CITY OF CARNATION

KING COUNTY **WASHINGTON**

EAST BIRD STREET IMPROVEMENTS
STORMWATER SITE PLAN

G&O #23440.07
NOVEMBER 2023

Gray & Osborne, Inc.
CONSULTING ENGINEERS

CITY OF CARNATION

KING COUNTY **WASHINGTON**

EAST BIRD STREET IMPROVEMENTS
STORMWATER SITE PLAN

KERRI SIDEBOTTOM
STATE OF WASHINGTON
56378
REGISTERED
PROFESSIONAL ENGINEER

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PROJECT OVERVIEW

The project is located in the City of Carnation along East Bird Street, between East Commercial Street and Milwaukee Avenue. Construction activities will include repaving an existing asphalt road with two 10-foot wide travel lanes, installation of 8-foot wide gravel shoulders on either side of the pavement, construction of a new 5-foot wide sidewalk, and installation of stormwater infiltration facilities. There is no existing drainage infrastructure along the project corridor or within the project vicinity. Temporary sediment and erosion control measures addressed in this report and in the contractor-prepared SWPPP shall apply to all portions of this project.

The site is currently City right-of-way, which is developed with a paved road section and gravel shoulders with some lawn and landscaping along the edges of the right-of-way. The project site covers an area of approximately 1.33 acres, consisting of the right-of-way over a length of 900 feet. Runoff from most of the project site currently flows downslope to the west following the natural topography, though the furthest east end of the site slopes toward the east. The project contains one threshold discharge area, as the general runoff patterns result in a convergence of drainage offsite. See the planset (provided separately) for the project location. Since all of the improvements will be completed within the City-owned property or the right-of-way, difficult site conditions regarding property conflicts are not anticipated for this project.

The topography ranges from an elevation of approximately 90 feet at the high point of the alignment near Milwaukee Avenue on the east side of the site to approximately 85 feet at the west end, at Commercial Street. Off-site runoff tributary to the project area is minimal due to the very flat slopes in the vicinity and the even slope of the surrounding topography from east to west. Runoff from surrounding properties appears to flow to the west rather than toward the road.

The project area consists of more than 35 percent existing impervious coverage, qualifying the project as a redevelopment project. The redevelopment flow chart in the 2021 WA Department of Ecology *Stormwater Management Manual for Western Washington* (Manual) is used to determine the Minimum Requirement applicability for the project and is included as Figure 1. The City has adopted the latest version of the Manual (CMC 15.64.170) and generally has no additional drainage requirements beyond the Manual's requirements.

The project includes more than 5,000 square feet of new impervious surface, and is a road related project which does increases the impervious coverage within the right-of-way by more than 50 percent. Therefore, all Minimum Requirements apply to the new and replaced impervious surfaces on the site.

According to the geotechnical report prepared for site in October 2023, the soils in the project vicinity are variable, consisting of composed of alluvium deposits including loose to medium dense silty sand and loose to dense well-graded gravel with varying sand and silt content, and cobbles and boulders at a depth of 15 to 20 feet. This is overlain by loose silt with sand indicative of floodplain deposits and a layer of fill. Infiltration is feasible in this location, however infiltration rates on site vary depending on location and depth.

EXISTING CONDITIONS SUMMARY

The existing site consists of approximately 900 linear feet of 60-foot-wide right-of-way. This includes primarily existing pavement and gravel shoulders with sparse lawn along the edges of the right-of-way. No drainage infrastructure currently exists within the project site, and runoff sheet flows primarily toward the west along the road. Runoff eventually reaches the Snoqualmie River via surface flow, or encounters the stormwater system in Tolt Avenue, which provides infiltration.

Topography from the west to the east of the site varies by approximately 5 feet over a length of approximately 900 lineal feet resulting in an average slope of less than 1 percent. The site steepens toward the west end to approximately 1 to 1.5 percent. The site is located in an area with residential land use. There is not a high potential for erosion in the project area, as it is currently developed and paved and/or landscaped at flat slopes. There is limited potential for run-on from adjacent properties for the same reasons.

Figure I-3.2: Flow Chart for Determining Requirements for Redevelopment

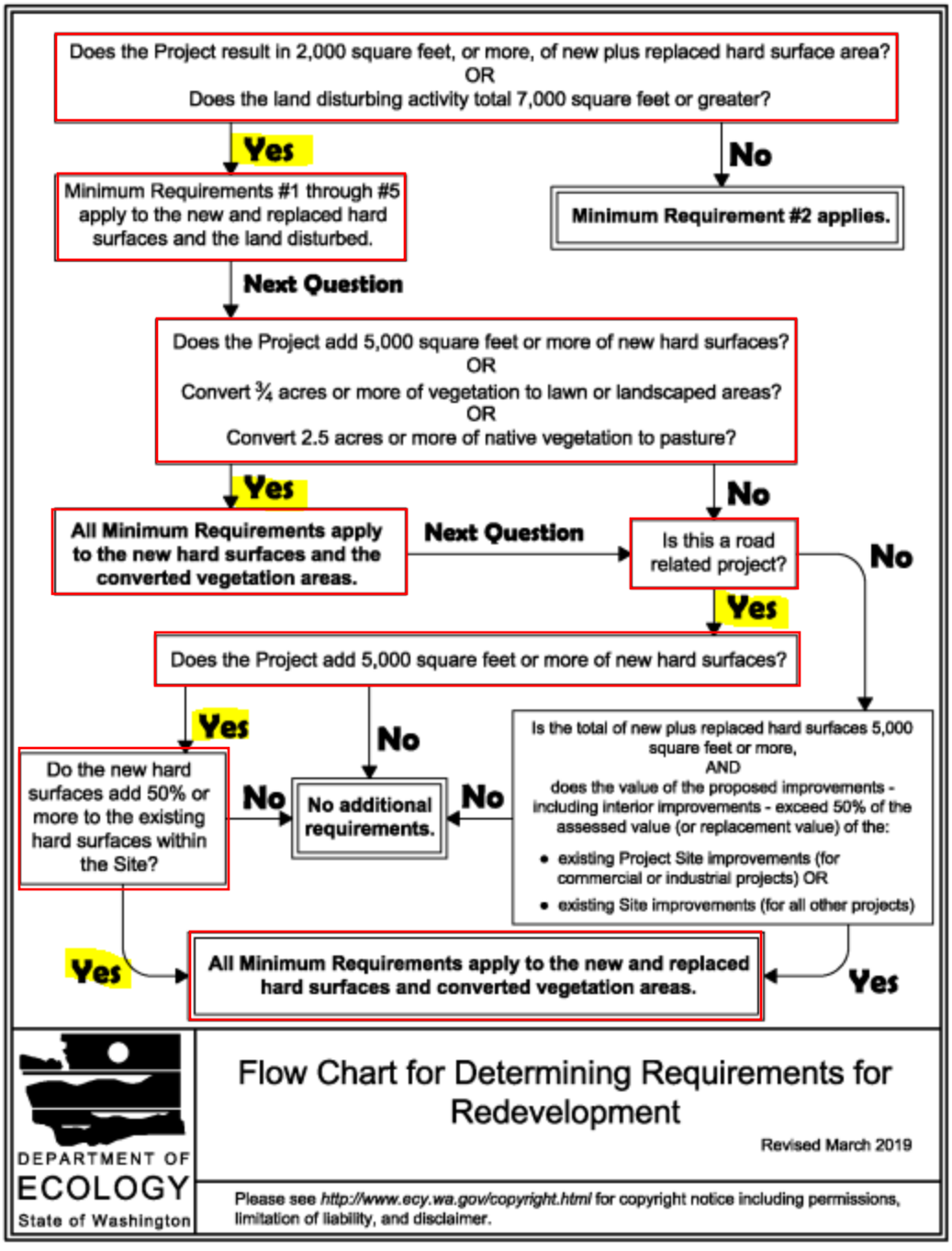


FIGURE 1

Determination of Minimum Requirements

MINIMUM REQUIREMENTS

The sections below highlight each applicable minimum requirement for stormwater treatment and management listed within the Manual, and the steps taken for this project to address each requirement.

MINIMUM REQUIREMENT 1: PREPARATION OF STORMWATER SITE PLANS

This report is intended to address Minimum Requirement 1.

MINIMUM REQUIREMENT 2: CONSTRUCTION STORMWATER POLLUTION PREVENTION

Temporary sediment and erosion control measures are indicated on the plans, and a SWPPP will apply to all portions of this project. The contractor will provide a SWPPP for the project prior to construction.

A Department of Ecology Construction Stormwater General Permit will be required for the project. The City will acquire this permit and will transfer the coverage to the Contractor prior to construction.

MINIMUM REQUIREMENT 3: SOURCE CONTROL OF POLLUTION

No special source control BMPs will be implemented following project completion. The City maintains its roadways and drainage systems and will continue to do so for this section of roadway. Source control measures to be employed during construction will be addressed in the SWPPP.

MINIMUM REQUIREMENT 4: PRESERVATION OF NATURAL DRAINAGE SYSTEMS AND OUTFALLS

The project does not propose any change to the natural drainage patterns present on the site.

Stormwater will be infiltrated onsite in infiltration galleries, and any overflows would continue to drain toward the nearby surface waters following the on-site topography as it does currently and did prior to any development in the area.

No new outfalls or changes to existing outfalls are proposed.

MINIMUM REQUIREMENT 5: ON-SITE STORMWATER MANAGEMENT

The BMPs listed in List 2 were considered for Minimum Requirement 5. This is addressed in more detail under the Permanent Stormwater Control section.

MINIMUM REQUIREMENT 6: RUNOFF TREATMENT

The amount of pollution-generating target surfaces within the project site is above the 5,000-square-foot threshold that would require runoff treatment. Runoff treatment will be provided through biofiltration and infiltration. This is addressed in more detail under the Permanent Stormwater Control section.

MINIMUM REQUIREMENT 7: FLOW CONTROL

The amount of target hard surfaces within the project site is above the 10,000-square-foot threshold that would require flow control. Flow control will be provided through full infiltration. This is addressed in more detail under the Permanent Stormwater Control section.

MINIMUM REQUIREMENT 8: WETLANDS PROTECTION

There are no wetlands within or adjacent to the project site.

MINIMUM REQUIREMENT 9: OPERATION AND MAINTENANCE

Infiltration galleries and conveyance swales will be installed on the project site. The City will maintain the roadway and any drainage elements within the project area.

OFF-SITE ANALYSIS

The project area primarily slopes downward following the site topography from east to west, with a small portion of the east end of the site sloping instead to the east. The City does not own, maintain, or manage any centralized stormwater collection, conveyance, treatment, and/or discharge facilities, and instead relies on the permeable soils to facilitate local infiltration for any stormwater collected within a specific project area. This is accomplished through small area collection within catch basins that drain to a drywell located adjacent to the basin.

Runoff flows to the west, eventually discharging to either the Snoqualmie River to the west of the project via surface flow, or to the stormwater system installed in Tolt Avenue to the west of the site. The Tolt Avenue drainage system includes infiltration for runoff management, but is not tied into any outfalls to surface water.

The Snoqualmie River downstream of the project area is listed on the Washington Department of Ecology's 303d List of impaired water bodies as a Category 4A for temperature and dissolved oxygen. There is a total maximum daily load (TMDL) in place for these parameters. The proposed stormwater management method for the site will involve infiltration of stormwater, which will not contribute to high temperatures or low dissolved oxygen levels within the River. The SWPPP includes procedures to prevent silt laden material from leaving the site including covering of exposed soils and soil stabilization. Construction stormwater discharge sampling will be conducted to monitor sediment levels. If elevated turbidity levels are noted, the CESCL will investigate the cause of sediment discharge and apply enhanced BMPs.

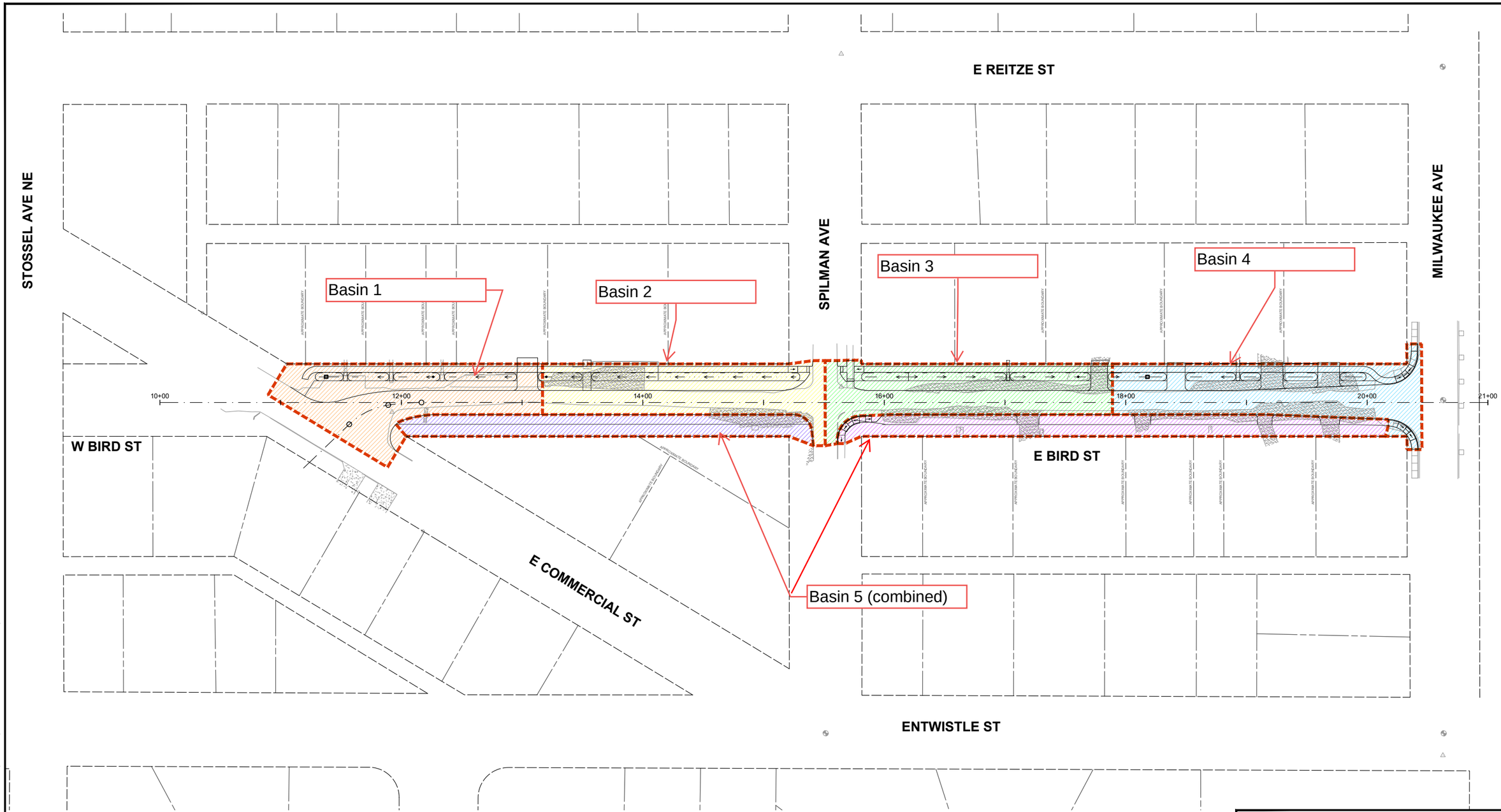
In compliance with the Manual, the project site must apply all Minimum Requirements to the new and replaced hard surfaces onsite. Compliance with each applicable Minimum Requirement was discussed previously.

