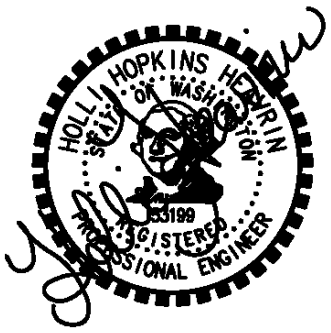
# Preliminary
# Storm Drainage Report

FOR

## BELL CREEK

## Sequim, WA




10/25/2024

| | |
|---|---|
| Prepared for: | Bell Creek LLC |
| | 9307 Bay Shore Drive NW, Suite 307 |
| | Silverdale, WA 98383 |
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| Date: | February 29, 2024 |
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| | October 25, 2024 |
| Core No: | 23255 |

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# 1. Project Overview

The Bell Creek project site consists of one parcel in Sequim, WA. The site is located at 1212 Third Avenue. See the Vicinity Map provided below for reference. Specifically, the project is located in the northeast quarter of the northeast quarter of Section 30, Township 30 N, Range 3 W, W.M. The Clallam County tax parcel ID number and area for the project parcel is provided below in Table 1-1.

**Table 1-1 Parcel Information**

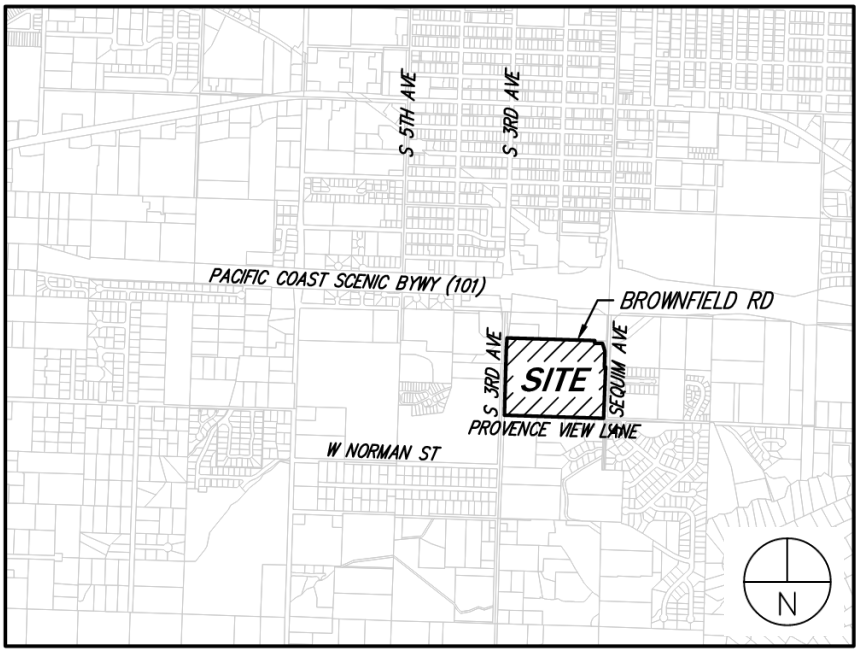
| Clallam County Parcel ID | Area (ac)* |
|---|---|
| 033030110000 | 28.46 |

**Per survey by Core Design, may differ from Clallam County records*

The project is located within the City of Sequim UGA and is bordered by single family residences to the east, south, and west. Additionally, the parcels to the north are zoned for commercial development, but are currently undeveloped. The site is undeveloped in the current condition and vegetation consists of pasture with brush and trees through the center of the site, following Bell Creek. The project site slopes generally southwest to northeast at slopes ranging from 3 to 15 percent. The portion of the site to the west of Bell Creek drains to Bell Creek, while the portion to the east of the creek will drain to the existing culvert at the northeast corner of the property.

Proposed development of the project site will consist of construction of 104 single family homes with associated roads and utilities. The project has been designed using the guidelines and requirements established in the 2019 Department of Ecology Stormwater Management Manual for Western Washington, as adopted by the City of Sequim Municipal Code.

