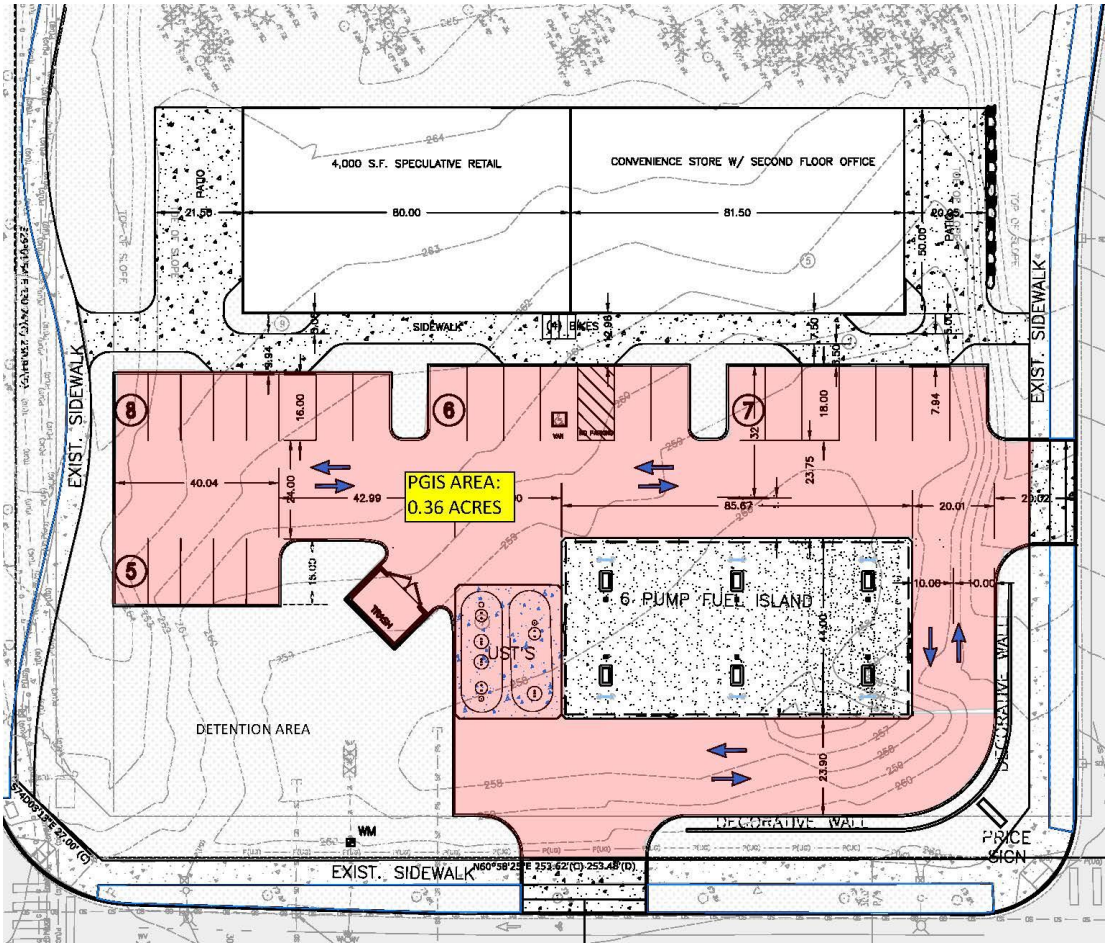
Since the site is a commercial site, landscape plans are required to be prepared by a licensed landscape architect. These plans include the required **"Post Construction Soil Quality and Depth" and are included in the submittal package.**

Parking and Driveway Water Quality: Water quality will be provided by installing a "StormFilter" Catch Basin structure from Contech Engineered Solutions Inc. Since the water quality structure is upstream of the vault it was sized to pick up the runoff from all the PGHS areas including the parking and driveways. Based on the design results, the system will require **two filters to treat the** flow determined from the mass loading design.

The following information was used for the final design of the filter (See design results on the next page)

Linear Storm Filter Design:

- Total contributing area: **0.36 acres**
- PGHS area draining to the StormFilter: **0.36 acres**
- Water Quality Flow Rate: **0.037 cfs**
- Peak Hydraulic Flow Rate: **0.460 cfs**



PGHS AREAS

Size and Cost Estimate

Prepared February 2, 2021

Gas Station – Stormwater Treatment System

Lacy, WA

Information provided:

- Total contributing area = 0.36ac
- Impervious area = 0.36ac
- Water quality flow, Q_{wq} = 0.037cfs
- Peak hydraulic flow rate, Q_{peak} = 0.46cfs
- Presiding agency = City of Lacy, WA

Assumptions:

- Media = ZPG cartridges
- Cartridge flow rate = 11.25 gpm
- Drop required from inlet to outlet = 3.05' minimum

Size and cost estimates:

The StormFilter is a flow-based system, and is therefore sized by calculating the peak water quality flow rate associated with the design storm. The water quality flow rate was calculated by the consulting engineer using WWHM and was provided to Contech Engineered Solutions LLC for the purposes of developing this estimate.

The StormFilter for this site was sized based on a water quality flow rate of 0.037 cfs. To accommodate this flow rate, it is recommended to use a StormFilter catch basin with 2, 27" cartridges (see attached detail).

11835 NE Glenn Widing Dr., Portland OR 97220
Toll-free: 800.548.4667 Fax: 800.561.1271

CONTECH®
ENGINEERED SOLUTIONS

Project Name:	Lacy Gas Station		
Site Designation:	CB #1	**Date:**	1/2/21
County or Independent City:	Lacy	**Design Engineer:**	RAD
State:	WA		

Mass Loading Calculations:

Peak Design Flow (cfs)	0.46
Water Quality Flow (cfs)	0.04
Annual Rainfall (inches)	36
Total Drainage Area, A (ac)	0.36
Post Development Impervious Area, A_I (ac)	0.36
Pervious Area, A_P (ac)	0.00
% Impervious	100%
Runoff Coefficient, Rc	0.95
TSS Removal By Pretreatment	50%
Agency Required TSS % Removal	80%
Required TSS Removal Efficiency of Filter	60%
Percent Runoff Capture	90%
Mean Annual Runoff, V_t (ft^3)	37,989
Event Mean Concentration of Pollutant, EMC (mg/L)	60
Annual Mass Load, M_{total} (lbs)	142.21

Flow Based Filter Sizing:

Mass to be Captured by System (lbs)	42.66
Filter Type	StormFilter
Structure Type	Catchbasin (Steel)
Cartridge Height	27"
Media Type	ZPG
Cartridge Flow Rate, gpm/sf	1.00 gpm/sf
Allowable Load Per Cartridge (lbs)	54
Cartridges Required	2
Recommended Model	SFCB2
TSS Treatment Capacity (lbs)	108.00
Maximum Water Quality Flow	0.05 cfs

Section 5: Aesthetic Considerations for Facilities

The proposed vault will be located underground with landscaping on top and will therefore be hidden from view.