PERMANENT STORMWATER CONTROL PLAN

Due to the addition of more than 5,000 square feet of new impervious surface, the Manual states that a Stormwater Site Plan is required and the new and replaced impervious surfaces in the project area must comply with all Minimum Requirements. This site plan has been developed to follow the requirements and guidelines present in the Manual.

EXISTING SITE HYDROLOGY

The project site was divided into four roughly equivalent lengths, and the 8-foot wide shoulder along the south side of the road was considered a distinct basin as runoff from this area will be collected in a separate facility. Runoff from Basins 1 and 2 include the portion of the site west of the centerline of Spilman Avenue, and will contribute runoff to a trench on the west side of the site. Runoff from Basins 3 and 4 include the portion of the site east of the centerline of Spilman Avenue, and will contribute runoff to a trench on the east side of the site. Figure 2 shows the basin delineation. Table 1 lists the land use areas for the basins under both existing and developed conditions. The site is currently paved right-of-way with grassy lawn areas, and partially graveled shoulders.



SITE MAP
SCALE: 1"=40'

40' 20' 0 40' 80'
SCALE: 1"=40'

0 1"
ONE INCH AT FULL SCALE. IF NOT, SCALE ACCORDINGLY

CITY OF CARNATION

EAST BIRD STREET IMPROVEMENTS

Figure 2
Drainage Basins

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TABLE 1

Existing and Developed Conditions

	Total Area (ac)	Existing Conditions		Developed Conditions	
		Pervious Area – Grass (acres)	Impervious Area (acres)	Pervious Area – Grass (acres)	Impervious Area (acres)
Basin 1 (west of Spilman Avenue)	0.262	0.097	0.158	0.082	0.180
Basin 2 (west of Spilman Avenue)	0.286	0.138	0.142	0.099	0.187
Basin 3 (east of Spilman Avenue)	0.290	0.114	0.163	0.090	0.201
Basin 4 (east of Spilman Avenue)	0.320	0.098	0.207	0.092	0.228
Basin 5 (Shoulder Basin – 8 feet shoulder along entire south side of project)	0.165	0.165	0	0	0.165
Total	**1.323**	**0.631**	**0.670**	**0.363**	**0.960**

DEVELOPED SITE HYDROLOGY

Table 2 lists the new impervious areas associated with the project area under developed conditions. Though some of the site is currently graveled, the Manual considers an upgrade from gravel to asphalt or concrete as a new impervious surface. Replaced hard surfaces are considered target surfaces for this project based on Figure 1.

TABLE 2

Impervious Surfaces under Developed Conditions

	New/Replaced PGIS[(1)] Area (Pavement) [sqft]	Water Quality Threshold (Based on New/Replaced PGIS) [sqft]	New/Replaced Hard Surface Area [sqft]	Flow Control Requirement Trigger (Based on New/Replaced Impervious Area) [sqft]
Basin 1	5,164	--	6,204	--
Basin 2	6,388	--	7,498	--
Basin 3	6,574	--	7,823	--
Basin 4	7,265	--	8,637	--
Basin 5 (Shoulder Basin)	7,200	--	7,200	--
Total	**32,591**	**5,000**	**37,362**	**10,000**

(1) PGIS = Pollution Generating Impervious Surface.

As seen in Table 2, project land cover areas exceed the thresholds for both the water quality and flow control requirements.

PERFORMANCE STANDARDS

For water quality purposes (MR 6), the site does not count as a high-use site, so oil control facilities are not required. Additionally, the watershed encompassing the site is not a phosphorus-sensitive area, so phosphorus treatment is not required. As such, basic treatment will be provided.

For flow control purposes (MR 7), runoff from the target (i.e., new and replaced) impervious surfaces on site must match developed discharge durations to predeveloped durations for the range of predeveloped discharge rates from 50 percent of the 2-year peak flow up to the full 50-year peak flow. Infiltration will be provided to control runoff from the site.

MINIMUM REQUIREMENT 5: ON-SITE STORMWATER MANAGEMENT

The project must consider onsite stormwater management BMPs per Minimum Requirement 5. The following BMPs from List 2 were considered in order:

- **Lawn and Landscaped Areas**
    - Soil Preservation and Amendment BMP: This BMP will be employed on all disturbed pervious areas to preserve the soil condition.
- **Roofs**
    - There are no roofs on the project site
- **Other Hard Surfaces**
    - Full Dispersion BMP: There is insufficient native vegetation within or adjacent to the project site for this BMP to be feasible.
    - Permeable Pavement BMP: Permeable pavement is not typically suitable for moderately traveled roads due to long-term durability and maintenance needs. Additionally, the geotechnical engineer determined that the shallower soils onsite are less suitable for infiltration. Full infiltration via deeper infiltration galleries will be used.

- Bioretention BMP: The geotechnical engineer determined that the shallower soils on site are less suitable for infiltration. Biofiltration will be used for conveyance and treatment within the roadside ditches.

- Sheet Flow Dispersion or Concentrated Flow Dispersion BMP: There is limited space adjacent to the road improvements for this BMP due to the presence of privately-owned, developed lots.

MINIMUM REQUIREMENT 6: WATER QUALITY SYSTEM

Since more than 5,000 square feet of new and replaced pollution-generating surfaces will be constructed as part of this project, water quality measures are required. Basic water quality treatment will be provided by biofiltration within the roadside ditches that will collect and convey runoff to the underground infiltration gallery inlets. The swales will also provide pretreatment for the runoff that will be flowing from the road into the infiltration galleries.

The ditch sizing was determined following the procedure in Section BMP T9.10 of the Manual. Note that the recommended minimum bottom width of 2 feet and the recommended minimum slope of 1.5 percent are not feasible at the site due to the existing topography and available roadside space. The swales have been evaluated with a bottom width of 0.5 feet and a slope of 1 percent.

Step 1: Estimate bottom width

$$b = \frac{Q_{wq} n_{wq}}{1.49 y^{1.67} s^{0.5}}$$

Q_{wq} = 0.042 cfs
n_{wq} =0.25 (from KCSWDM)
y =3" → 0.25' [must be <0.33']
s = 1%

$$b = \frac{0.042 * 0.25}{1.49 * 0.25^{1.67} * 0.01^{0.5}} = 0.7'$$

Swale bottom width will be 0.5 feet, and the flow depth will be recalculated below to accommodate this.

Step 2: Determine depth of flow based on bottom width (b) calculated in Step 1

$$y = \left(\frac{Q_{wq} n_{wq}}{1.49 s^{0.5} b}\right)^{0.6}$$ [y must be ≤4" (0.333')]

Q_{wq} = 0.042 cfs
n_{wq} =0.25 (from KCSWDM)
s = 1%
b = 0.5'

$$y = \left(\frac{0.042 * 0.25}{1.49 * 0.01^{0.5} * 0.5}\right)^{0.6} = 0.31'$$

Step 3: Determine WQ flow velocity

$$V_{wq} = \frac{Q_{wq}}{A_{wq}}$$ [V_{wq} must be ≤0.5 fps]

Q_{wq} = 0.042 cfs
$A_{wq} = by + Zy^2$= 0.44
Z =3
b = 0.5'

$$V_{wq} = \frac{0.042}{0.44} = 0.10 \text{ fps}$$

0.10 fps < 0.5 fps → WQ flow rate capacity is OK

Step 4: Determine swale bottom length

$L = 540 V_{wq}$ [L must be ≥100']

V_{wq} = 0.10 fps

$L = 540 * 0.10 = 54'$

The swale for each basin will be effectively 200 to 300 feet long, as the swales will extend along the entire project length. This exceeds the calculated minimum.

Step 5: Check 100-year flow rate capacity

$V_{100} = \frac{Q_{100}}{A_{100}}$ [V_{100} must be ≤3 fps]

Q_{100} = 0.25 cfs
$A_{100} = by + Zy^2$ = 0.42
n_{100} =0.06 (from SWMMWW Figure 9.4.7)
Z =3
b = 0.5'

$$V_{100} = \frac{0.25}{0.42} = 0.60 \text{ fps}$$

0.60 fps < 3 fps → 100-year flow rate capacity is OK

Additionally, the geotechnical report for the site found that the native soils have a cation exchange capacity (CEC) of over 5 meq/100 g, which is suitable for treatment via infiltration. The CEC values at the depths of the proposed infiltration facilities ranged from approximately 10 meq/100 g to 14 meq/100 g.

MINIMUM REQUIREMENT 7: FLOW CONTROL SYSTEM

The site exceeds the thresholds stated in Minimum Requirement 7 for flow control facilities. As shown in Table 2, the target (new and replaced) impervious surfaces for the project site exceed the 10,000 square-foot threshold designated in the Manual. The site was modeled using WWHM2012, per the requirements of the Manual in order to size the infiltration facilities. The modeled areas are noted in Table 1. Table 3 includes the flow rates from the existing site and the proposed site following the project, prior to infiltration. The model report is included in Appendix A.

TABLE 3

Project Site Flow Rates

Year	Existing Flow Rate (cfs)	Proposed Flow Rate, Pre-Infiltration (cfs)
2-Year	0.3867	0.4995
25-Year	0.7273	0.8956
50-Year	0.8229	1.0041
100-Year	0.9231	1.1165

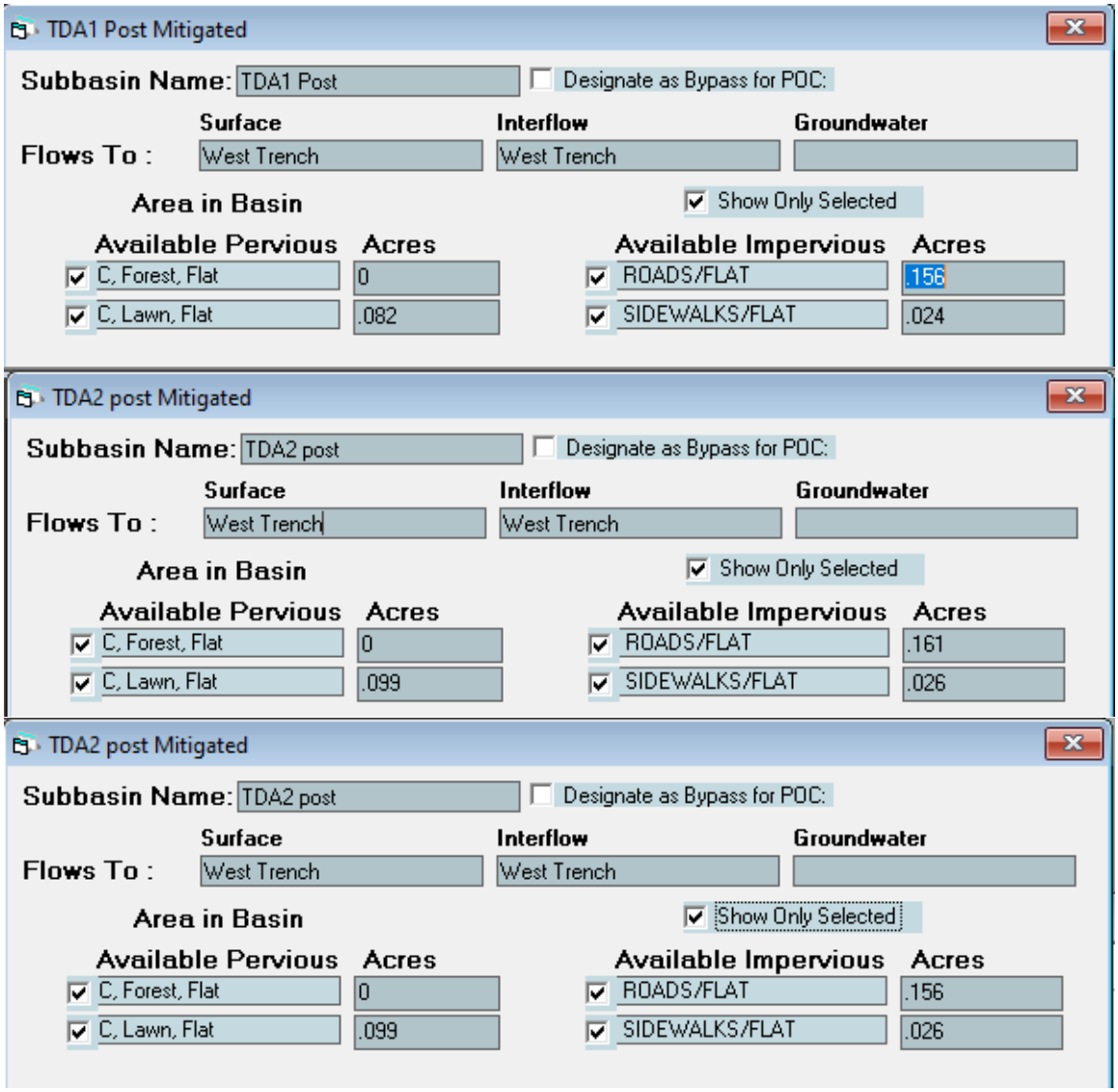
Runoff from the project site will sheet flow to the collection ditches along the north side of the road, which will discharge into the infiltration galleries via inlet structures. The shoulder along the south side of the road will slope away from the rest of the road, and a curtain drain will be installed to infiltrate runoff from the shoulder. Run-on from approximately 0.18 acres of adjacent lawn area has been assumed to be tributary to the curtain drain as well.

WWHM2012 was used to size the infiltration facilities in order to provide 100 percent infiltration for all runoff. The infiltration galleries were assumed to include drain rock with a void space of 40 percent, and the volume of the 8-inch pipe within each trench was included as an equivalent depth of 0.2 feet of empty storage space (cross-sectional area of an 8-inch pipe divided by the 7-foot wide trench width, with 100 percent void space).