**Figure 1-1 Vicinity Map**



# 2. Conditions and Requirement Summary

Per Sequim Municipal Code 13.104.030, the 2019 edition of the Department of Ecology's Stormwater Management Manual for Western Washington (2019 SWMMWW) will apply to the project. Per Figure I-2.4.1 of the 2019 SWMMWW, included at the end of this section, this project classifies as a New Development project resulting in 5,000 square feet or more of new plus replaced hard surface area. Therefore, all nine minimum requirements will be addressed.

## 2.1 Minimum Requirements

### 2.1.1 Minimum Requirement #1: Preparation of Stormwater Site Plans

See construction plans submitted under a separate cover.

### 2.1.2 Minimum Requirement #2: Construction Stormwater Pollution Prevention Plan

A separate CSWPPP long form including practices and erosion control measures will be prepared under the Clear ad Grade permit.

### 2.1.3 Minimum Requirement #3: Source Control of Pollution

The project is a single-family development which is not subject to source control.

### 2.1.4 Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls

The project site has two existing natural discharge locations which the proposed design will match. See Sections 3 and 4 of this report for information regarding the natural drainage patterns and proposed preservation of them.

### 2.1.5 Minimum Requirement #5: On-site Stormwater Management

Per the 2019 SWMMWW, projects shall apply onsite stormwater management BMPs to the extent feasible without causing flooding or erosion impacts. Since the project triggers minimum requirements 1-9 and is within the UGA, either the LID performance standard or BMP List #2 is required. This project has elected to follow BMP List #2. See Section 4.4 for further information regarding the proposed BMP design.

### 2.1.6 Minimum Requirement #6: Runoff Treatment

The project proposes more than 5,000 square feet of pollution generating impervious surface (PGIS) so it is subject to runoff treatment and a water quality facility will be designed for the site. Stormwater treatment facilities are designed in accordance with the process defined in Chapter 2 of Volume V of the 2019 SWMMWW. Per Figure V-2.1.1 of the 2019 SWMMWW, included at the end of this section, Basic Treatment will be provided for this site through the use of dead storage at the bottom of the proposed

detention ponds. See Section 4.3 for information regarding the sizing of the selected Runoff Treatment facilities.

### 2.1.7 Minimum Requirement #7: Flow Control

The project will have effective impervious surfaces totaling greater than 10,000 square feet in a threshold discharge area, so the project is subject to the standard flow control requirement. The project proposes to construct two stormwater detention ponds, which will provide both flow control and water quality for the site. See Section 4.2 of this report for information regarding the required sizes of these two facilities.