Section 6: Conveyance System Analysis and Design

The piping and conveyance system for the interception of the drainage from the site was designed to convey the runoff from the 100-year, 24-hour storm event. **(See Flow Charts Appendix A)**

The following conveyance capacity calculations for the on-site systems were calculated using the 100-year developed flow results from Landscape, Parking and Driveway's and the Rational Method for the storm calculations.

Design results:

Storm Event	**Dev. On Site**
• 100-year, return period:	**0.52 cfs**: Developed flows for **12-inch pipe** from the parking area.

PIPE CAPACITY: Parking

The **12- CPEP pipe** serving the parking area was sized to handle the runoff from the 100-year storm. (See **Appendix A** "Pipe Conveyance Charts"

Using D.O.T. Chart 35 "Design Charts For Open Channel Flow":

12" CPEP Pipe	Slope:	0.50 % Minimum Slope,	
	Mannings:	n = .012	
	100-Year Dev. Flows:	**0.52 cfs**	Design Flow

Capacity Results:

12" Pipe Capacity:	=	2.50 cfs	(flowing full)	> 0.52 cfs required
Velocity:	=	3.10 fps		> 3.00 fps required

Therefore the 12" CPEP is adequate.

12-INCH VAULT STANDPIPE OVERFLOW:

The **12- Stand pipe** used as a **vertical over flow** for the vault was sized to handle the runoff from the 100-year developed storm. (See **Appendix A** "Figure III-2.38 "Riser Inflows Curves")

Concrete Vault:

Peak Stage above overflow:	0.5 feet from overflow to top of vault lid
Capacity Required: **0.98** cfs	Capacity Provided: **4.80 cfs**

Therefore, overflow ok.

Section 7: Covenants, Dedications, Easements

TBD

Section 8: Agreements and Guarantees

COMMERCIAL/ INDUSTRIAL AGREEMENT TO MAINTAIN STORMWATER FACILITIES AND TO IMPLEMENT A POLLUTION SOURCE CONTROL PLAN

By and between the CITY OF LACEY, a Municipal Corporation, hereinafter called the CITY, and

_____

Their heirs, successors, or assigns, hereinafter called the DEVELOPER,

The upkeep and maintenance of stormwater facilities and the implementation of pollution source control best management practices (BMPs) is essential to the protection of water resources. All property owners are expected to conduct business in a manner that promotes environmental protection. This Agreement contains specific provisions with respect to maintenance of stormwater facilities and use of pollution source control BMPs.

LEGAL DESCRIPTION:

Whereas, the DEVELOPER has constructed improvements, including but not limited to, buildings, pavement, and stormwater facilities on the property described above. In order to further the goals of the CITY to ensure the protection and enhancement of water resources, the CITY and the DEVELOPER hereby enter into this Agreement. The responsibilities of each party to this Agreement are identified below.

The DEVELOPER shall:

1. Implement the stormwater facility maintenance program included herein as Attachment "A".

2. Implement the pollution source control program included herein as Attachment "B".

3. Maintain a record, in the form of a log book, of steps taken to implement the programs referenced in (1) and (2) above. The log book shall be available for inspection by City staff at _____ during normal business hours. The log book shall catalog the action taken, who took it, when it was done, how it was done, and any problems encountered or follow-up on actions recommended. Maintenance items ("problems") listed in Attachment "A" shall be inspected as specified in the attached instructions or more often if necessary. The DEVELOPER is encouraged to photocopy the individual checklists in Attachment "A" and use them to complete its inspections. These completed checklists would then, in combination, comprise the log book.

4. Submit an annual report to the CITY regarding implementation of the programs referenced in (1) and (2) above. The report must be submitted on or before May 15th of each calendar year and shall contain, at a minimum, the following:

    a. Name, address, and telephone number of the association, businesses, persons, or the firm responsible for plan implementation, and the person completing the report.

    b. Time period covered by the report.

    c. A chronological summary of activities conducted to implement the programs referenced in (1) and (2) above. A photocopy of the applicable sections of the log book, with any additional explanation needed, shall normally suffice. For any activities conducted by paid parties not affiliated with the DEVELOPER, include a copy of the invoice for services.

    d. An outline of planned activities for the next year.

5. Execute the following periodic major maintenance on the subdivision's stormwater facilities: sediment removal from ponds, managing vegetation in wet ponds, resetting orifice sizes and elevations, and adding baffles.

THE CITY SHALL:

1. Provide technical assistance to the DEVELOPER in support of its operation and maintenance activities conducted pursuant to its maintenance and source control programs. Said assistance shall be provided upon request and as CITY time and resources permit, at no charge to the DEVELOPER.

2. Review the annual report and conduct a minimum of one (1) site visit per year to discuss performance and problems with the DEVELOPER.

REMEDIES:

1. If the CITY determines that maintenance or repair work is required to be done to the stormwater facilities located on the property, the CITY shall give the owner of the property notice of the specific maintenance and/ or repair required. The CITY shall set a reasonable time in which such work is to be completed by the persons who were given notice. If the above required maintenance and/ or repair is not completed within the time set by the CITY, written notice will be sent to the persons who were given notice stating the CITY's intention to perform such maintenance and bill the owner for all incurred expenses. The CITY may also revoke stormwater utility rate credits if required maintenance is not performed.

2. If at any time the CITY determines that the existing system creates any imminent threat to the public health or welfare, the CITY may take immediate measures to remedy said threat. However, the CITY shall also take reasonable steps to immediately notify either the property owner or the person in control of said

property of such imminent threat in order to enable such owner or person in control to take such immediate measures either independently or in cooperation with the CITY.

3. The DEVELOPER grants limited authority to the CITY for access to the stormwater system features only for the purpose of performing maintenance, repair or inspection pursuant to the terms of this agreement.