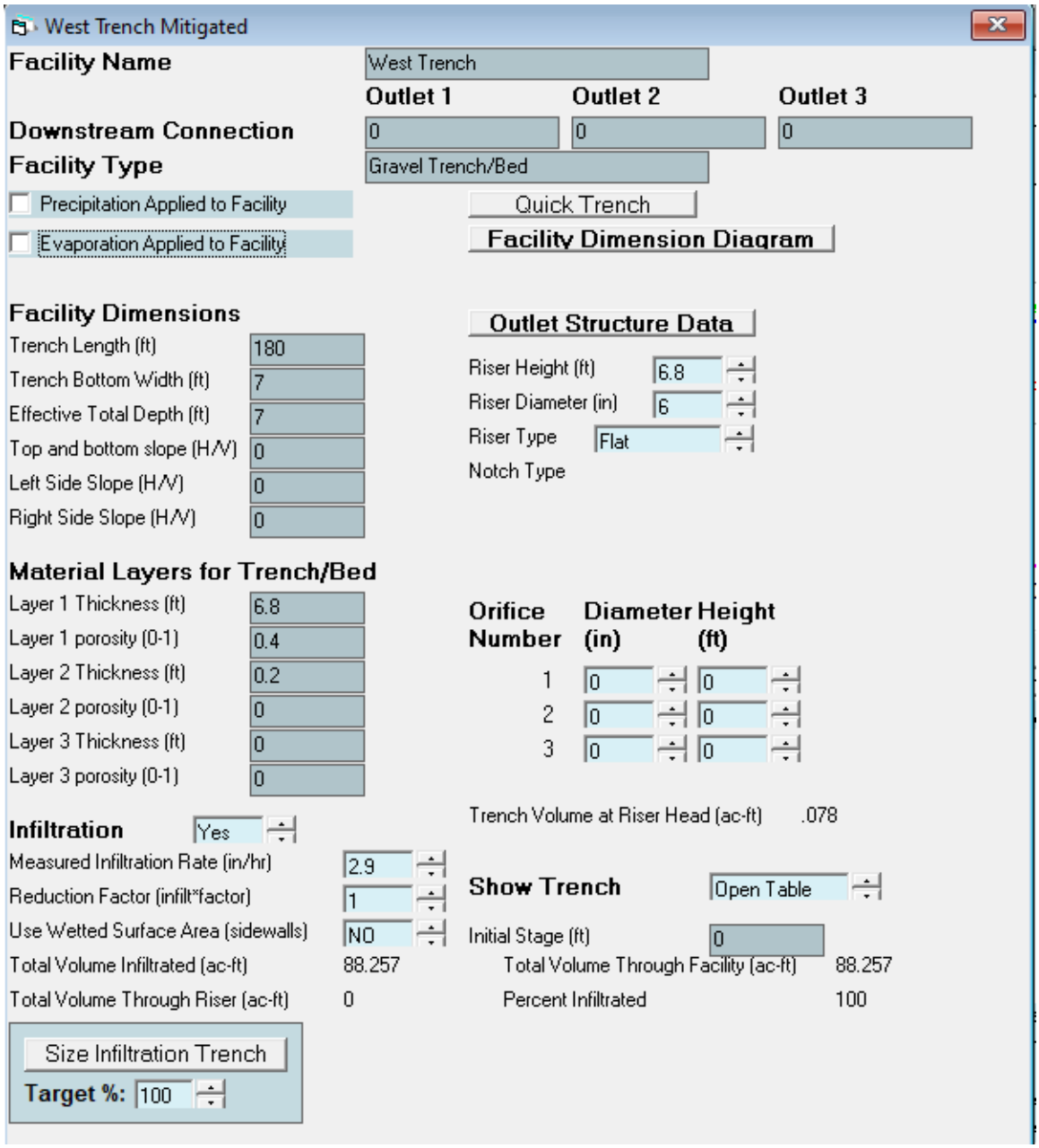
The two western basins, Basins 1 and 2, will contribute runoff to the West Trench, while the two eastern basins, Basins 3 and 4, will contribute runoff to the East Trench. The 8-foot wide gravel parking shoulder on the south side of the road will flow to the curtain drain along the southern edge of the project area. All trenches are designed to fully infiltrate runoff, according to the model results.

West Trench – Basins 1 and 2

Input Basins:



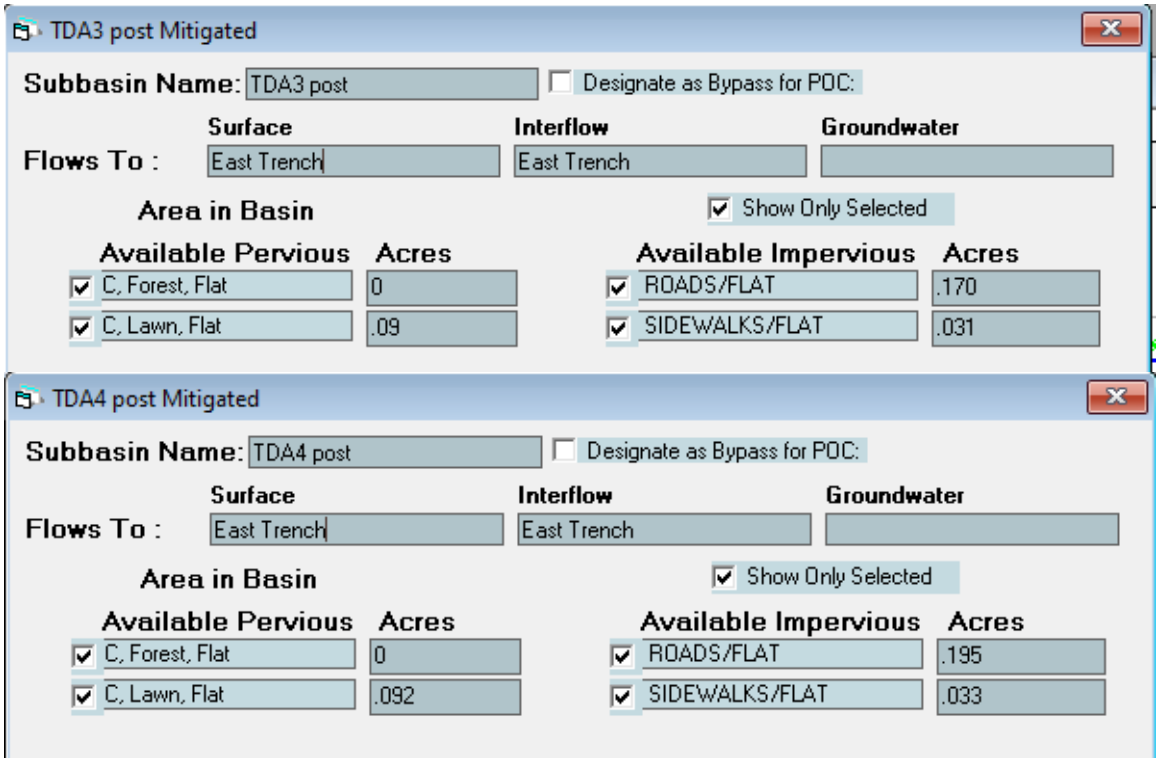
Trench Sizing:



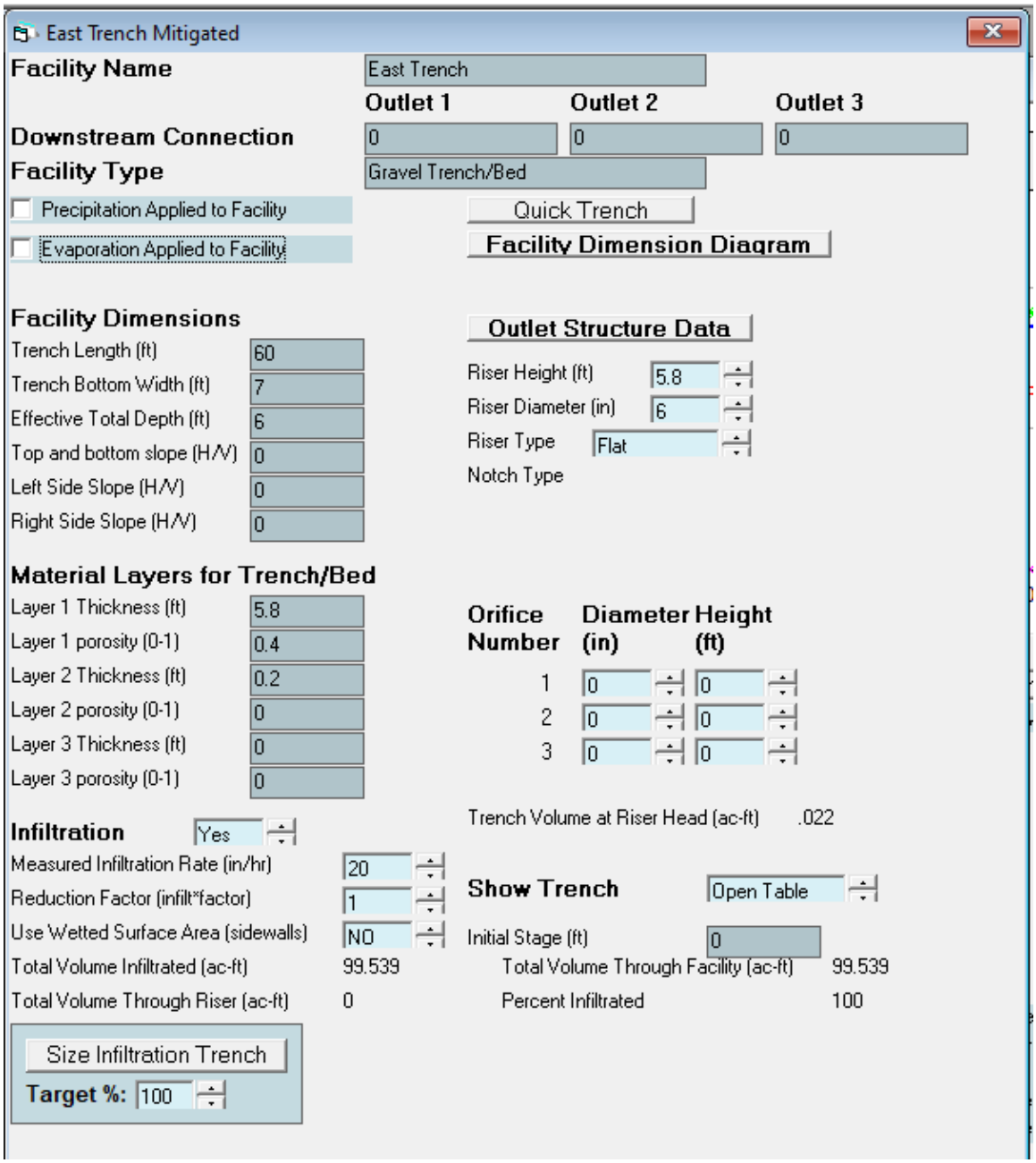
The western infiltration trench that will collect runoff from Basins 1 and 2 will be 180 feet long, 7 feet deep, and 7 feet wide. The infiltration rate of 2.9 in/hr is based on PanGEO's infiltration testing at PG-1 at a depth of 10 feet below the ground surface. See Table 1 in the geotechnical report. The modeling indicates that this is sufficient to infiltrate all runoff.

East Trench – Basins 3 and 4

Input Basins:



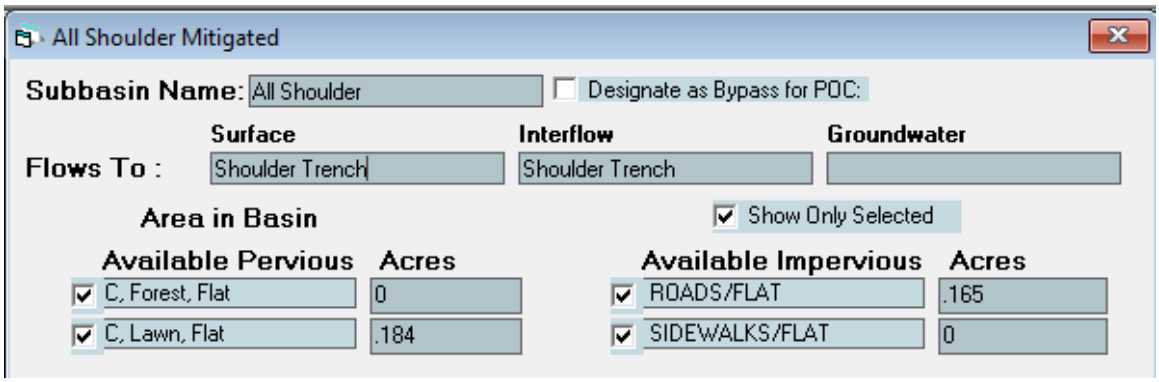
Trench Sizing:



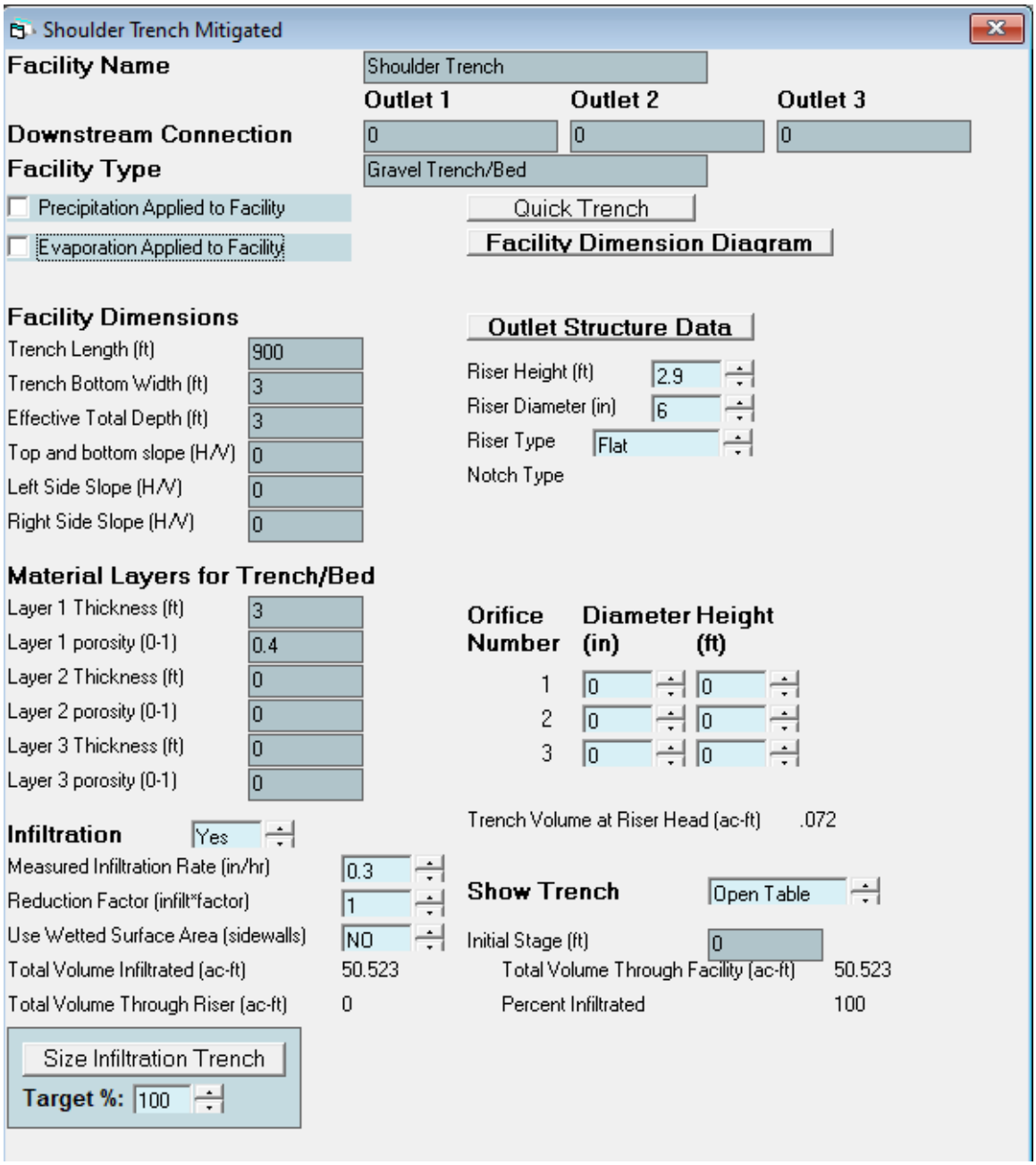
The eastern infiltration trench that will collect runoff from Basins 3 and 4 will be 60 feet long, 6 feet deep, and 7 feet wide. The infiltration rate of 20 in/hr is based on PanGEO's infiltration testing at TP-4 at a depth of 5.5 feet below the ground surface. The design infiltration rate for this location was determined to be 41.6 in/hr, which was reduced to 20 in/hr to be conservative. See Table 1 in the geotechnical report. The modeling indicates that this is sufficient to infiltrate all runoff.