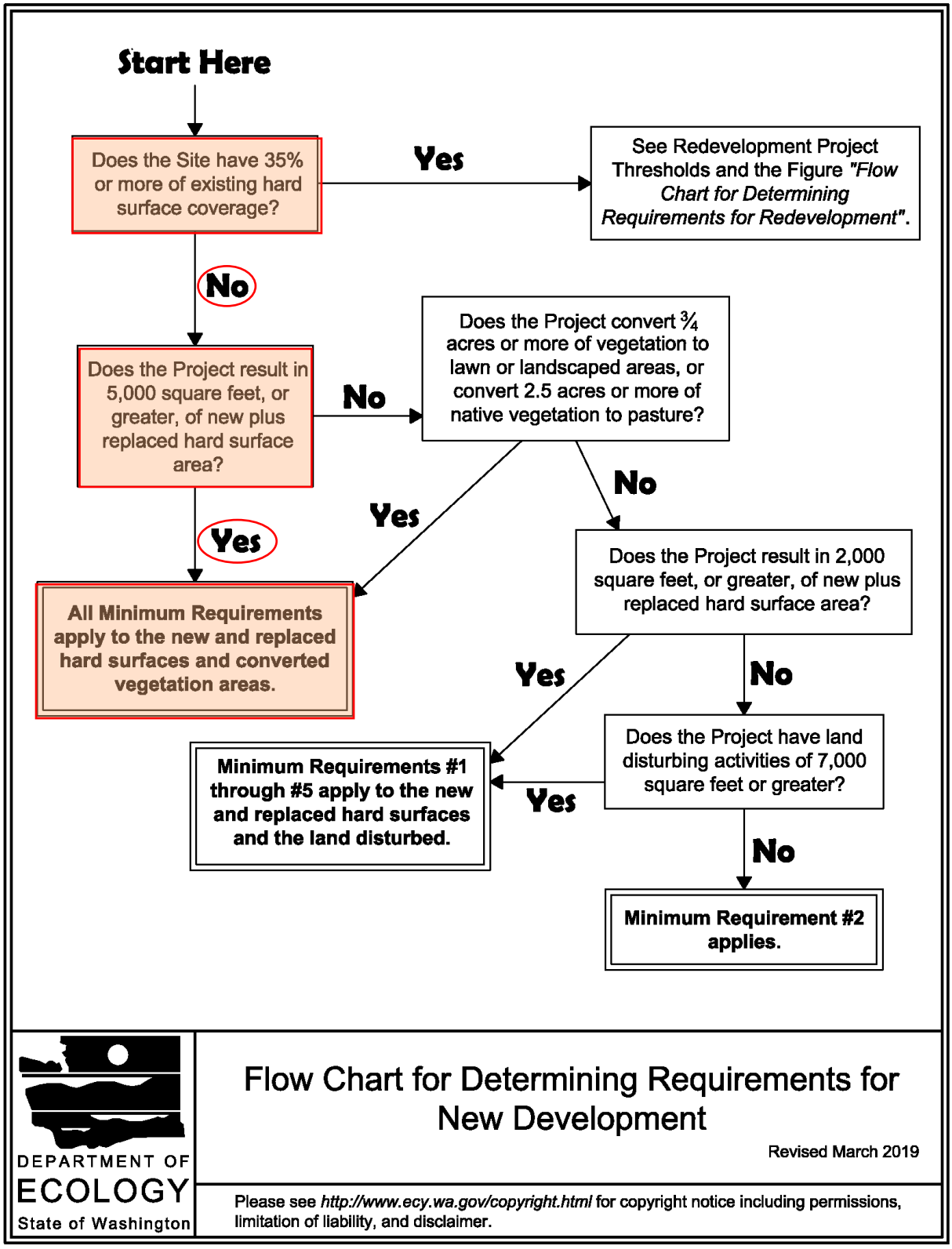
### 2.1.8 Minimum Requirement #8: Wetlands Protection

This project does not discharge into a wetland, either directly or indirectly, and, as such, is not subject to the wetland protection requirement.