4. The DEVELOPER shall be responsible for the cost of maintenance and repair of the stormwater facility. Such responsibility shall include reimbursement to the CITY within 30 days of the receipt of an invoice for work performed by the CITY in maintaining or repairing such facility pursuant to the terms of this agreement. Overdue payments will require the payment of interest at the current legal rate for liquidated judgements. The CITY shall have a lien for all unpaid charges together with such interest. However, notice of such lien shall not be filed by the CITY for a period of 60 days following mailing of the invoice for charges due. During such 60 days, the property owner or other person or agent in control of the property shall have the right to appeal such charges to the CITY's Land Use Hearings Examiner for a final decision. Such appeal may challenge either the necessity of the maintenance or repairs performed by the CITY or the amount of the charges rendered for such maintenance or repair. Notice of such lien shall not be filed during the pendency of such appeal until final decision is rendered by the Land Use Hearings Examiner. The lien shall be foreclosed in the same manner specified by state statute for foreclosure of a mechanic's or materialman's lien. In any legal action to foreclose such lien or otherwise collect such charges, the prevailing party shall be entitled to an award for its attorney fees and costs incurred.

This Agreement is intended to protect the value and desirability of the real property described above and to benefit all the citizens of the CITY. It shall run with the land and be binding on all parities having or acquiring any right, title, or interest, or any part thereof, of real property in the subdivision. They shall inure to the benefit of each present or future successor in interest of said property or any part thereof, or interest therein, and to the benefit of all citizens of the CITY.

IN WITNESS WHEREOF, this instrument has been executed _____, 2_____.

_____ _____
Grantor Grantor

STATE OF WASHINGTON)
) ss
COUNTY OF THURSTON)

I certify that I know or have satisfactory evidence that _____
_____ (is/ are) the person(s) who appeared before me, and said person(s) acknowledged that _____(he/ she/ they) signed this instrument, and acknowledged it to be _____(his/ her/ their) free and voluntary act for the uses and purposes mentioned in the instrument.

Given under my hand and seal this _____ day of _____, 2_____.

_____
Notary Public in and for the
State of Washington,
residing at _____
_____
My commission expires: _____

Accepted by the City of Lacey, Washington. this _____ day of _____, 2_____.

BY: _____
Director of Public Works

STATE OF WASHINGTON)
) ss
COUNTY OF THURSTON)

On this day and year above, personally appeared before me, _____, to me known to be the Public Works Director of City of Lacey, a Municipal Corporation, who executed the foregoing instrument and acknowledged the said instrument to be the free and voluntary act and deed of said Municipal Corporation for the uses and purposes therein mentioned and on oath states he is authorized to execute the said instrument.

Given under my hand and seal this _____ day of _____, 2_____.

_____
Notary Public in and for the
State of Washington,
residing at _____
_____
My commission expires: _____

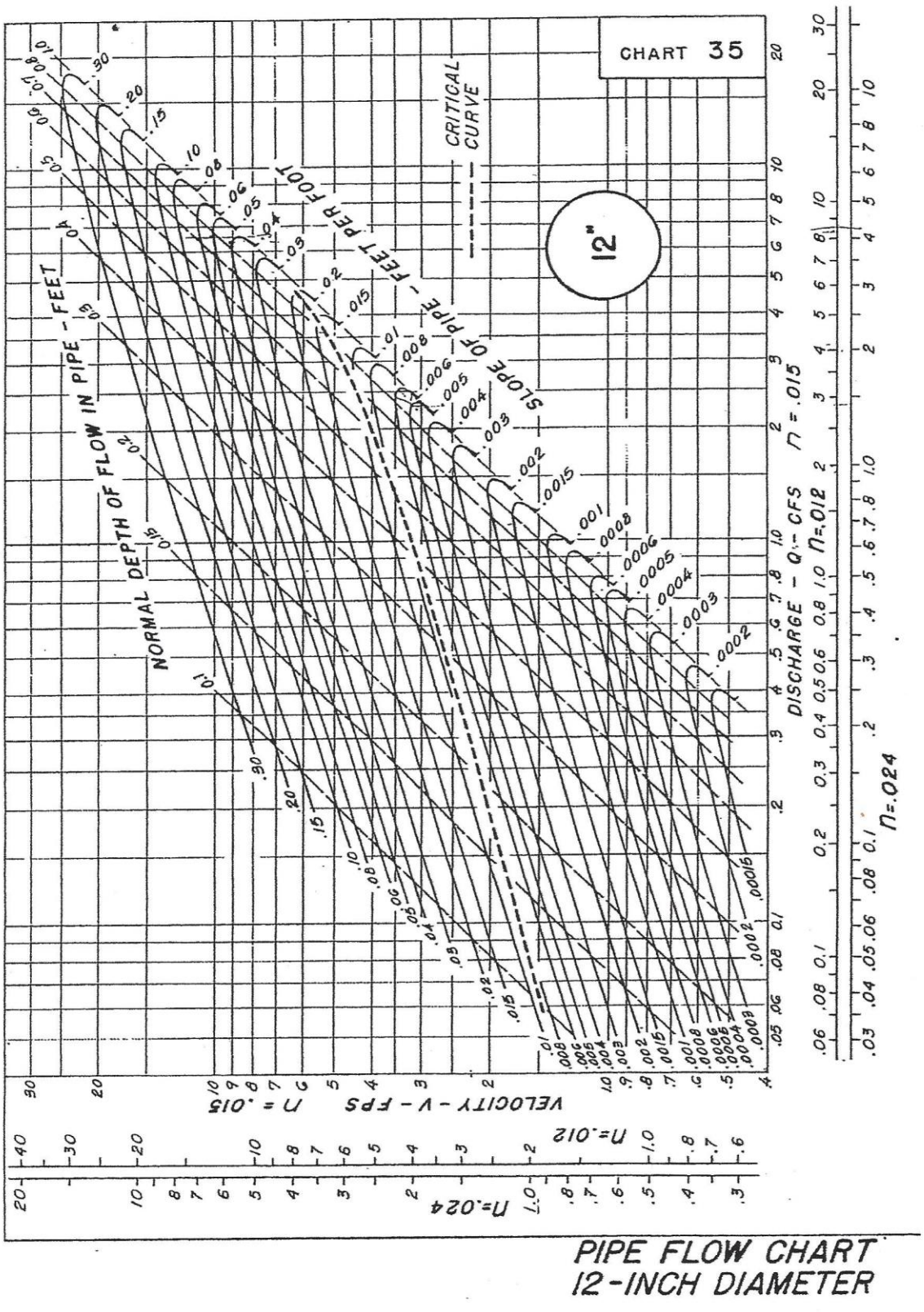
Section 9: Other Permits Or Conditions Placed on Project

The project may require other permits including:

- Building permits
- DOE Construction Stormwater Permit
- City of Lacy Right of Way Permit