South Shoulder

Input Basins:



Trench Sizing:



The south shoulder curtain drain that will collect runoff from the southern gravel shoulder will be 900 feet long, 3 feet deep, and 3 feet wide. The modeling indicates that this is sufficient to infiltrate all runoff. The infiltration rate of 0.3 in/hr is based on the minimum design infiltration rate that PanGEO found during testing throughout the site (0.6 in/hr at PG-2 at a depth of 12.5 feet below the ground surface). The modeled infiltration rate was reduced by half to 0.3 in/hr to be conservative and to reflect the shallow position of the curtain drain, the potential variability of the infiltration rate along the length of the trench, and the lack of a presettling facility for the curtain drain. See Table 1 in the geotechnical report.

Table 4 includes the predeveloped flow rates and post-infiltration flow rates for the flow control analysis. The predeveloped flow rates assume that the target surfaces (new and replaced hard surfaces) are forested land cover, in accordance with the Manual's requirements.

TABLE 4

Project Site Flow Rates for Flow Control

Year	Predeveloped Flow Rate (cfs)	Proposed Flow Rate, Post-Infiltration (cfs)
2-Year	0.1164	0
25-Year	0.2838	0
50-Year	0.3346	0
100-Year	0.3891	0

The flow control duration analysis results are included in Figure 3, which shows the proposed facilities in compliance with the Manual's requirements.

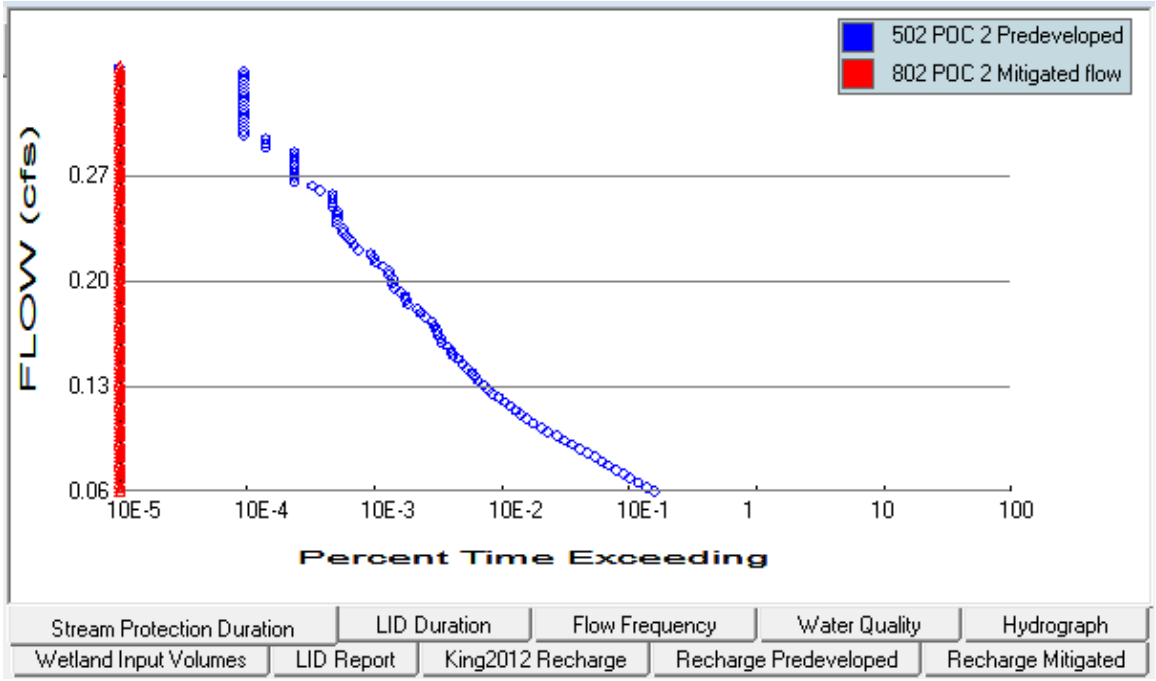


FIGURE 3

Flow Control Duration Analysis

CONVEYANCE SYSTEM ANALYSIS AND DESIGN

No new conveyance is proposed for the site aside from the collection ditches along the side of the road. The ditches will be 1 foot deep with a bottom width of 0.5 foot and side slopes of 3:1 to facilitate mowing. The ditches are sloped at approximately 1 percent. Based on the peak flow rates within each basin, the ditches would need to be 0.8 feet deep in order to accommodate the 100-year flow rates. The 1-foot depth exceeds this minimum requirement.

The infiltration trenches will include 8-inch diameter perforated pipe to distribute water within the trench media. These pipes will be flat and are not intended to provide conveyance.

SPECIAL REPORTS AND STUDIES

No known basin plan exists for this area. A geotechnical report was compiled by PanGEO, Inc. in 2023 for the project. The report indicated that the project area consists of glacial deposits with low infiltration rates at shallow depths and better infiltration capacity in deeper soils.

No other reports have been prepared for this project.

OTHER PERMITS

The following permits have or will be submitted for this project:

- City of Carnation ROW Permit
- Construction Stormwater General Permit

SWPPP ANALYSIS AND DESIGN

Best management practices will be used to control runoff from the project area. A Stormwater Pollution Prevention Plan (SWPPP) will be prepared by the Contractor awarded the improvements project, in accordance with Minimum Requirement 2. The SWPPP will include an Erosion Sediment Control Plan (ESC) describing which BMPs will be utilized throughout this project. The SWPPP will also include a Stormwater Pollution Prevention and Spill Plan (SWPPS) covering measures intended for the unlikely event of a spill on the project site as well as necessary means to keep hazardous construction materials from entering nearby surface water systems. A Department of Ecology Construction Stormwater Permit is required for this project as the disturbed area is more than 1 acre in size.

OPERATIONS AND MAINTENANCE MANUAL

Operations and maintenance documentation for infiltration trenches and conveyance ditches is included in Appendix B. The City will be responsible for maintenance.

BOND QUANTITIES

A Payment Bond and Performance Bond will be required from the contractor to complete the work intended for this site.

APPENDIX A

WWHM MODEL

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	carnation bird shoulder deep 40pct 23.11.08
Site Name:	
Site Address:	
City:	
Report Date:	11/22/2023
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.167
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
Low Flow Threshold for POC2:	50 Percent of the 2 Year
High Flow Threshold for POC2:	50 Year

Landuse Basin Data
Predeveloped Land Use

TDA1 exist

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.143
Pervious Total	0.143

Impervious Land Use	acre
ROADS FLAT	0.16
Impervious Total	0.16
Basin Total	0.303

Element Flows To:

Surface	Interflow	Groundwater

TDA2 exist

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.184
Pervious Total	0.184

Impervious Land Use	acre
ROADS FLAT	0.143
Impervious Total	0.143
Basin Total	0.327

Element Flows To:

Surface	Interflow	Groundwater

TDA3 Exist

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.16
Pervious Total	0.16

Impervious Land Use	acre
ROADS FLAT	0.172
Impervious Total	0.172
Basin Total	0.332

Element Flows To:

Surface	Interflow	Groundwater

TDA4 exist

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.144
Pervious Total	0.144

Impervious Land Use	acre
ROADS FLAT	0.216
Impervious Total	0.216
Basin Total	0.36

Element Flows To:

Surface	Interflow	Groundwater

TDA1 pre

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Forest, Flat	0.184
C, Lawn, Flat	0.081
Pervious Total	0.265

Impervious Land Use	acre
ROADS FLAT	0.038
Impervious Total	0.038
Basin Total	0.303

Element Flows To:

Surface	Interflow	Groundwater

TDA2 pre

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Forest, Flat	0.213
C, Lawn, Flat	0.099
Pervious Total	0.312

Impervious Land Use	acre
ROADS FLAT	0.015
Impervious Total	0.015
Basin Total	0.327

Element Flows To:

Surface	Interflow	Groundwater

TDA3 pre

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.09
C, Forest, Flat	0.221
Pervious Total	0.311

Impervious Land Use	acre
ROADS FLAT	0.021
Impervious Total	0.021
Basin Total	0.332

Element Flows To:

Surface	Interflow	Groundwater

TDA4 pre

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Forest, Flat	0.24
C, Lawn, Flat	0.092
Pervious Total	0.332

Impervious Land Use	acre
ROADS FLAT	0.029
Impervious Total	0.029
Basin Total	0.361

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

TDA1 Post

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.082
Pervious Total	0.082

Impervious Land Use	acre
ROADS FLAT	0.156
SIDEWALKS FLAT	0.024
Impervious Total	0.18
Basin Total	0.262

Element Flows To:

Surface	Interflow	Groundwater
West Trench	West Trench	

TDA2 post

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.099
Pervious Total	0.099

Impervious Land Use	acre
ROADS FLAT	0.161
SIDEWALKS FLAT	0.026
Impervious Total	0.187
Basin Total	0.286

Element Flows To:

Surface	Interflow	Groundwater
West Trench	West Trench	

TDA3 post

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.09
Pervious Total	0.09

Impervious Land Use	acre
ROADS FLAT	0.17
SIDEWALKS FLAT	0.031
Impervious Total	0.201
Basin Total	0.291

Element Flows To:

Surface	Interflow	Groundwater
East Trench	East Trench	

TDA4 post

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.092
Pervious Total	0.092

Impervious Land Use	acre
ROADS FLAT	0.195
SIDEWALKS FLAT	0.033
Impervious Total	0.228
Basin Total	0.32

Element Flows To:

Surface	Interflow	Groundwater
East Trench	East Trench	

All Shoulder

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.184
Pervious Total	0.184

Impervious Land Use	acre
ROADS FLAT	0.165
Impervious Total	0.165
Basin Total	0.349

Element Flows To:

Surface	Interflow	Groundwater
Shoulder Trench	Shoulder Trench	

Mitigated Routing

West Trench

Bottom Length:	180.00 ft.
Bottom Width:	7.00 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	6.8
Pour Space of material for first layer:	0.4
Material thickness of second layer:	0.2
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	2.9
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	88.257
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	88.257
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	6.8 ft.
Riser Diameter:	6 in.
Element Flows To:	
Outlet 1	Outlet 2

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.028	0.000	0.000	0.000
0.0778	0.028	0.000	0.000	0.084
0.1556	0.028	0.001	0.000	0.084
0.2333	0.028	0.002	0.000	0.084
0.3111	0.028	0.003	0.000	0.084
0.3889	0.028	0.004	0.000	0.084
0.4667	0.028	0.005	0.000	0.084
0.5444	0.028	0.006	0.000	0.084
0.6222	0.028	0.007	0.000	0.084
0.7000	0.028	0.008	0.000	0.084
0.7778	0.028	0.009	0.000	0.084
0.8556	0.028	0.009	0.000	0.084
0.9333	0.028	0.010	0.000	0.084
1.0111	0.028	0.011	0.000	0.084
1.0889	0.028	0.012	0.000	0.084
1.1667	0.028	0.013	0.000	0.084
1.2444	0.028	0.014	0.000	0.084
1.3222	0.028	0.015	0.000	0.084
1.4000	0.028	0.016	0.000	0.084
1.4778	0.028	0.017	0.000	0.084
1.5556	0.028	0.018	0.000	0.084
1.6333	0.028	0.018	0.000	0.084
1.7111	0.028	0.019	0.000	0.084
1.7889	0.028	0.020	0.000	0.084

1.8667	0.028	0.021	0.000	0.084
1.9444	0.028	0.022	0.000	0.084
2.0222	0.028	0.023	0.000	0.084
2.1000	0.028	0.024	0.000	0.084
2.1778	0.028	0.025	0.000	0.084
2.2556	0.028	0.026	0.000	0.084
2.3333	0.028	0.027	0.000	0.084
2.4111	0.028	0.027	0.000	0.084
2.4889	0.028	0.028	0.000	0.084
2.5667	0.028	0.029	0.000	0.084
2.6444	0.028	0.030	0.000	0.084
2.7222	0.028	0.031	0.000	0.084
2.8000	0.028	0.032	0.000	0.084
2.8778	0.028	0.033	0.000	0.084
2.9556	0.028	0.034	0.000	0.084
3.0333	0.028	0.035	0.000	0.084
3.1111	0.028	0.036	0.000	0.084
3.1889	0.028	0.036	0.000	0.084
3.2667	0.028	0.037	0.000	0.084
3.3444	0.028	0.038	0.000	0.084
3.4222	0.028	0.039	0.000	0.084
3.5000	0.028	0.040	0.000	0.084
3.5778	0.028	0.041	0.000	0.084
3.6556	0.028	0.042	0.000	0.084
3.7333	0.028	0.043	0.000	0.084
3.8111	0.028	0.044	0.000	0.084
3.8889	0.028	0.045	0.000	0.084
3.9667	0.028	0.045	0.000	0.084
4.0444	0.028	0.046	0.000	0.084
4.1222	0.028	0.047	0.000	0.084
4.2000	0.028	0.048	0.000	0.084
4.2778	0.028	0.049	0.000	0.084
4.3556	0.028	0.050	0.000	0.084
4.4333	0.028	0.051	0.000	0.084
4.5111	0.028	0.052	0.000	0.084
4.5889	0.028	0.053	0.000	0.084
4.6667	0.028	0.054	0.000	0.084
4.7444	0.028	0.054	0.000	0.084
4.8222	0.028	0.055	0.000	0.084
4.9000	0.028	0.056	0.000	0.084
4.9778	0.028	0.057	0.000	0.084
5.0556	0.028	0.058	0.000	0.084
5.1333	0.028	0.059	0.000	0.084
5.2111	0.028	0.060	0.000	0.084
5.2889	0.028	0.061	0.000	0.084
5.3667	0.028	0.062	0.000	0.084
5.4444	0.028	0.063	0.000	0.084
5.5222	0.028	0.063	0.000	0.084
5.6000	0.028	0.064	0.000	0.084
5.6778	0.028	0.065	0.000	0.084
5.7556	0.028	0.066	0.000	0.084
5.8333	0.028	0.067	0.000	0.084
5.9111	0.028	0.068	0.000	0.084
5.9889	0.028	0.069	0.000	0.084
6.0667	0.028	0.070	0.000	0.084
6.1444	0.028	0.071	0.000	0.084
6.2222	0.028	0.072	0.000	0.084
6.3000	0.028	0.072	0.000	0.084

6.3778	0.028	0.073	0.000	0.084
6.4556	0.028	0.074	0.000	0.084
6.5333	0.028	0.075	0.000	0.084
6.6111	0.028	0.076	0.000	0.084
6.6889	0.028	0.077	0.000	0.084
6.7667	0.028	0.078	0.000	0.084
6.8444	0.028	0.078	0.049	0.084
6.9222	0.028	0.078	0.209	0.084
7.0000	0.028	0.078	0.346	0.084

East Trench

Bottom Length:	60.00 ft.
Bottom Width:	7.00 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	5.8
Pour Space of material for first layer:	0.4
Material thickness of second layer:	0.2
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	20
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	99.539
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	99.539
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	5.8 ft.
Riser Diameter:	6 in.
Element Flows To:	
Outlet 1	Outlet 2