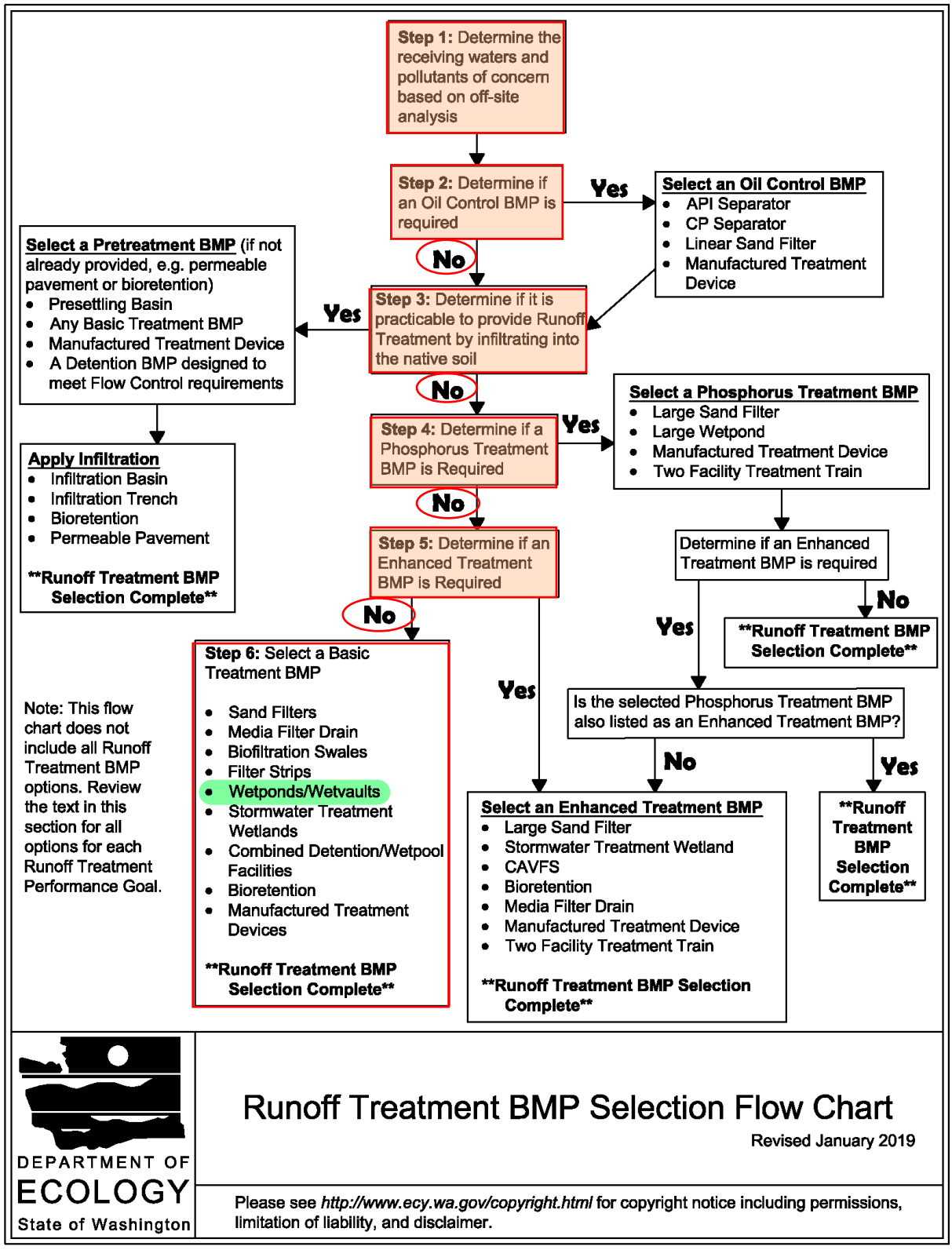
### 2.1.9 Minimum Requirement #9: Operations and Maintenance

An operation and maintenance manual will be provided upon construction plan approval.

## Figure I-3.1: Flow Chart for Determining Requirements for New Development



## Figure III-1.1: Runoff Treatment BMP Selection Flow Chart



# 3. Off-Site Analysis

## 3.1 Task 1, Study Area Definition and Maps

The proposed project is located on Clallam County parcel number 033030110000. A map of the downstream can be found at the end of this section.

## 3.2 Task 2, Resource Review

**FEMA Maps**
The Clallam County Washington Flood Map Update was reviewed. This revealed the Bell Creek buffer is classified as Zone X (0.2% Annual Chance). The remainder of the project site is not mapped as having a flood hazard.

**Sensitive Areas**
Per the critical areas study, Bell Creek runs through the project site and is the only sensitive area found onsite.

**Soils**
The Geotechnical Report was completed by Krazan & Associates, Inc. It was determined that site soils consist of native glacial soils.

## 3.3 Task 3, Field Investigation

A site visit was completed on January 23, 2024. The temperature was about 55 degrees and sunny.

**Upstream Tributary Area**
Upstream area to the site generally drains into Bell Creek. One existing six-inch pipe discharges onto the property site on the east side of Bell Creek. This pipe is believed to discharge runoff from the neighboring property for sheet flow across the property. In order to maintain the natural course of this runoff, it will be collected and routed through the East Pond, and treated as area not subject to flow control. No other upstream drainage is anticipated to reach the site via sheet flow.