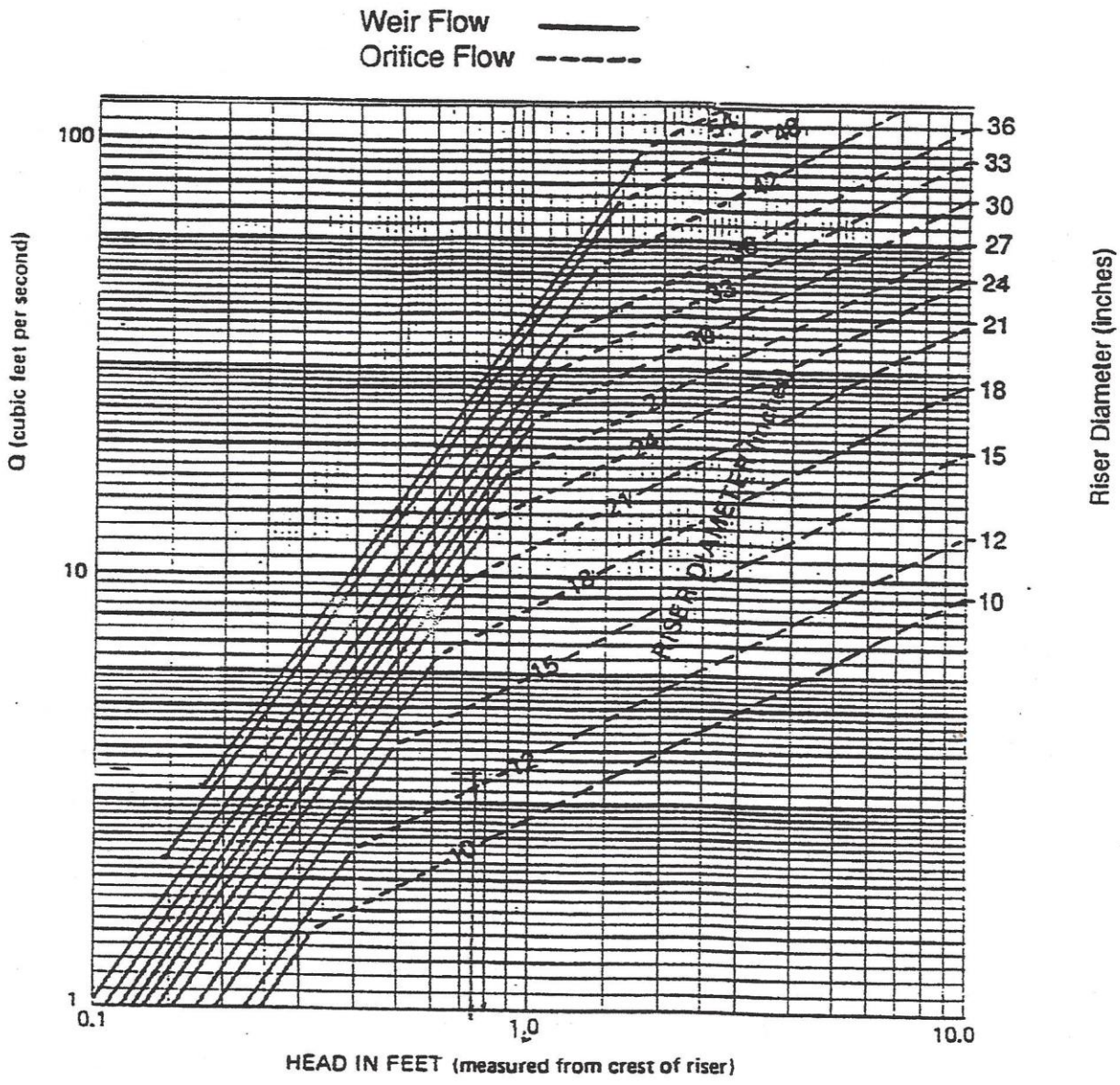
APPENDIX A

CONVEYANCE CHARTS
WWHM12 RESULTS



PIPE FLOW CHART
12-INCH DIAMETER

Figure III-2.38 Riser Inflow Curves



SOURCE: USDA-SCS

$Q_{WIER} = 9.739\ DH^{3/2}$

$Q_{ORIFICE} = 3.782\ D^2H^{1/2}$

Q in cfs, D and H in feet

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	default
Site Name:	
Site Address:	
City:	
Report Date:	1/25/2021
Gage:	Fairgrounds
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

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

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Steep	0.99
Pervious Total	0.99
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.99

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.24
Pervious Total	0.24

Impervious Land Use	acre
ROADS STEEP	0.5
ROOF TOPS FLAT	0.25
Impervious Total	0.75
Basin Total	0.99

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Vault 1

Width: 30.5732033541586 ft.
Length: 61.1464067083168 ft.
Depth: 8 ft.
Discharge Structure
Riser Height: 7 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 0.68 in. Elevation:0 ft.
Orifice 2 Diameter: 1.12 in. Elevation:4.579 ft.
Orifice 3 Diameter: 0.64 in. Elevation:5.63958333333336 ft.
Element Flows To:
Outlet 1 Outlet 2