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.009	0.000	0.000	0.000
0.0667	0.009	0.000	0.000	0.194
0.1333	0.009	0.000	0.000	0.194
0.2000	0.009	0.000	0.000	0.194
0.2667	0.009	0.001	0.000	0.194
0.3333	0.009	0.001	0.000	0.194
0.4000	0.009	0.001	0.000	0.194
0.4667	0.009	0.001	0.000	0.194
0.5333	0.009	0.002	0.000	0.194
0.6000	0.009	0.002	0.000	0.194
0.6667	0.009	0.002	0.000	0.194
0.7333	0.009	0.002	0.000	0.194
0.8000	0.009	0.003	0.000	0.194
0.8667	0.009	0.003	0.000	0.194
0.9333	0.009	0.003	0.000	0.194
1.0000	0.009	0.003	0.000	0.194
1.0667	0.009	0.004	0.000	0.194
1.1333	0.009	0.004	0.000	0.194
1.2000	0.009	0.004	0.000	0.194
1.2667	0.009	0.004	0.000	0.194
1.3333	0.009	0.005	0.000	0.194
1.4000	0.009	0.005	0.000	0.194
1.4667	0.009	0.005	0.000	0.194
1.5333	0.009	0.005	0.000	0.194
1.6000	0.009	0.006	0.000	0.194
1.6667	0.009	0.006	0.000	0.194

1.7333	0.009	0.006	0.000	0.194
1.8000	0.009	0.006	0.000	0.194
1.8667	0.009	0.007	0.000	0.194
1.9333	0.009	0.007	0.000	0.194
2.0000	0.009	0.007	0.000	0.194
2.0667	0.009	0.008	0.000	0.194
2.1333	0.009	0.008	0.000	0.194
2.2000	0.009	0.008	0.000	0.194
2.2667	0.009	0.008	0.000	0.194
2.3333	0.009	0.009	0.000	0.194
2.4000	0.009	0.009	0.000	0.194
2.4667	0.009	0.009	0.000	0.194
2.5333	0.009	0.009	0.000	0.194
2.6000	0.009	0.010	0.000	0.194
2.6667	0.009	0.010	0.000	0.194
2.7333	0.009	0.010	0.000	0.194
2.8000	0.009	0.010	0.000	0.194
2.8667	0.009	0.011	0.000	0.194
2.9333	0.009	0.011	0.000	0.194
3.0000	0.009	0.011	0.000	0.194
3.0667	0.009	0.011	0.000	0.194
3.1333	0.009	0.012	0.000	0.194
3.2000	0.009	0.012	0.000	0.194
3.2667	0.009	0.012	0.000	0.194
3.3333	0.009	0.012	0.000	0.194
3.4000	0.009	0.013	0.000	0.194
3.4667	0.009	0.013	0.000	0.194
3.5333	0.009	0.013	0.000	0.194
3.6000	0.009	0.013	0.000	0.194
3.6667	0.009	0.014	0.000	0.194
3.7333	0.009	0.014	0.000	0.194
3.8000	0.009	0.014	0.000	0.194
3.8667	0.009	0.014	0.000	0.194
3.9333	0.009	0.015	0.000	0.194
4.0000	0.009	0.015	0.000	0.194
4.0667	0.009	0.015	0.000	0.194
4.1333	0.009	0.015	0.000	0.194
4.2000	0.009	0.016	0.000	0.194
4.2667	0.009	0.016	0.000	0.194
4.3333	0.009	0.016	0.000	0.194
4.4000	0.009	0.017	0.000	0.194
4.4667	0.009	0.017	0.000	0.194
4.5333	0.009	0.017	0.000	0.194
4.6000	0.009	0.017	0.000	0.194
4.6667	0.009	0.018	0.000	0.194
4.7333	0.009	0.018	0.000	0.194
4.8000	0.009	0.018	0.000	0.194
4.8667	0.009	0.018	0.000	0.194
4.9333	0.009	0.019	0.000	0.194
5.0000	0.009	0.019	0.000	0.194
5.0667	0.009	0.019	0.000	0.194
5.1333	0.009	0.019	0.000	0.194
5.2000	0.009	0.020	0.000	0.194
5.2667	0.009	0.020	0.000	0.194
5.3333	0.009	0.020	0.000	0.194
5.4000	0.009	0.020	0.000	0.194
5.4667	0.009	0.021	0.000	0.194
5.5333	0.009	0.021	0.000	0.194

5.6000	0.009	0.021	0.000	0.194
5.6667	0.009	0.021	0.000	0.194
5.7333	0.009	0.022	0.000	0.194
5.8000	0.009	0.022	0.000	0.194
5.8667	0.009	0.022	0.090	0.194
5.9333	0.009	0.022	0.233	0.194
6.0000	0.009	0.022	0.346	0.194

Shoulder Trench

Bottom Length:	900.00 ft.
Bottom Width:	3.00 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	3
Pour Space of material for first layer:	0.4
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	0.3
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	50.523
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	50.523
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	2.9 ft.
Riser Diameter:	6 in.
Element Flows To:	
Outlet 1	Outlet 2

Gravel Trench Bed Hydraulic Table

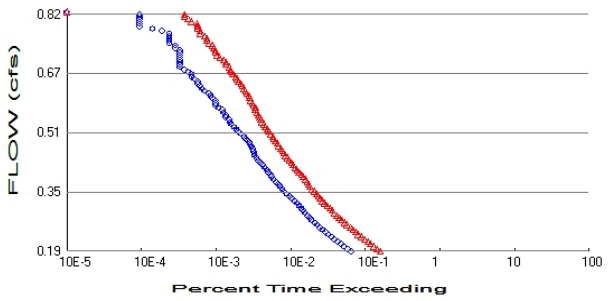
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.062	0.000	0.000	0.000
0.0333	0.062	0.000	0.000	0.018
0.0667	0.062	0.001	0.000	0.018
0.1000	0.062	0.002	0.000	0.018
0.1333	0.062	0.003	0.000	0.018
0.1667	0.062	0.004	0.000	0.018
0.2000	0.062	0.005	0.000	0.018
0.2333	0.062	0.005	0.000	0.018
0.2667	0.062	0.006	0.000	0.018
0.3000	0.062	0.007	0.000	0.018
0.3333	0.062	0.008	0.000	0.018
0.3667	0.062	0.009	0.000	0.018
0.4000	0.062	0.009	0.000	0.018
0.4333	0.062	0.010	0.000	0.018
0.4667	0.062	0.011	0.000	0.018
0.5000	0.062	0.012	0.000	0.018
0.5333	0.062	0.013	0.000	0.018
0.5667	0.062	0.014	0.000	0.018
0.6000	0.062	0.014	0.000	0.018
0.6333	0.062	0.015	0.000	0.018
0.6667	0.062	0.016	0.000	0.018
0.7000	0.062	0.017	0.000	0.018
0.7333	0.062	0.018	0.000	0.018
0.7667	0.062	0.019	0.000	0.018
0.8000	0.062	0.019	0.000	0.018
0.8333	0.062	0.020	0.000	0.018

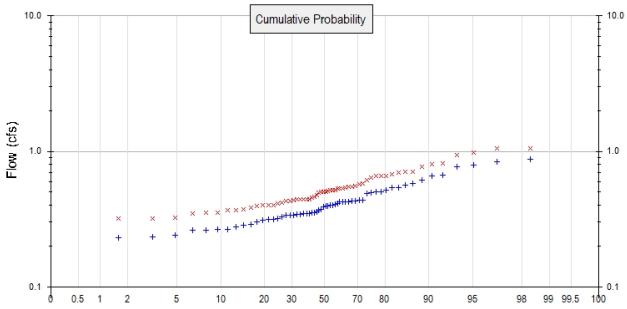
0.8667	0.062	0.021	0.000	0.018
0.9000	0.062	0.022	0.000	0.018
0.9333	0.062	0.023	0.000	0.018
0.9667	0.062	0.024	0.000	0.018
1.0000	0.062	0.024	0.000	0.018
1.0333	0.062	0.025	0.000	0.018
1.0667	0.062	0.026	0.000	0.018
1.1000	0.062	0.027	0.000	0.018
1.1333	0.062	0.028	0.000	0.018
1.1667	0.062	0.028	0.000	0.018
1.2000	0.062	0.029	0.000	0.018
1.2333	0.062	0.030	0.000	0.018
1.2667	0.062	0.031	0.000	0.018
1.3000	0.062	0.032	0.000	0.018
1.3333	0.062	0.033	0.000	0.018
1.3667	0.062	0.033	0.000	0.018
1.4000	0.062	0.034	0.000	0.018
1.4333	0.062	0.035	0.000	0.018
1.4667	0.062	0.036	0.000	0.018
1.5000	0.062	0.037	0.000	0.018
1.5333	0.062	0.038	0.000	0.018
1.5667	0.062	0.038	0.000	0.018
1.6000	0.062	0.039	0.000	0.018
1.6333	0.062	0.040	0.000	0.018
1.6667	0.062	0.041	0.000	0.018
1.7000	0.062	0.042	0.000	0.018
1.7333	0.062	0.043	0.000	0.018
1.7667	0.062	0.043	0.000	0.018
1.8000	0.062	0.044	0.000	0.018
1.8333	0.062	0.045	0.000	0.018
1.8667	0.062	0.046	0.000	0.018
1.9000	0.062	0.047	0.000	0.018
1.9333	0.062	0.047	0.000	0.018
1.9667	0.062	0.048	0.000	0.018
2.0000	0.062	0.049	0.000	0.018
2.0333	0.062	0.050	0.000	0.018
2.0667	0.062	0.051	0.000	0.018
2.1000	0.062	0.052	0.000	0.018
2.1333	0.062	0.052	0.000	0.018
2.1667	0.062	0.053	0.000	0.018
2.2000	0.062	0.054	0.000	0.018
2.2333	0.062	0.055	0.000	0.018
2.2667	0.062	0.056	0.000	0.018
2.3000	0.062	0.057	0.000	0.018
2.3333	0.062	0.057	0.000	0.018
2.3667	0.062	0.058	0.000	0.018
2.4000	0.062	0.059	0.000	0.018
2.4333	0.062	0.060	0.000	0.018
2.4667	0.062	0.061	0.000	0.018
2.5000	0.062	0.062	0.000	0.018
2.5333	0.062	0.062	0.000	0.018
2.5667	0.062	0.063	0.000	0.018
2.6000	0.062	0.064	0.000	0.018
2.6333	0.062	0.065	0.000	0.018
2.6667	0.062	0.066	0.000	0.018
2.7000	0.062	0.066	0.000	0.018
2.7333	0.062	0.067	0.000	0.018
2.7667	0.062	0.068	0.000	0.018

2.8000	0.062	0.069	0.000	0.018
2.8333	0.062	0.070	0.000	0.018
2.8667	0.062	0.071	0.000	0.018
2.9000	0.062	0.071	0.000	0.018
2.9333	0.062	0.072	0.032	0.018
2.9667	0.062	0.073	0.090	0.018
3.0000	0.062	0.074	0.160	0.018

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.631
Total Impervious Area: 0.691

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.547
Total Impervious Area: 0.961

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.386678
5 year	0.514942
10 year	0.605703
25 year	0.727257
50 year	0.822936
100 year	0.923118

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.499507
5 year	0.650943
10 year	0.756334
25 year	0.895645
50 year	1.00405
100 year	1.116538

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.559	0.698
1950	0.502	0.656
1951	0.342	0.428
1952	0.234	0.319
1953	0.261	0.355
1954	0.321	0.412
1955	0.350	0.458
1956	0.337	0.440
1957	0.422	0.533
1958	0.302	0.398

1959	0.276	0.381
1960	0.351	0.442
1961	0.348	0.444
1962	0.263	0.354
1963	0.350	0.444
1964	0.310	0.401
1965	0.435	0.550
1966	0.266	0.345
1967	0.499	0.617
1968	0.543	0.703
1969	0.409	0.512
1970	0.367	0.472
1971	0.430	0.557
1972	0.519	0.636
1973	0.225	0.312
1974	0.415	0.529
1975	0.424	0.536
1976	0.314	0.403
1977	0.329	0.417
1978	0.375	0.496
1979	0.490	0.663
1980	0.581	0.711
1981	0.402	0.519
1982	0.615	0.770
1983	0.428	0.567
1984	0.289	0.373
1985	0.398	0.514
1986	0.338	0.429
1987	0.497	0.659
1988	0.265	0.368
1989	0.360	0.500
1990	0.871	1.045
1991	0.671	0.816
1992	0.286	0.370
1993	0.239	0.325
1994	0.230	0.319
1995	0.337	0.444
1996	0.422	0.531
1997	0.397	0.500
1998	0.348	0.462
1999	0.841	1.058
2000	0.394	0.503
2001	0.388	0.518
2002	0.543	0.676
2003	0.438	0.547
2004	0.774	0.979
2005	0.344	0.436
2006	0.316	0.397
2007	0.789	0.942
2008	0.657	0.797
2009	0.425	0.582

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.8714	1.0576
2	0.8410	1.0446
3	0.7888	0.9791

4	0.7741	0.9416
5	0.6711	0.8157
6	0.6566	0.7970
7	0.6153	0.7701
8	0.5809	0.7113
9	0.5593	0.7034
10	0.5434	0.6983
11	0.5428	0.6761
12	0.5187	0.6625
13	0.5020	0.6592
14	0.4993	0.6561
15	0.4974	0.6363
16	0.4902	0.6174
17	0.4383	0.5820
18	0.4353	0.5673
19	0.4304	0.5566
20	0.4276	0.5499
21	0.4253	0.5471
22	0.4245	0.5360
23	0.4223	0.5334
24	0.4220	0.5310
25	0.4147	0.5292
26	0.4092	0.5188
27	0.4021	0.5180
28	0.3985	0.5143
29	0.3973	0.5122
30	0.3941	0.5033
31	0.3880	0.5004
32	0.3749	0.4996
33	0.3674	0.4959
34	0.3595	0.4720
35	0.3506	0.4618
36	0.3502	0.4578
37	0.3497	0.4444
38	0.3483	0.4443
39	0.3481	0.4437
40	0.3443	0.4416
41	0.3417	0.4396
42	0.3379	0.4359
43	0.3373	0.4286
44	0.3369	0.4283
45	0.3291	0.4172
46	0.3215	0.4125
47	0.3161	0.4032
48	0.3145	0.4006
49	0.3104	0.3985
50	0.3016	0.3968
51	0.2887	0.3815
52	0.2862	0.3731
53	0.2760	0.3703
54	0.2657	0.3678
55	0.2646	0.3549
56	0.2631	0.3536
57	0.2615	0.3453
58	0.2390	0.3253
59	0.2342	0.3192
60	0.2296	0.3192
61	0.2249	0.3121