**Downstream Drainage**
Bell Creek flows from the southern property line to the northern property line of the project site. A swale branches off from the creek about two thirds of the way through the site and slopes to the northeastern corner of the site. The point at which Bell Creek leaves the site has been defined as Natural Discharge Location 1, while the point at which the noted swale leaves the site has been defined as Natural Discharge Location 2. See the Downstream Drainage Exhibit provided at the end of the section for these locations and additional reference throughout the discussion of the downstream drainage system. Photos from the field investigation have also been included, and their locations are noted on the Downstream Drainage Exhibit.

From Natural Discharge Location 1, runoff will flow through Bell Creek north through an existing culvert under Brownfield Road. The creek continues generally north until it reaches the north side of SR 101, traveling through a series of culverts to route the stream under the existing roads. Upon reaching the northern side of SR 101, the stream begins to flow generally northeast. The one-quarter mile point is reached just before the creek travels through a culvert under S Sequim Avenue. Beyond the quarter mile point, the stream continues to flow generally northeast, eventually discharging into The Lagoon, just northwest of Sequim Bay. No potential flooding or erosion were observed along the downstream path.

From Natural Discharge Location 2, runoff flows northeast through a pipe to the northeast corner of S Sequim Ave and E Brownfield Road. At this point, runoff flows through a catch basin which directs runoff to continue to the northeast through a piped system. On the north side of SR 101, this system eventually outlets into a well-defined channel, and the one-quarter mile point is reached. Beyond this point, flow continues through the channel to the northeast until it joins with Bell Creek, northeast of Carrie Blake Park. At this point, approximately one mile downstream of the project site, the downstream drainage paths match. No potential flooding or erosion were observed along the downstream path.

**Downstream Flow Path Photos**



1_A – Looking south at Bell Creek Culvert on South Side W Brownfield Road



1_B – Looking north at culvert outlet on north side W Brownfield Road



1_C – Looking west from S Sequim Ave toward ¼ mile point



2_A – Looking north at Natural Discharge Location 2



2_B – Looking northeast from CB at southwest corner S Sequim Ave and W Brownfield Rd in direction of pipe flow.