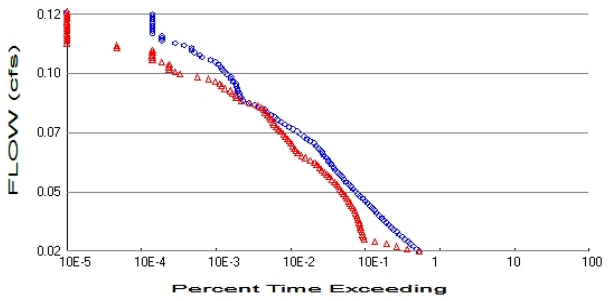
Vault Hydraulic Table

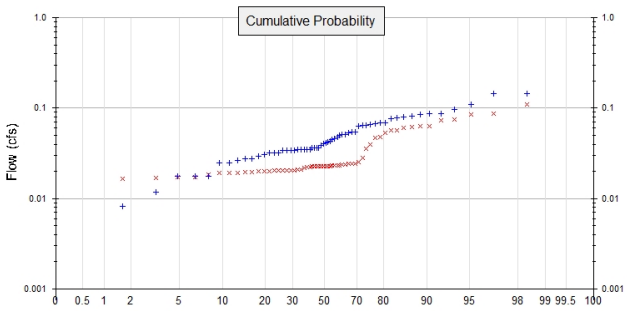
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.042	0.000	0.000	0.000
0.0889	0.042	0.003	0.003	0.000
0.1778	0.042	0.007	0.005	0.000
0.2667	0.042	0.011	0.006	0.000
0.3556	0.042	0.015	0.007	0.000
0.4444	0.042	0.019	0.008	0.000
0.5333	0.042	0.022	0.009	0.000
0.6222	0.042	0.026	0.009	0.000
0.7111	0.042	0.030	0.010	0.000
0.8000	0.042	0.034	0.011	0.000
0.8889	0.042	0.038	0.011	0.000
0.9778	0.042	0.042	0.012	0.000
1.0667	0.042	0.045	0.013	0.000
1.1556	0.042	0.049	0.013	0.000
1.2444	0.042	0.053	0.014	0.000
1.3333	0.042	0.057	0.014	0.000
1.4222	0.042	0.061	0.015	0.000
1.5111	0.042	0.064	0.015	0.000
1.6000	0.042	0.068	0.015	0.000
1.6889	0.042	0.072	0.016	0.000
1.7778	0.042	0.076	0.016	0.000
1.8667	0.042	0.080	0.017	0.000
1.9556	0.042	0.083	0.017	0.000
2.0444	0.042	0.087	0.017	0.000
2.1333	0.042	0.091	0.018	0.000
2.2222	0.042	0.095	0.018	0.000
2.3111	0.042	0.099	0.019	0.000
2.4000	0.042	0.103	0.019	0.000
2.4889	0.042	0.106	0.019	0.000
2.5778	0.042	0.110	0.020	0.000
2.6667	0.042	0.114	0.020	0.000
2.7556	0.042	0.118	0.020	0.000
2.8444	0.042	0.122	0.021	0.000
2.9333	0.042	0.125	0.021	0.000
3.0222	0.042	0.129	0.021	0.000
3.1111	0.042	0.133	0.022	0.000
3.2000	0.042	0.137	0.022	0.000
3.2889	0.042	0.141	0.022	0.000

3.3778	0.042	0.145	0.023	0.000
3.4667	0.042	0.148	0.023	0.000
3.5556	0.042	0.152	0.023	0.000
3.6444	0.042	0.156	0.024	0.000
3.7333	0.042	0.160	0.024	0.000
3.8222	0.042	0.164	0.024	0.000
3.9111	0.042	0.167	0.024	0.000
4.0000	0.042	0.171	0.025	0.000
4.0889	0.042	0.175	0.025	0.000
4.1778	0.042	0.179	0.025	0.000
4.2667	0.042	0.183	0.025	0.000
4.3556	0.042	0.186	0.026	0.000
4.4444	0.042	0.190	0.026	0.000
4.5333	0.042	0.194	0.026	0.000
4.6222	0.042	0.198	0.034	0.000
4.7111	0.042	0.202	0.039	0.000
4.8000	0.042	0.206	0.043	0.000
4.8889	0.042	0.209	0.046	0.000
4.9778	0.042	0.213	0.049	0.000
5.0667	0.042	0.217	0.052	0.000
5.1556	0.042	0.221	0.054	0.000
5.2444	0.042	0.225	0.056	0.000
5.3333	0.042	0.228	0.058	0.000
5.4222	0.042	0.232	0.060	0.000
5.5111	0.042	0.236	0.062	0.000
5.6000	0.042	0.240	0.064	0.000
5.6889	0.042	0.244	0.068	0.000
5.7778	0.042	0.248	0.071	0.000
5.8667	0.042	0.251	0.074	0.000
5.9556	0.042	0.255	0.076	0.000
6.0444	0.042	0.259	0.079	0.000
6.1333	0.042	0.263	0.081	0.000
6.2222	0.042	0.267	0.083	0.000
6.3111	0.042	0.270	0.085	0.000
6.4000	0.042	0.274	0.087	0.000
6.4889	0.042	0.278	0.089	0.000
6.5778	0.042	0.282	0.091	0.000
6.6667	0.042	0.286	0.092	0.000
6.7556	0.042	0.289	0.094	0.000
6.8444	0.042	0.293	0.096	0.000
6.9333	0.042	0.297	0.097	0.000
7.0222	0.042	0.301	0.152	0.000
7.1111	0.042	0.305	0.688	0.000
7.2000	0.042	0.309	1.507	0.000
7.2889	0.042	0.312	2.478	0.000
7.3778	0.042	0.316	3.492	0.000
7.4667	0.042	0.320	4.433	0.000
7.5556	0.042	0.324	5.206	0.000
7.6444	0.042	0.328	5.759	0.000
7.7333	0.042	0.331	6.125	0.000
7.8222	0.042	0.335	6.538	0.000
7.9111	0.042	0.339	6.878	0.000
8.0000	0.042	0.343	7.202	0.000
8.0889	0.042	0.347	7.511	0.000
8.1778	0.000	0.000	7.809	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.99
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.24
Total Impervious Area: 0.75

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.044301
5 year	0.070567
10 year	0.087621
25 year	0.108246
50 year	0.122812
100 year	0.136664

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.026416
5 year	0.041599
10 year	0.054611
25 year	0.07503
50 year	0.093551
100 year	0.115295

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.050	0.019
1950	0.055	0.024
1951	0.087	0.074
1952	0.032	0.017
1953	0.025	0.020
1954	0.035	0.022
1955	0.063	0.023
1956	0.048	0.025
1957	0.045	0.022
1958	0.043	0.023

1959	0.035	0.021
1960	0.064	0.063
1961	0.034	0.023
1962	0.025	0.017
1963	0.032	0.022
1964	0.040	0.021
1965	0.031	0.024
1966	0.028	0.020
1967	0.065	0.023
1968	0.037	0.021
1969	0.039	0.020
1970	0.034	0.020
1971	0.035	0.024
1972	0.069	0.040
1973	0.034	0.023
1974	0.034	0.023
1975	0.053	0.023
1976	0.036	0.023
1977	0.006	0.019
1978	0.035	0.023
1979	0.018	0.017
1980	0.081	0.057
1981	0.027	0.020
1982	0.066	0.053
1983	0.046	0.023
1984	0.032	0.019
1985	0.018	0.020
1986	0.078	0.035
1987	0.068	0.057
1988	0.029	0.019
1989	0.018	0.019
1990	0.146	0.062
1991	0.085	0.061
1992	0.037	0.023
1993	0.034	0.020
1994	0.012	0.016
1995	0.043	0.024
1996	0.097	0.073
1997	0.087	0.063
1998	0.027	0.020
1999	0.077	0.048
2000	0.037	0.024
2001	0.008	0.017
2002	0.042	0.047
2003	0.054	0.021
2004	0.080	0.086
2005	0.051	0.023
2006	0.051	0.023
2007	0.111	0.110
2008	0.146	0.086
2009	0.067	0.028

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.1464	0.1102
2	0.1462	0.0864
3	0.1106	0.0855