Duration Flows

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1933	1360	3373	248	Fail
0.1997	1228	3063	249	Fail
0.2061	1092	2740	250	Fail
0.2124	996	2496	250	Fail
0.2188	899	2316	257	Fail
0.2251	811	2087	257	Fail
0.2315	749	1890	252	Fail
0.2379	682	1725	252	Fail
0.2442	622	1581	254	Fail
0.2506	569	1458	256	Fail
0.2569	527	1351	256	Fail
0.2633	482	1215	252	Fail
0.2697	449	1119	249	Fail
0.2760	405	1026	253	Fail
0.2824	384	956	248	Fail
0.2887	358	886	247	Fail
0.2951	333	814	244	Fail
0.3015	311	771	247	Fail
0.3078	294	713	242	Fail
0.3142	274	658	240	Fail
0.3205	260	610	234	Fail
0.3269	240	571	237	Fail
0.3332	221	533	241	Fail
0.3396	206	502	243	Fail
0.3460	189	471	249	Fail
0.3523	171	440	257	Fail
0.3587	164	408	248	Fail
0.3650	153	385	251	Fail
0.3714	144	371	257	Fail
0.3778	135	353	261	Fail
0.3841	126	335	265	Fail
0.3905	118	311	263	Fail
0.3968	113	298	263	Fail
0.4032	107	276	257	Fail
0.4096	104	260	250	Fail
0.4159	97	244	251	Fail
0.4223	89	229	257	Fail
0.4286	83	219	263	Fail
0.4350	78	205	262	Fail
0.4414	74	192	259	Fail
0.4477	71	179	252	Fail
0.4541	69	172	249	Fail
0.4604	67	166	247	Fail
0.4668	66	157	237	Fail
0.4732	64	148	231	Fail
0.4795	60	142	236	Fail
0.4859	57	132	231	Fail
0.4922	53	126	237	Fail
0.4986	51	123	241	Fail
0.5050	47	113	240	Fail
0.5113	42	109	259	Fail
0.5177	40	103	257	Fail
0.5240	37	97	262	Fail
0.5304	34	93	273	Fail

0.5368	33	87	263	Fail
0.5431	32	84	262	Fail
0.5495	29	82	282	Fail
0.5558	29	79	272	Fail
0.5622	27	75	277	Fail
0.5686	26	72	276	Fail
0.5749	23	72	313	Fail
0.5813	21	68	323	Fail
0.5876	21	65	309	Fail
0.5940	21	62	295	Fail
0.6004	19	60	315	Fail
0.6067	18	59	327	Fail
0.6131	17	55	323	Fail
0.6194	15	53	353	Fail
0.6258	14	51	364	Fail
0.6321	13	48	369	Fail
0.6385	12	46	383	Fail
0.6449	12	42	350	Fail
0.6512	11	41	372	Fail
0.6576	10	39	390	Fail
0.6639	10	36	360	Fail
0.6703	9	34	377	Fail
0.6767	8	33	412	Fail
0.6830	7	32	457	Fail
0.6894	7	29	414	Fail
0.6957	7	29	414	Fail
0.7021	7	27	385	Fail
0.7085	7	24	342	Fail
0.7148	7	22	314	Fail
0.7212	7	21	300	Fail
0.7275	7	21	300	Fail
0.7339	6	20	333	Fail
0.7403	6	19	316	Fail
0.7466	5	17	340	Fail
0.7530	5	16	320	Fail
0.7593	5	16	320	Fail
0.7657	5	15	300	Fail
0.7721	5	13	260	Fail
0.7784	4	13	325	Fail
0.7848	3	12	400	Fail
0.7911	2	12	600	Fail
0.7975	2	12	600	Fail
0.8039	2	10	500	Fail
0.8102	2	9	450	Fail
0.8166	2	8	400	Fail
0.8229	2	8	400	Fail

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality

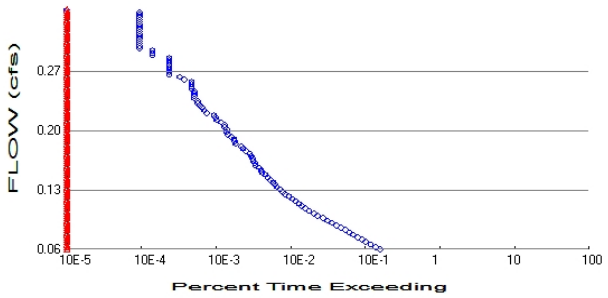
Water Quality BMP Flow and Volume for POC #1

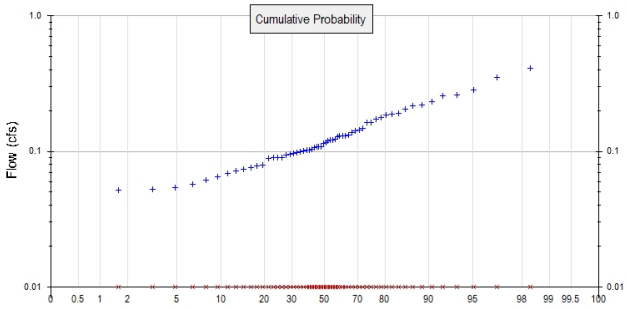
On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

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
Total Volume Infiltrated		0.00	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 = Failed

POC 2





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #2
Total Pervious Area: 1.22
Total Impervious Area: 0.103

Mitigated Landuse Totals for POC #2
Total Pervious Area: 0.547
Total Impervious Area: 0.961

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	**Flow(cfs)**
2 year	0.116377
5 year	0.176423
10 year	0.221313
25 year	0.283832
50 year	0.334629
100 year	0.389068

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	**Flow(cfs)**
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #2

Year	**Predeveloped**	**Mitigated**
1949	0.189	0.000
1950	0.186	0.000
1951	0.130	0.000
1952	0.071	0.000
1953	0.057	0.000
1954	0.095	0.000
1955	0.102	0.000
1956	0.102	0.000
1957	0.138	0.000
1958	0.074	0.000
1959	0.068	0.000

1960	0.143	0.000
1961	0.108	0.000
1962	0.053	0.000
1963	0.107	0.000
1964	0.098	0.000
1965	0.131	0.000
1966	0.078	0.000
1967	0.190	0.000
1968	0.123	0.000
1969	0.120	0.000
1970	0.109	0.000
1971	0.131	0.000
1972	0.179	0.000
1973	0.065	0.000
1974	0.121	0.000
1975	0.147	0.000
1976	0.103	0.000
1977	0.089	0.000
1978	0.097	0.000
1979	0.089	0.000
1980	0.234	0.000
1981	0.109	0.000
1982	0.221	0.000
1983	0.099	0.000
1984	0.079	0.000
1985	0.094	0.000
1986	0.132	0.000
1987	0.129	0.000
1988	0.052	0.000
1989	0.054	0.000
1990	0.409	0.000
1991	0.260	0.000
1992	0.090	0.000
1993	0.061	0.000
1994	0.042	0.000
1995	0.089	0.000
1996	0.203	0.000
1997	0.141	0.000
1998	0.101	0.000
1999	0.283	0.000
2000	0.114	0.000
2001	0.076	0.000
2002	0.173	0.000
2003	0.164	0.000
2004	0.216	0.000
2005	0.121	0.000
2006	0.116	0.000
2007	0.350	0.000
2008	0.257	0.000
2009	0.164	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #2

Rank	Predeveloped	Mitigated
1	0.4090	0.0000
2	0.3497	0.0000
3	0.2828	0.0000
4	0.2600	0.0000

5	0.2570	0.0000
6	0.2340	0.0000
7	0.2206	0.0000
8	0.2159	0.0000
9	0.2034	0.0000
10	0.1905	0.0000
11	0.1889	0.0000
12	0.1865	0.0000
13	0.1785	0.0000
14	0.1735	0.0000
15	0.1642	0.0000
16	0.1637	0.0000
17	0.1473	0.0000
18	0.1430	0.0000
19	0.1413	0.0000
20	0.1383	0.0000
21	0.1318	0.0000
22	0.1310	0.0000
23	0.1310	0.0000
24	0.1299	0.0000
25	0.1290	0.0000
26	0.1228	0.0000
27	0.1214	0.0000
28	0.1206	0.0000
29	0.1200	0.0000
30	0.1161	0.0000
31	0.1141	0.0000
32	0.1089	0.0000
33	0.1087	0.0000
34	0.1082	0.0000
35	0.1066	0.0000
36	0.1030	0.0000
37	0.1020	0.0000
38	0.1019	0.0000
39	0.1008	0.0000
40	0.0989	0.0000
41	0.0976	0.0000
42	0.0967	0.0000
43	0.0954	0.0000
44	0.0940	0.0000
45	0.0895	0.0000
46	0.0894	0.0000
47	0.0893	0.0000
48	0.0887	0.0000
49	0.0793	0.0000
50	0.0779	0.0000
51	0.0756	0.0000
52	0.0737	0.0000
53	0.0712	0.0000
54	0.0682	0.0000
55	0.0653	0.0000
56	0.0614	0.0000
57	0.0568	0.0000
58	0.0539	0.0000
59	0.0527	0.0000
60	0.0517	0.0000
61	0.0415	0.0000

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0582	3405	0	0	Pass
0.0610	2915	0	0	Pass
0.0638	2505	0	0	Pass
0.0666	2165	0	0	Pass
0.0694	1923	0	0	Pass
0.0722	1680	0	0	Pass
0.0749	1474	0	0	Pass
0.0777	1298	0	0	Pass
0.0805	1144	0	0	Pass
0.0833	1000	0	0	Pass
0.0861	877	0	0	Pass
0.0889	771	0	0	Pass
0.0917	668	0	0	Pass
0.0945	579	0	0	Pass
0.0973	492	0	0	Pass
0.1001	436	0	0	Pass
0.1029	374	0	0	Pass
0.1057	335	0	0	Pass
0.1085	299	0	0	Pass
0.1112	276	0	0	Pass
0.1140	247	0	0	Pass
0.1168	228	0	0	Pass
0.1196	202	0	0	Pass
0.1224	179	0	0	Pass
0.1252	166	0	0	Pass
0.1280	153	0	0	Pass
0.1308	142	0	0	Pass
0.1336	131	0	0	Pass
0.1364	124	0	0	Pass
0.1392	114	0	0	Pass
0.1420	105	0	0	Pass
0.1448	98	0	0	Pass
0.1475	88	0	0	Pass
0.1503	85	0	0	Pass
0.1531	80	0	0	Pass
0.1559	72	0	0	Pass
0.1587	70	0	0	Pass
0.1615	67	0	0	Pass
0.1643	65	0	0	Pass
0.1671	64	0	0	Pass
0.1699	60	0	0	Pass
0.1727	54	0	0	Pass
0.1755	49	0	0	Pass
0.1783	46	0	0	Pass
0.1811	39	0	0	Pass
0.1838	38	0	0	Pass
0.1866	37	0	0	Pass
0.1894	34	0	0	Pass
0.1922	31	0	0	Pass
0.1950	30	0	0	Pass
0.1978	30	0	0	Pass
0.2006	28	0	0	Pass
0.2034	28	0	0	Pass

0.2062	25	0	0	Pass
0.2090	22	0	0	Pass
0.2118	21	0	0	Pass
0.2146	20	0	0	Pass
0.2174	16	0	0	Pass
0.2201	15	0	0	Pass
0.2229	14	0	0	Pass
0.2257	13	0	0	Pass
0.2285	12	0	0	Pass
0.2313	12	0	0	Pass
0.2341	11	0	0	Pass
0.2369	11	0	0	Pass
0.2397	11	0	0	Pass
0.2425	11	0	0	Pass
0.2453	10	0	0	Pass
0.2481	10	0	0	Pass
0.2509	10	0	0	Pass
0.2537	10	0	0	Pass
0.2564	8	0	0	Pass
0.2592	7	0	0	Pass
0.2620	5	0	0	Pass
0.2648	5	0	0	Pass
0.2676	5	0	0	Pass
0.2704	5	0	0	Pass
0.2732	5	0	0	Pass
0.2760	5	0	0	Pass
0.2788	5	0	0	Pass
0.2816	5	0	0	Pass
0.2844	3	0	0	Pass
0.2872	3	0	0	Pass
0.2900	3	0	0	Pass
0.2927	2	0	0	Pass
0.2955	2	0	0	Pass
0.2983	2	0	0	Pass
0.3011	2	0	0	Pass
0.3039	2	0	0	Pass
0.3067	2	0	0	Pass
0.3095	2	0	0	Pass
0.3123	2	0	0	Pass
0.3151	2	0	0	Pass
0.3179	2	0	0	Pass
0.3207	2	0	0	Pass
0.3235	2	0	0	Pass
0.3263	2	0	0	Pass
0.3290	2	0	0	Pass
0.3318	2	0	0	Pass
0.3346	2	0	0	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #2

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
West Trench POC	☐	80.31			☐	100.00			
East Trench POC	☐	90.58			☐	100.00			
Shoulder Trench POC	☐	45.98			☐	100.00			
Total Volume Infiltrated		216.87	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

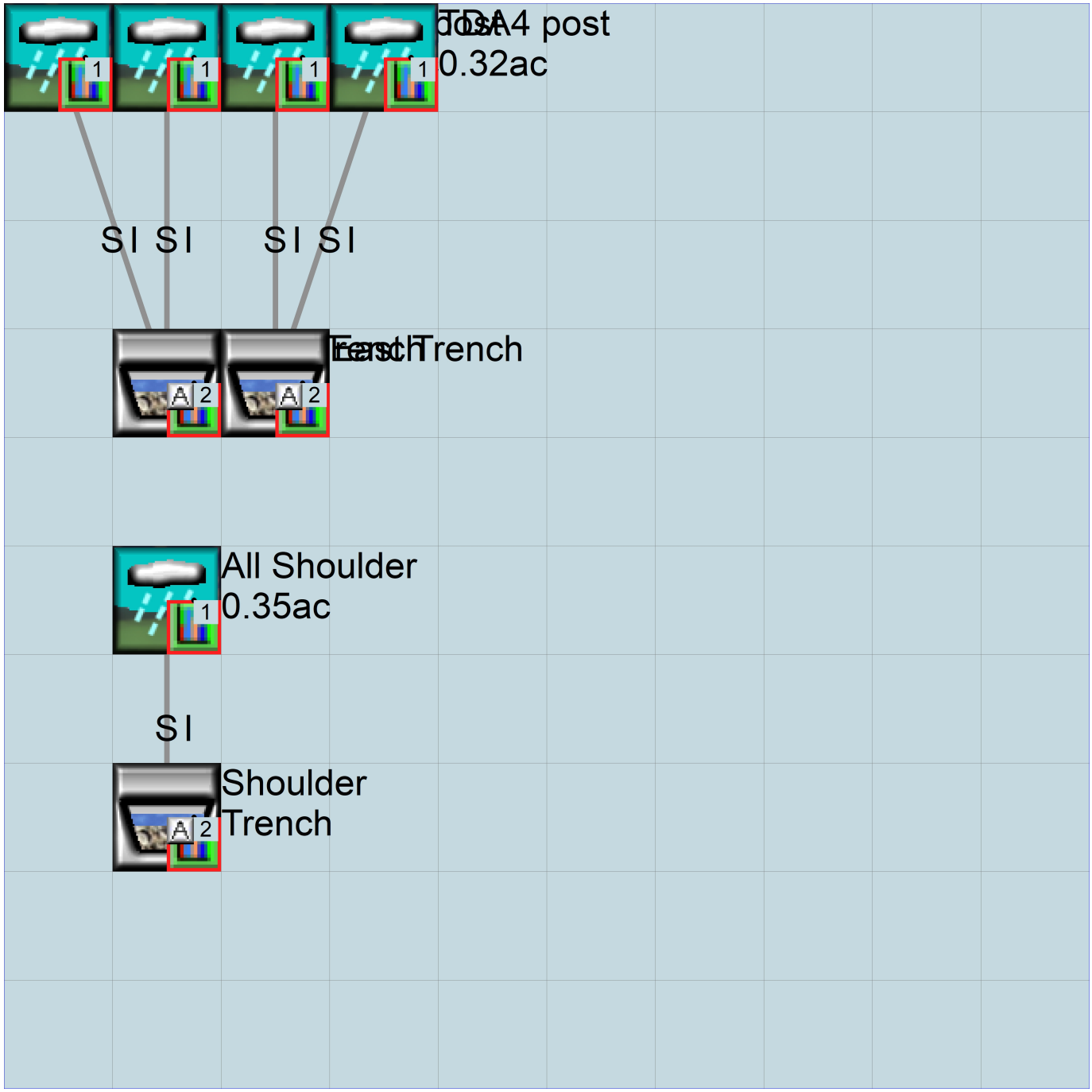
IMPLND Changes

No IMPLND changes have been made.