4	0.0973	0.0744
5	0.0866	0.0729
6	0.0865	0.0632
7	0.0849	0.0629
8	0.0813	0.0622
9	0.0800	0.0611
10	0.0778	0.0573
11	0.0766	0.0566
12	0.0693	0.0531
13	0.0682	0.0484
14	0.0675	0.0466
15	0.0664	0.0398
16	0.0652	0.0355
17	0.0640	0.0282
18	0.0634	0.0252
19	0.0546	0.0244
20	0.0545	0.0244
21	0.0535	0.0240
22	0.0514	0.0236
23	0.0512	0.0236
24	0.0497	0.0234
25	0.0481	0.0234
26	0.0458	0.0233
27	0.0453	0.0233
28	0.0428	0.0230
29	0.0426	0.0230
30	0.0417	0.0229
31	0.0403	0.0229
32	0.0387	0.0228
33	0.0367	0.0228
34	0.0366	0.0227
35	0.0366	0.0226
36	0.0365	0.0225
37	0.0352	0.0225
38	0.0351	0.0221
39	0.0349	0.0219
40	0.0348	0.0209
41	0.0345	0.0208
42	0.0344	0.0206
43	0.0343	0.0205
44	0.0343	0.0205
45	0.0343	0.0204
46	0.0323	0.0203
47	0.0322	0.0203
48	0.0318	0.0201
49	0.0305	0.0200
50	0.0293	0.0199
51	0.0279	0.0197
52	0.0275	0.0194
53	0.0266	0.0193
54	0.0250	0.0193
55	0.0245	0.0190
56	0.0178	0.0185
57	0.0177	0.0173
58	0.0177	0.0171
59	0.0118	0.0168
60	0.0082	0.0165
61	0.0064	0.0161

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0222	11407	11287	98	Pass
0.0232	10371	7736	74	Pass
0.0242	9441	5602	59	Pass
0.0252	8630	4105	47	Pass
0.0262	7944	2849	35	Pass
0.0272	7274	2070	28	Pass
0.0283	6669	2019	30	Pass
0.0293	6100	1975	32	Pass
0.0303	5612	1920	34	Pass
0.0313	5150	1870	36	Pass
0.0323	4772	1840	38	Pass
0.0333	4413	1808	40	Pass
0.0344	4072	1772	43	Pass
0.0354	3767	1726	45	Pass
0.0364	3544	1682	47	Pass
0.0374	3287	1636	49	Pass
0.0384	3069	1584	51	Pass
0.0394	2862	1530	53	Pass
0.0405	2667	1456	54	Pass
0.0415	2479	1401	56	Pass
0.0425	2306	1329	57	Pass
0.0435	2158	1276	59	Pass
0.0445	1974	1221	61	Pass
0.0455	1827	1164	63	Pass
0.0466	1683	1094	65	Pass
0.0476	1571	1030	65	Pass
0.0486	1459	969	66	Pass
0.0496	1362	931	68	Pass
0.0506	1267	881	69	Pass
0.0516	1173	823	70	Pass
0.0527	1100	762	69	Pass
0.0537	1030	703	68	Pass
0.0547	962	651	67	Pass
0.0557	905	602	66	Pass
0.0567	849	556	65	Pass
0.0577	802	519	64	Pass
0.0588	750	480	64	Pass
0.0598	715	446	62	Pass
0.0608	679	388	57	Pass
0.0618	638	334	52	Pass
0.0628	605	297	49	Pass
0.0638	572	266	46	Pass
0.0649	542	250	46	Pass
0.0659	503	239	47	Pass
0.0669	469	226	48	Pass
0.0679	435	217	49	Pass
0.0689	391	205	52	Pass
0.0699	351	193	54	Pass
0.0710	321	181	56	Pass
0.0720	293	172	58	Pass
0.0730	264	156	59	Pass
0.0740	230	146	63	Pass
0.0750	203	136	66	Pass

0.0760	177	129	72	Pass
0.0771	160	123	76	Pass
0.0781	141	116	82	Pass
0.0791	130	111	85	Pass
0.0801	116	104	89	Pass
0.0811	103	98	95	Pass
0.0821	95	92	96	Pass
0.0832	78	85	108	Pass
0.0842	71	77	108	Pass
0.0852	58	61	105	Pass
0.0862	49	46	93	Pass
0.0872	46	40	86	Pass
0.0882	44	39	88	Pass
0.0893	43	35	81	Pass
0.0903	42	33	78	Pass
0.0913	41	28	68	Pass
0.0923	40	25	62	Pass
0.0933	39	24	61	Pass
0.0943	36	21	58	Pass
0.0954	34	17	50	Pass
0.0964	34	12	35	Pass
0.0974	30	7	23	Pass
0.0984	28	6	21	Pass
0.0994	26	5	19	Pass
0.1004	25	5	20	Pass
0.1015	23	5	21	Pass
0.1025	21	4	19	Pass
0.1035	18	3	16	Pass
0.1045	14	3	21	Pass
0.1055	13	3	23	Pass
0.1065	11	3	27	Pass
0.1076	10	3	30	Pass
0.1086	10	1	10	Pass
0.1096	8	1	12	Pass
0.1106	6	0	0	Pass
0.1116	4	0	0	Pass
0.1126	4	0	0	Pass
0.1137	4	0	0	Pass
0.1147	3	0	0	Pass
0.1157	3	0	0	Pass
0.1167	3	0	0	Pass
0.1177	3	0	0	Pass
0.1187	3	0	0	Pass
0.1198	3	0	0	Pass
0.1208	3	0	0	Pass
0.1218	3	0	0	Pass
0.1228	3	0	0	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
Vault 1 POC	☐	128.00			☐	0.00			
Total Volume Infiltrated		128.00	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.