Appendix

Predeveloped Schematic

Mitigated Schematic



Predeveloped UCI File

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RUN

GLOBAL
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  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

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MESSU       25   Precarnation bird shoulder deep 40pct 23.11.08.MES
            27   Precarnation bird shoulder deep 40pct 23.11.08.L61
            28   Precarnation bird shoulder deep 40pct 23.11.08.L62
            30   POCcarnation bird shoulder deep 40pct 23.11.081.dat
            31   POCcarnation bird shoulder deep 40pct 23.11.082.dat
END FILES

OPN SEQUENCE
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      PERLND      16
      IMPLND       1
      PERLND      10
      COPY       501
      COPY       502
      DISPLY       1
      DISPLY       2
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        TDA1 exist                 MAX                    1    2   30    9
    2        TDA1 pre                   MAX                    1    2   31    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  502         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
   10     C, Forest, 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
```

```
 10         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
   10         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
   10         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
   10              0       4.5      0.08       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
   10              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
   10            0.2       0.5      0.35         6       0.5       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
   16              0         0         0         0       2.5         1         0
   10              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           ***
    1      ROADS/FLAT             1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         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     ***
    1         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
TDA1 exist***
PERLND  16                       0.143     COPY   501     12
PERLND  16                       0.143     COPY   501     13
IMPLND   1                        0.16     COPY   501     15
TDA2 exist***
PERLND  16                       0.184     COPY   501     12
PERLND  16                       0.184     COPY   501     13
IMPLND   1                       0.143     COPY   501     15
TDA3 Exist***
PERLND  16                        0.16     COPY   501     12
PERLND  16                        0.16     COPY   501     13
IMPLND   1                       0.172     COPY   501     15
TDA4 exist***
PERLND  16                       0.144     COPY   501     12
PERLND  16                       0.144     COPY   501     13
IMPLND   1                       0.216     COPY   501     15
TDA1 pre***
PERLND  10                       0.184     COPY   502     12
PERLND  10                       0.184     COPY   502     13
PERLND  16                       0.081     COPY   502     12
PERLND  16                       0.081     COPY   502     13
IMPLND   1                       0.038     COPY   502     15
TDA2 pre***
PERLND  10                       0.213     COPY   502     12
PERLND  10                       0.213     COPY   502     13
PERLND  16                       0.099     COPY   502     12
PERLND  16                       0.099     COPY   502     13
IMPLND   1                       0.015     COPY   502     15
TDA3 pre***
PERLND  16                        0.09     COPY   502     12
PERLND  16                        0.09     COPY   502     13
PERLND  10                       0.221     COPY   502     12
PERLND  10                       0.221     COPY   502     13
IMPLND   1                       0.021     COPY   502     15
TDA4 pre***
PERLND  10                        0.24     COPY   502     12
PERLND  10                        0.24     COPY   502     13
PERLND  16                       0.092     COPY   502     12
PERLND  16                       0.092     COPY   502     13
IMPLND   1                       0.029     COPY   502     15

******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
COPY   502 OUTPUT MEAN   1 1   48.4        DISPLY   2     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    1.167          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.167          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
COPY   502 OUTPUT MEAN   1 1     48.4      WDM    502 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

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


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   carnation bird shoulder deep 40pct 23.11.08.wdm
MESSU       25   Mitcarnation bird shoulder deep 40pct 23.11.08.MES
            27   Mitcarnation bird shoulder deep 40pct 23.11.08.L61
            28   Mitcarnation bird shoulder deep 40pct 23.11.08.L62
            30   POCcarnation bird shoulder deep 40pct 23.11.081.dat
            31   POCcarnation bird shoulder deep 40pct 23.11.082.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      16
      IMPLND       1
      IMPLND       8
      RCHRES       1
      RCHRES       2
      RCHRES       3
      COPY       501
      COPY         2
      COPY       502
      DISPLY       1
      DISPLY       2
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        TDA1 Post                  MAX                    1    2   30    9
    2        Shoulder Trench            MAX                    1    2   31    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
    2         1    1
  502         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           ***
    1      ROADS/FLAT             1    1    1   27    0
    8      SIDEWALKS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    8         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
    8         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     ***
    1         0    0    0    0    0
    8         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    8            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    8              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    8              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
TDA2 post***
PERLND  16                      0.099     RCHRES   2      2
PERLND  16                      0.099     RCHRES   2      3
IMPLND   1                      0.161     RCHRES   2      5
IMPLND   8                      0.026     RCHRES   2      5
TDA1 Post***
PERLND  16                      0.082     RCHRES   2      2
PERLND  16                      0.082     RCHRES   2      3
IMPLND   1                      0.156     RCHRES   2      5
IMPLND   8                      0.024     RCHRES   2      5
TDA3 post***
PERLND  16                       0.09     RCHRES   3      2
PERLND  16                       0.09     RCHRES   3      3
IMPLND   1                       0.17     RCHRES   3      5
IMPLND   8                      0.031     RCHRES   3      5
TDA4 post***
PERLND  16                      0.092     RCHRES   3      2
PERLND  16                      0.092     RCHRES   3      3
IMPLND   1                      0.195     RCHRES   3      5
IMPLND   8                      0.033     RCHRES   3      5
All Shoulder***
PERLND  16                      0.184     RCHRES   1      2
PERLND  16                      0.184     RCHRES   1      3
IMPLND   1                      0.165     RCHRES   1      5
TDA1 Post***
PERLND  16                      0.082     COPY   501     12
PERLND  16                      0.082     COPY   501     13
IMPLND   1                      0.156     COPY   501     15
IMPLND   8                      0.024     COPY   501     15
TDA2 post***
PERLND  16                      0.099     COPY   501     12
PERLND  16                      0.099     COPY   501     13
IMPLND   1                      0.161     COPY   501     15
IMPLND   8                      0.026     COPY   501     15
TDA3 post***
PERLND  16                       0.09     COPY   501     12
PERLND  16                       0.09     COPY   501     13
IMPLND   1                       0.17     COPY   501     15
IMPLND   8                      0.031     COPY   501     15
```

```
TDA4 post***
PERLND  16                      0.092     COPY   501     12
PERLND  16                      0.092     COPY   501     13
IMPLND   1                      0.195     COPY   501     15
IMPLND   8                      0.033     COPY   501     15
All Shoulder***
PERLND  16                      0.184     COPY   501     12
PERLND  16                      0.184     COPY   501     13
IMPLND   1                      0.165     COPY   501     15

******Routing******
PERLND  16                      0.082     COPY     2     12
IMPLND   1                      0.156     COPY     2     15
IMPLND   8                      0.024     COPY     2     15
PERLND  16                      0.082     COPY     2     13
PERLND  16                      0.099     COPY     2     12
IMPLND   1                      0.161     COPY     2     15
IMPLND   8                      0.026     COPY     2     15
PERLND  16                      0.099     COPY     2     13
PERLND  16                       0.09     COPY     2     12
IMPLND   1                       0.17     COPY     2     15
IMPLND   8                      0.031     COPY     2     15
PERLND  16                       0.09     COPY     2     13
PERLND  16                      0.092     COPY     2     12
IMPLND   1                      0.195     COPY     2     15
IMPLND   8                      0.033     COPY     2     15
PERLND  16                      0.092     COPY     2     13
PERLND  16                      0.184     COPY     2     12
IMPLND   1                      0.165     COPY     2     15
PERLND  16                      0.184     COPY     2     13
RCHRES   2                          1     COPY   502     17
RCHRES   3                          1     COPY   502     17
RCHRES   1                          1     COPY   502     17
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
COPY   502 OUTPUT MEAN   1 1   48.4        DISPLY   2     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     Shoulder Trench         2    1    1    1   28    0    1
    2     West Trench             2    1    1    1   28    0    1
    3     East Trench             2    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
    2         1    0    0    0    0    0    0    0    0    0
    3         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
```

```
    2         4    0    0    0    0    0    0    0    0    0    1    9
    3         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  5  0  0  0       0  0  0  0  0       2  2  2  2  2
    2       0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
    3       0  1  0  0    4  5  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      0.17       0.0       0.0       0.5       0.0
    2              2      0.03       0.0       0.0       0.5       0.0
    3              3      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  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    3            0         4.0  5.0  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      2
   92    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.028926  0.000000  0.000000  0.000000
  0.077778  0.028926  0.000900  0.000000  0.084583
  0.155556  0.028926  0.001800  0.000000  0.084583
  0.233333  0.028926  0.002700  0.000000  0.084583
  0.311111  0.028926  0.003600  0.000000  0.084583
  0.388889  0.028926  0.004500  0.000000  0.084583
  0.466667  0.028926  0.005399  0.000000  0.084583
  0.544444  0.028926  0.006299  0.000000  0.084583
  0.622222  0.028926  0.007199  0.000000  0.084583
  0.700000  0.028926  0.008099  0.000000  0.084583
  0.777778  0.028926  0.008999  0.000000  0.084583
  0.855556  0.028926  0.009899  0.000000  0.084583
  0.933333  0.028926  0.010799  0.000000  0.084583
  1.011111  0.028926  0.011699  0.000000  0.084583
  1.088889  0.028926  0.012599  0.000000  0.084583
  1.166667  0.028926  0.013499  0.000000  0.084583
  1.244444  0.028926  0.014399  0.000000  0.084583
  1.322222  0.028926  0.015298  0.000000  0.084583
  1.400000  0.028926  0.016198  0.000000  0.084583
  1.477778  0.028926  0.017098  0.000000  0.084583
  1.555556  0.028926  0.017998  0.000000  0.084583
  1.633333  0.028926  0.018898  0.000000  0.084583
  1.711111  0.028926  0.019798  0.000000  0.084583
  1.788889  0.028926  0.020698  0.000000  0.084583
  1.866667  0.028926  0.021598  0.000000  0.084583
  1.944444  0.028926  0.022498  0.000000  0.084583
  2.022222  0.028926  0.023398  0.000000  0.084583
  2.100000  0.028926  0.024298  0.000000  0.084583
  2.177778  0.028926  0.025197  0.000000  0.084583
  2.255556  0.028926  0.026097  0.000000  0.084583
  2.333333  0.028926  0.026997  0.000000  0.084583
```