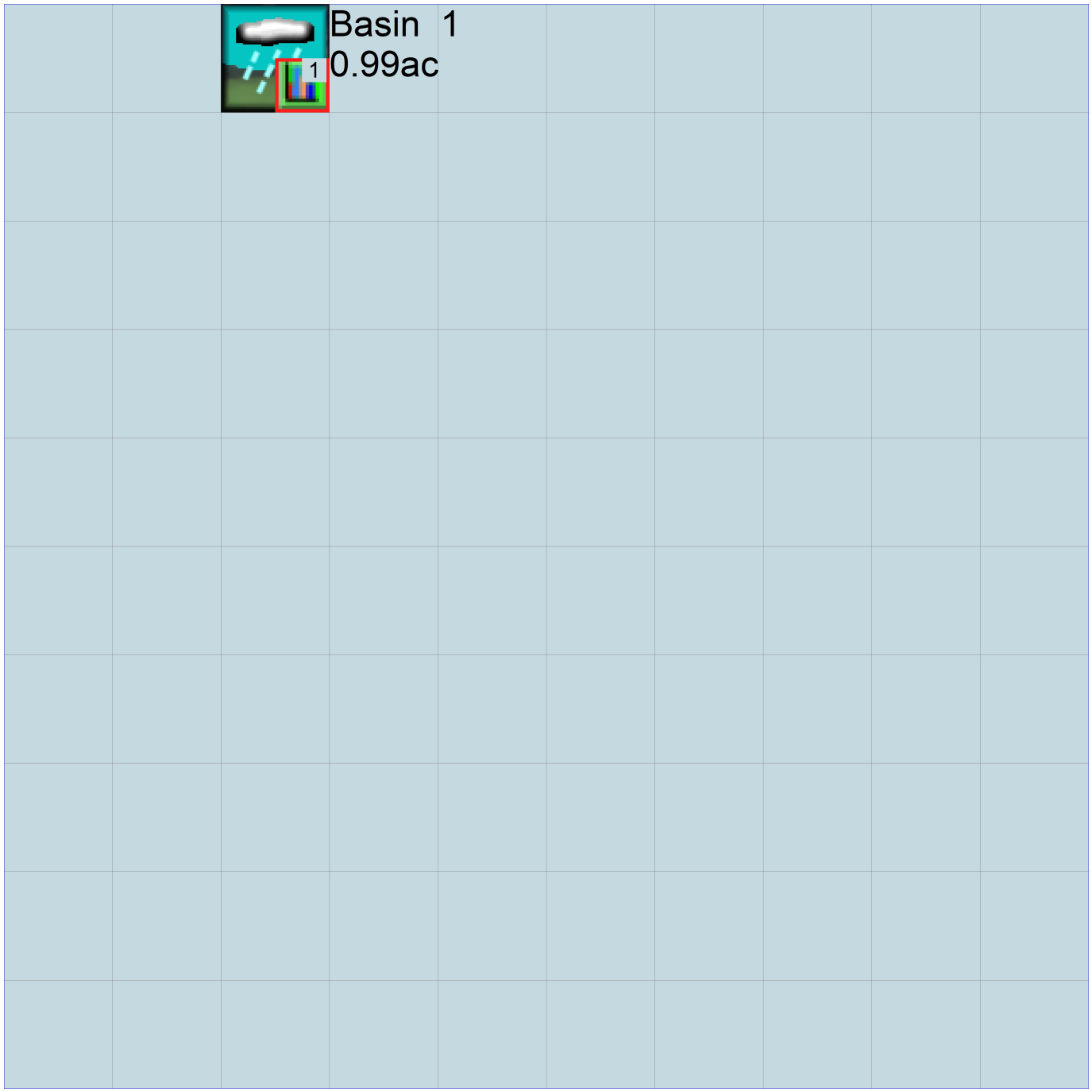
PERLND Changes

No PERLND changes have been made.

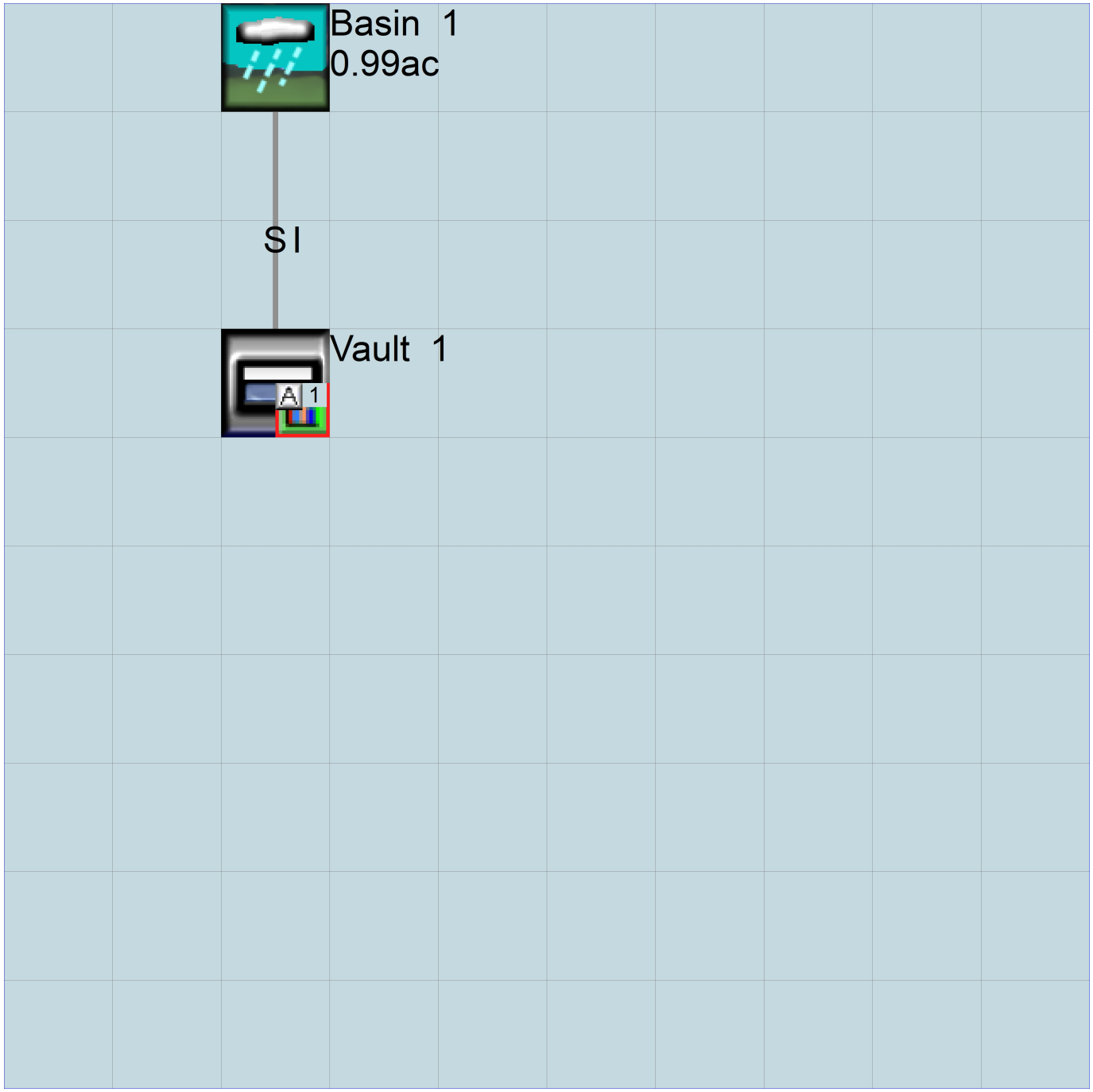
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 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.wdm
MESSU       25   Predefault.MES
            27   Predefault.L61
            28   Predefault.L62
            30   POCdefault1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      12
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  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           ***
   12     C, Forest, Steep        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 ***
   12         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  *********
   12         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 ***
   12         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
   12              0       4.5      0.08       400      0.15       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   12             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   12           0.2       0.3      0.35         6       0.3       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
   12             0         0         0         0       2.5         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  12                        0.99     COPY   501     12
PERLND  12                        0.99     COPY   501     13