```
2.411111  0.028926  0.027897  0.000000  0.084583
2.488889  0.028926  0.028797  0.000000  0.084583
2.566667  0.028926  0.029697  0.000000  0.084583
2.644444  0.028926  0.030597  0.000000  0.084583
2.722222  0.028926  0.031497  0.000000  0.084583
2.800000  0.028926  0.032397  0.000000  0.084583
2.877778  0.028926  0.033297  0.000000  0.084583
2.955556  0.028926  0.034197  0.000000  0.084583
3.033333  0.028926  0.035096  0.000000  0.084583
3.111111  0.028926  0.035996  0.000000  0.084583
3.188889  0.028926  0.036896  0.000000  0.084583
3.266667  0.028926  0.037796  0.000000  0.084583
3.344444  0.028926  0.038696  0.000000  0.084583
3.422222  0.028926  0.039596  0.000000  0.084583
3.500000  0.028926  0.040496  0.000000  0.084583
3.577778  0.028926  0.041396  0.000000  0.084583
3.655556  0.028926  0.042296  0.000000  0.084583
3.733333  0.028926  0.043196  0.000000  0.084583
3.811111  0.028926  0.044096  0.000000  0.084583
3.888889  0.028926  0.044995  0.000000  0.084583
3.966667  0.028926  0.045895  0.000000  0.084583
4.044444  0.028926  0.046795  0.000000  0.084583
4.122222  0.028926  0.047695  0.000000  0.084583
4.200000  0.028926  0.048595  0.000000  0.084583
4.277778  0.028926  0.049495  0.000000  0.084583
4.355556  0.028926  0.050395  0.000000  0.084583
4.433333  0.028926  0.051295  0.000000  0.084583
4.511111  0.028926  0.052195  0.000000  0.084583
4.588889  0.028926  0.053095  0.000000  0.084583
4.666667  0.028926  0.053994  0.000000  0.084583
4.744444  0.028926  0.054894  0.000000  0.084583
4.822222  0.028926  0.055794  0.000000  0.084583
4.900000  0.028926  0.056694  0.000000  0.084583
4.977778  0.028926  0.057594  0.000000  0.084583
5.055556  0.028926  0.058494  0.000000  0.084583
5.133333  0.028926  0.059394  0.000000  0.084583
5.211111  0.028926  0.060294  0.000000  0.084583
5.288889  0.028926  0.061194  0.000000  0.084583
5.366667  0.028926  0.062094  0.000000  0.084583
5.444444  0.028926  0.062994  0.000000  0.084583
5.522222  0.028926  0.063893  0.000000  0.084583
5.600000  0.028926  0.064793  0.000000  0.084583
5.677778  0.028926  0.065693  0.000000  0.084583
5.755556  0.028926  0.066593  0.000000  0.084583
5.833333  0.028926  0.067493  0.000000  0.084583
5.911111  0.028926  0.068393  0.000000  0.084583
5.988889  0.028926  0.069293  0.000000  0.084583
6.066667  0.028926  0.070193  0.000000  0.084583
6.144444  0.028926  0.071093  0.000000  0.084583
6.222222  0.028926  0.071993  0.000000  0.084583
6.300000  0.028926  0.072893  0.000000  0.084583
6.377778  0.028926  0.073792  0.000000  0.084583
6.455556  0.028926  0.074692  0.000000  0.084583
6.533333  0.028926  0.075592  0.000000  0.084583
6.611111  0.028926  0.076492  0.000000  0.084583
6.688889  0.028926  0.077392  0.000000  0.084583
6.766667  0.028926  0.078292  0.000000  0.084583
6.844444  0.028926  0.078292  0.049489  0.084583
6.922222  0.028926  0.078292  0.209226  0.084583
7.000000  0.028926  0.078292  0.346488  0.084583
7.077778  0.028926  0.080542  0.415000  0.084583
END FTABLE  2
FTABLE      3
 92    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.009642  0.000000  0.000000  0.000000
0.066667  0.009642  0.000257  0.000000  0.194444
0.133333  0.009642  0.000514  0.000000  0.194444
0.200000  0.009642  0.000771  0.000000  0.194444
```

0.266667	0.009642	0.001028	0.000000	0.194444
0.333333	0.009642	0.001286	0.000000	0.194444
0.400000	0.009642	0.001543	0.000000	0.194444
0.466667	0.009642	0.001800	0.000000	0.194444
0.533333	0.009642	0.002057	0.000000	0.194444
0.600000	0.009642	0.002314	0.000000	0.194444
0.666667	0.009642	0.002571	0.000000	0.194444
0.733333	0.009642	0.002828	0.000000	0.194444
0.800000	0.009642	0.003085	0.000000	0.194444
0.866667	0.009642	0.003343	0.000000	0.194444
0.933333	0.009642	0.003600	0.000000	0.194444
1.000000	0.009642	0.003857	0.000000	0.194444
1.066667	0.009642	0.004114	0.000000	0.194444
1.133333	0.009642	0.004371	0.000000	0.194444
1.200000	0.009642	0.004628	0.000000	0.194444
1.266667	0.009642	0.004885	0.000000	0.194444
1.333333	0.009642	0.005142	0.000000	0.194444
1.400000	0.009642	0.005399	0.000000	0.194444
1.466667	0.009642	0.005657	0.000000	0.194444
1.533333	0.009642	0.005914	0.000000	0.194444
1.600000	0.009642	0.006171	0.000000	0.194444
1.666667	0.009642	0.006428	0.000000	0.194444
1.733333	0.009642	0.006685	0.000000	0.194444
1.800000	0.009642	0.006942	0.000000	0.194444
1.866667	0.009642	0.007199	0.000000	0.194444
1.933333	0.009642	0.007456	0.000000	0.194444
2.000000	0.009642	0.007713	0.000000	0.194444
2.066667	0.009642	0.007971	0.000000	0.194444
2.133333	0.009642	0.008228	0.000000	0.194444
2.200000	0.009642	0.008485	0.000000	0.194444
2.266667	0.009642	0.008742	0.000000	0.194444
2.333333	0.009642	0.008999	0.000000	0.194444
2.400000	0.009642	0.009256	0.000000	0.194444
2.466667	0.009642	0.009513	0.000000	0.194444
2.533333	0.009642	0.009770	0.000000	0.194444
2.600000	0.009642	0.010028	0.000000	0.194444
2.666667	0.009642	0.010285	0.000000	0.194444
2.733333	0.009642	0.010542	0.000000	0.194444
2.800000	0.009642	0.010799	0.000000	0.194444
2.866667	0.009642	0.011056	0.000000	0.194444
2.933333	0.009642	0.011313	0.000000	0.194444
3.000000	0.009642	0.011570	0.000000	0.194444
3.066667	0.009642	0.011827	0.000000	0.194444
3.133333	0.009642	0.012084	0.000000	0.194444
3.200000	0.009642	0.012342	0.000000	0.194444
3.266667	0.009642	0.012599	0.000000	0.194444
3.333333	0.009642	0.012856	0.000000	0.194444
3.400000	0.009642	0.013113	0.000000	0.194444
3.466667	0.009642	0.013370	0.000000	0.194444
3.533333	0.009642	0.013627	0.000000	0.194444
3.600000	0.009642	0.013884	0.000000	0.194444
3.666667	0.009642	0.014141	0.000000	0.194444
3.733333	0.009642	0.014399	0.000000	0.194444
3.800000	0.009642	0.014656	0.000000	0.194444
3.866667	0.009642	0.014913	0.000000	0.194444
3.933333	0.009642	0.015170	0.000000	0.194444
4.000000	0.009642	0.015427	0.000000	0.194444
4.066667	0.009642	0.015684	0.000000	0.194444
4.133333	0.009642	0.015941	0.000000	0.194444
4.200000	0.009642	0.016198	0.000000	0.194444
4.266667	0.009642	0.016455	0.000000	0.194444
4.333333	0.009642	0.016713	0.000000	0.194444
4.400000	0.009642	0.016970	0.000000	0.194444
4.466667	0.009642	0.017227	0.000000	0.194444
4.533333	0.009642	0.017484	0.000000	0.194444
4.600000	0.009642	0.017741	0.000000	0.194444
4.666667	0.009642	0.017998	0.000000	0.194444
4.733333	0.009642	0.018255	0.000000	0.194444
4.800000	0.009642	0.018512	0.000000	0.194444
4.866667	0.009642	0.018770	0.000000	0.194444

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4.933333  0.009642  0.019027  0.000000  0.194444
5.000000  0.009642  0.019284  0.000000  0.194444
5.066667  0.009642  0.019541  0.000000  0.194444
5.133333  0.009642  0.019798  0.000000  0.194444
5.200000  0.009642  0.020055  0.000000  0.194444
5.266667  0.009642  0.020312  0.000000  0.194444
5.333333  0.009642  0.020569  0.000000  0.194444
5.400000  0.009642  0.020826  0.000000  0.194444
5.466667  0.009642  0.021084  0.000000  0.194444
5.533333  0.009642  0.021341  0.000000  0.194444
5.600000  0.009642  0.021598  0.000000  0.194444
5.666667  0.009642  0.021855  0.000000  0.194444
5.733333  0.009642  0.022112  0.000000  0.194444
5.800000  0.009642  0.022369  0.000000  0.194444
5.866667  0.009642  0.022369  0.090096  0.194444
5.933333  0.009642  0.022369  0.233006  0.194444
6.000000  0.009642  0.022369  0.346488  0.194444
6.066667  0.009642  0.023012  0.406615  0.194444
END FTABLE  3
FTABLE      1
 92    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
0.000000  0.061983  0.000000  0.000000  0.000000
0.033333  0.061983  0.000826  0.000000  0.018750
0.066667  0.061983  0.001653  0.000000  0.018750
0.100000  0.061983  0.002479  0.000000  0.018750
0.133333  0.061983  0.003306  0.000000  0.018750
0.166667  0.061983  0.004132  0.000000  0.018750
0.200000  0.061983  0.004959  0.000000  0.018750
0.233333  0.061983  0.005785  0.000000  0.018750
0.266667  0.061983  0.006612  0.000000  0.018750
0.300000  0.061983  0.007438  0.000000  0.018750
0.333333  0.061983  0.008264  0.000000  0.018750
0.366667  0.061983  0.009091  0.000000  0.018750
0.400000  0.061983  0.009917  0.000000  0.018750
0.433333  0.061983  0.010744  0.000000  0.018750
0.466667  0.061983  0.011570  0.000000  0.018750
0.500000  0.061983  0.012397  0.000000  0.018750
0.533333  0.061983  0.013223  0.000000  0.018750
0.566667  0.061983  0.014050  0.000000  0.018750
0.600000  0.061983  0.014876  0.000000  0.018750
0.633333  0.061983  0.015702  0.000000  0.018750
0.666667  0.061983  0.016529  0.000000  0.018750
0.700000  0.061983  0.017355  0.000000  0.018750
0.733333  0.061983  0.018182  0.000000  0.018750
0.766667  0.061983  0.019008  0.000000  0.018750
0.800000  0.061983  0.019835  0.000000  0.018750
0.833333  0.061983  0.020661  0.000000  0.018750
0.866667  0.061983  0.021488  0.000000  0.018750
0.900000  0.061983  0.022314  0.000000  0.018750
0.933333  0.061983  0.023140  0.000000  0.018750
0.966667  0.061983  0.023967  0.000000  0.018750
1.000000  0.061983  0.024793  0.000000  0.018750
1.033333  0.061983  0.025620  0.000000  0.018750
1.066667  0.061983  0.026446  0.000000  0.018750
1.100000  0.061983  0.027273  0.000000  0.018750
1.133333  0.061983  0.028099  0.000000  0.018750
1.166667  0.061983  0.028926  0.000000  0.018750
1.200000  0.061983  0.029752  0.000000  0.018750
1.233333  0.061983  0.030579  0.000000  0.018750
1.266667  0.061983  0.031405  0.000000  0.018750
1.300000  0.061983  0.032231  0.000000  0.018750
1.333333  0.061983  0.033058  0.000000  0.018750
1.366667  0.061983  0.033884  0.000000  0.018750
1.400000  0.061983  0.034711  0.000000  0.018750
1.433333  0.061983  0.035537  0.000000  0.018750
1.466667  0.061983  0.036364  0.000000  0.018750
1.500000  0.061983  0.037190  0.000000  0.018750
1.533333  0.061983  0.038017  0.000000  0.018750
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  1.566667  0.061983  0.038843  0.000000  0.018750
  1.600000  0.061983  0.039669  0.000000  0.018750
  1.633333  0.061983  0.040496  0.000000  0.018750
  1.666667  0.061983  0.041322  0.000000  0.018750
  1.700000  0.061983  0.042149  0.000000  0.018750
  1.733333  0.061983  0.042975  0.000000  0.018750
  1.766667  0.061983  0.043802  0.000000  0.018750
  1.800000  0.061983  0.044628  0.000000  0.018750
  1.833333  0.061983  0.045455  0.000000  0.018750
  1.866667  0.061983  0.046281  0.000000  0.018750
  1.900000  0.061983  0.047107  0.000000  0.018750
  1.933333  0.061983  0.047934  0.000000  0.018750
  1.966667  0.061983  0.048760  0.000000  0.018750
  2.000000  0.061983  0.049587  0.000000  0.018750
  2.033333  0.061983  0.050413  0.000000  0.018750
  2.066667  0.061983  0.051240  0.000000  0.018750
  2.100000  0.061983  0.052066  0.000000  0.018750
  2.133333  0.061983  0.052893  0.000000  0.018750
  2.166667  0.061983  0.053719  0.000000  0.018750
  2.200000  0.061983  0.054545  0.000000  0.018750
  2.233333  0.061983  0.055372  0.000000  0.018750
  2.266667  0.061983  0.056198  0.000000  0.018750
  2.300000  0.061983  0.057025  0.000000  0.018750
  2.333333  0.061983  0.057851  0.000000  0.018750
  2.366667  0.061983  0.058678  0.000000  0.018750
  2.400000  0.061983  0.059504  0.000000  0.018750
  2.433333  0.061983  0.060331  0.000000  0.018750
  2.466667  0.061983  0.061157  0.000000  0.018750
  2.500000  0.061983  0.061983  0.000000  0.018750
  2.533333  0.061983  0.062810  0.000000  0.018750
  2.566667  0.061983  0.063636  0.000000  0.018750
  2.600000  0.061983  0.064463  0.000000  0.018750
  2.633333  0.061983  0.065289  0.000000  0.018750
  2.666667  0.061983  0.066116  0.000000  0.018750
  2.700000  0.061983  0.066942  0.000000  0.018750
  2.733333  0.061983  0.067769  0.000000  0.018750
  2.766667  0.061983  0.068595  0.000000  0.018750
  2.800000  0.061983  0.069421  0.000000  0.018750
  2.833333  0.061983  0.070248  0.000000  0.018750
  2.866667  0.061983  0.071074  0.000000  0.018750
  2.900000  0.061983  0.071901  0.000000  0.018750
  2.933333  0.061983  0.072727  0.032215  0.018750
  2.966667  0.061983  0.073554  0.090096  0.018750
  3.000000  0.061983  0.074380  0.160456  0.018750
  3.033333  0.061983  0.076446  0.233006  0.018750
  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    1.167          PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.167          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     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
RCHRES   2 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      1 1        1      WDM   1001 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
COPY     2 OUTPUT MEAN   1 1     48.4      WDM    702 FLOW     ENGL      REPL
COPY   502 OUTPUT MEAN   1 1     48.4      WDM    802 FLOW     ENGL      REPL
RCHRES   3 HYDR   RO     1 1        1      WDM   1004 FLOW     ENGL      REPL
```

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RCHRES   3 HYDR   O      1 1        1      WDM   1005 FLOW     ENGL      REPL
RCHRES   3 HYDR   O      2 1        1      WDM   1006 FLOW     ENGL      REPL
RCHRES   3 HYDR   STAGE  1 1        1      WDM   1007 STAG     ENGL      REPL
RCHRES   1 HYDR   RO     1 1        1      WDM   1008 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1009 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1        1      WDM   1010 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1011 STAG     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       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

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APPENDIX B

MAINTENANCE GUIDANCE

Table V-A.2: Maintenance Standards - Infiltration

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash & Debris	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Poisonous/Noxious Vegetation	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Contaminants and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Rodent Holes	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Storage Area	Sediment	Water ponding in infiltration pond after rainfall ceases and appropriate time allowed for infiltration. Treatment basins should infiltrate Water Quality Design Storm Volume within 48 hours, and empty within 24 hours after cessation of most rain events.	Sediment is removed and/or facility is cleaned so that infiltration system works according to design.

Table V-A.2: Maintenance Standards - Infiltration (continued)

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
		(A percolation test pit or test of facility indicates facility is only working at 90% of its designed capabilities. Test every 2 to 5 years. If two inches or more sediment is present, remove).	
Filter Bags (if applicable)	Filled with Sediment and Debris	Sediment and debris fill bag more than 1/2 full.	Filter bag is replaced or system is redesigned.
Rock Filters	Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rain storms.	Gravel in rock filter is replaced.
Side Slopes of Pond	Erosion	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Emergency Overflow Spillway and Berms over 4 feet in height.	Tree Growth	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Piping	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Emergency Overflow Spillway	Rock Missing	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Erosion	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Pre-settling Ponds and Vaults	Facility or sump filled with Sediment and/or debris	6" or designed sediment trap depth of sediment.	Sediment is removed.

Table V-A.6: Maintenance Standards - Debris Barriers (e.g., Trash Racks)

Maintenance Components	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris	Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
Metal	Damaged/ Missing Bars.	Bars are bent out of shape more than 3 inches. Bars are missing or entire barrier missing. Bars are loose and rust is causing 50% deterioration to any part of barrier.	Bars in place with no bends more than 3/4 inch. Bars in place according to design. Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe	Barrier firmly attached to pipe

Table V-A.8: Maintenance Standards - Typical Biofiltration Swale

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Recommended Maintenance to Correct Problem
General	Sediment Accumulation on Grass	Sediment depth exceeds 2 inches.	Remove sediment deposits on grass treatment area of the bio-swale. When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased.
	Standing Water	When water stands in the swale between storms and does not drain freely.	Any of the following may apply: remove sediment or trash blockages, improve grade from head to foot of swale, remove clogged check dams, add underdrains or convert to a wet biofiltration swale.
	Flow spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed through entire swale width.	Level the spreader and clean so that flows are spread evenly over entire swale width.

Table V-A.8: Maintenance Standards - Typical Biofiltration Swale (continued)

Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Recommended Maintenance to Correct Problem
	Constant Baseflow	When small quantities of water continually flow through the swale, even when it has been dry for weeks, and an eroded, muddy channel has formed in the swale bottom.	Add a low-flow pea-gravel drain the length of the swale or by-pass the baseflow around the swale.
	Poor Vegetation Coverage	When grass is sparse or bare or eroded patches occur in more than 10% of the swale bottom.	Determine why grass growth is poor and correct that condition. Re-plant with plugs of grass from the upper slope: plant in the swale bottom at 8-inch intervals. Or re-seed into loosened, fertile soil.
	Vegetation	When the grass becomes excessively tall (greater than 10-inches); when nuisance weeds and other vegetation starts to take over.	Mow vegetation or remove nuisance vegetation so that flow not impeded. Grass should be mowed to a height of 3 to 4 inches. Remove grass clippings.
	Excessive Shading	Grass growth is poor because sunlight does not reach swale.	If possible, trim back over-hanging limbs and remove brushy vegetation on adjacent slopes.
	Inlet/Outlet	Inlet/outlet areas clogged with sediment and/or debris.	Remove material so that there is no clogging or blockage in the inlet and outlet area.
	Trash and Debris Accumulation	Trash and debris accumulated in the bio-swale.	Remove trash and debris from bioswale.
	Erosion/Scouring	Eroded or scoured swale bottom due to flow channelization, or higher flows.	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. If bare areas are large, generally greater than 12 inches wide, the swale should be re-graded and re-seeded. For smaller bare areas, overseed when bare spots are evident, or take plugs of grass from the upper slope and plant in the swale bottom at 8-inch intervals.