******Routing******
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                             ***
  END GEN-INFO
  *** Section RCHRES***

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

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  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
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  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
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
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***
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       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


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 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.wdm
MESSU       25   Mitdefault.MES
            27   Mitdefault.L61
            28   Mitdefault.L62
            30   POCdefault1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      16
      IMPLND       3
      IMPLND       4
      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        Vault  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           ***
   16     C, Lawn, Flat           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 ***
   16         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  *********
   16         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 ***
   16         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
   16              0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   16              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   16           0.1      0.25      0.25         6       0.5      0.25
  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
   16              0         0         0         0       2.5          1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    3      ROADS/STEEP            1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    3         0    0    1    0    0    0
    4         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    3         0    0    4    0    0    0    1    9
    4         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    3         0    0    0    0    0
    4         0    0    0    0    0
  END IWAT-PARM1

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

```
    3            400       0.1       0.1      0.05
    4            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    3              0         0
    4              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    3              0         0
    4              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  16                        0.24     RCHRES   1      2
PERLND  16                        0.24     RCHRES   1      3
IMPLND   3                         0.5     RCHRES   1      5
IMPLND   4                        0.25     RCHRES   1      5

******Routing******
PERLND  16                        0.24     COPY     1     12
IMPLND   3                         0.5     COPY     1     15
IMPLND   4                        0.25     COPY     1     15
PERLND  16                        0.24     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     Vault  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      0.01       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
   92    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.042916  0.000000  0.000000
  0.088889  0.042916  0.003815  0.003741
  0.177778  0.042916  0.007630  0.005291
  0.266667  0.042916  0.011444  0.006480
  0.355556  0.042916  0.015259  0.007482
  0.444444  0.042916  0.019074  0.008365
  0.533333  0.042916  0.022889  0.009164
  0.622222  0.042916  0.026704  0.009898
  0.711111  0.042916  0.030518  0.010581
  0.800000  0.042916  0.034333  0.011223
  0.888889  0.042916  0.038148  0.011830
  0.977778  0.042916  0.041963  0.012408
  1.066667  0.042916  0.045778  0.012960
  1.155556  0.042916  0.049592  0.013489
  1.244444  0.042916  0.053407  0.013998
  1.333333  0.042916  0.057222  0.014489
  1.422222  0.042916  0.061037  0.014964
  1.511111  0.042916  0.064852  0.015425
  1.600000  0.042916  0.068666  0.015872
  1.688889  0.042916  0.072481  0.016307
  1.777778  0.042916  0.076296  0.016731
  1.866667  0.042916  0.080111  0.017144
  1.955556  0.042916  0.083926  0.017547
  2.044444  0.042916  0.087740  0.017942
  2.133333  0.042916  0.091555  0.018328
  2.222222  0.042916  0.095370  0.018706
  2.311111  0.042916  0.099185  0.019076
  2.400000  0.042916  0.103000  0.019439
  2.488889  0.042916  0.106814  0.019796
  2.577778  0.042916  0.110629  0.020146
  2.666667  0.042916  0.114444  0.020491
  2.755556  0.042916  0.118259  0.020830
  2.844444  0.042916  0.122074  0.021163
  2.933333  0.042916  0.125888  0.021491
  3.022222  0.042916  0.129703  0.021814
  3.111111  0.042916  0.133518  0.022133
  3.200000  0.042916  0.137333  0.022447
  3.288889  0.042916  0.141148  0.022756
  3.377778  0.042916  0.144962  0.023062
  3.466667  0.042916  0.148777  0.023363
  3.555556  0.042916  0.152592  0.023661
  3.644444  0.042916  0.156407  0.023955
```

```
  3.733333  0.042916  0.160221  0.024245
  3.822222  0.042916  0.164036  0.024532
  3.911111  0.042916  0.167851  0.024816
  4.000000  0.042916  0.171666  0.025096
  4.088889  0.042916  0.175481  0.025373
  4.177778  0.042916  0.179295  0.025648
  4.266667  0.042916  0.183110  0.025919
  4.355556  0.042916  0.186925  0.026188
  4.444444  0.042916  0.190740  0.026454
  4.533333  0.042916  0.194555  0.026717
  4.622222  0.042916  0.198369  0.034055
  4.711111  0.042916  0.202184  0.039608
  4.800000  0.042916  0.205999  0.043494
  4.888889  0.042916  0.209814  0.046694
  4.977778  0.042916  0.213629  0.049492
  5.066667  0.042916  0.217443  0.052016
  5.155556  0.042916  0.221258  0.054339
  5.244444  0.042916  0.225073  0.056504
  5.333333  0.042916  0.228888  0.058543
  5.422222  0.042916  0.232703  0.060477
  5.511111  0.042916  0.236517  0.062322
  5.600000  0.042916  0.240332  0.064090
  5.688889  0.042916  0.244147  0.068259
  5.777778  0.042916  0.247962  0.071564
  5.866667  0.042916  0.251777  0.074317
  5.955556  0.042916  0.255591  0.076809
  6.044444  0.042916  0.259406  0.079130
  6.133333  0.042916  0.263221  0.081326
  6.222222  0.042916  0.267036  0.083421
  6.311111  0.042916  0.270851  0.085432
  6.400000  0.042916  0.274665  0.087373
  6.488889  0.042916  0.278480  0.089251
  6.577778  0.042916  0.282295  0.091074
  6.666667  0.042916  0.286110  0.092848
  6.755556  0.042916  0.289925  0.094577
  6.844444  0.042916  0.293739  0.096264
  6.933333  0.042916  0.297554  0.097914
  7.022222  0.042916  0.301369  0.152267
  7.111111  0.042916  0.305184  0.688917
  7.200000  0.042916  0.308999  1.507129
  7.288889  0.042916  0.312813  2.478912
  7.377778  0.042916  0.316628  3.491969
  7.466667  0.042916  0.320443  4.433184
  7.555556  0.042916  0.324258  5.205959
  7.644444  0.042916  0.328073  5.759451
  7.733333  0.042916  0.331887  6.125425
  7.822222  0.042916  0.335702  6.538759
  7.911111  0.042916  0.339517  6.878559
  8.000000  0.042916  0.343332  7.202197
  8.088889  0.042916  0.347147  7.511783
  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     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        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  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       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

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


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

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