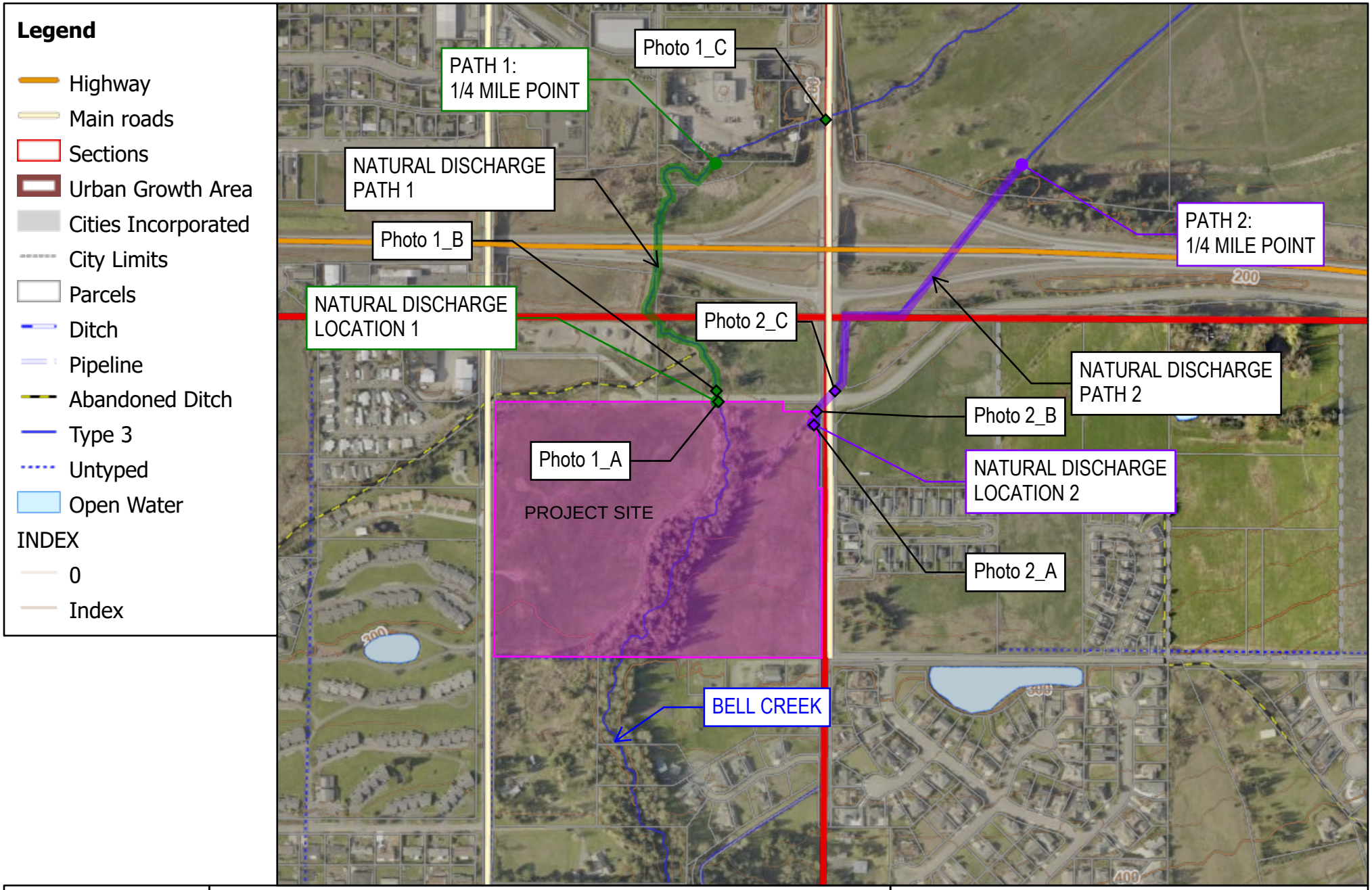


2_C – Looking northeast from CB at northeast corner S Sequim Ave and E Brownfield Rd in direction of pipe flow

## 3.4 Task 4, Drainage System Description and Problem Description

The provided Downstream Drainage Exhibit at the end of this section describes the downstream drainage and any observed problems.

DOWNSTREAM DRAINAGE EXHIBIT




**Clallam County, WA**

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We are happy to share our maps and hope that you find them helpful. Please be advised, however, that these maps are intended to serve as a guide to the general location of features shown. The accuracy of the individual layers varies and layers may not align with one another. Determination of actual regulatory location of features shown on this map typically requires a field examination by qualified staff. Any person or entity that relies on any information contained herein does so at their own risk. Clallam County makes no warranty of the accuracy or usefulness of this data.

# 4. Flow Control and Water Quality Facility Analysis and Design

## 4.1 Basin Modeling

All stormwater facilities will be designed in accordance with the 2019 SWMMWW. The DOE approved Western Washington Hydrology Model 2012 (WWHM) was used for modeling the project. The project site consists of two threshold discharge areas, and all runoff in the developed condition will be routed to the respective detention ponds.

### 4.1.1 Existing Conditions

Onsite soils, as investigated by Krazan & Associates, Inc., and detailed in the Geotechnical Engineering Report, dated March 9, 2020, consist of till soils, hydrologic soil group C, with low infiltration and low erosion potential. Per the 2019 SWMMWW, the existing condition should be modeled as the historic conditions for the project site. According to historical data, the project site was historically prairie and, as such, will be modeled as pasture. Proposed expansion of the existing frontage roadway on S 3rd Ave and S Sequim Ave is not proposed to impact existing pavement, however, proposed flow control facilities will collect runoff from these areas. Since these existing impervious areas are not considered target surfaces, they will be modeled as impervious in both the existing and proposed conditions per Section 2.3 of Volume III of the 2019 SWMMWW. Refer to Table 4-1 for a breakdown of the site areas used for modeling in the existing condition. Future improvement to W Brownfield Rd will eventually route runoff to both of the onsite ponds. In preparation for this future buildout which will fully replace the existing road, these areas have been included in the predeveloped condition as the historic landcover. An exhibit of the existing condition is also included at the end of this section.

**Table 4-1 Predeveloped Areas**

| **West Basin** | |
|---|---|
| **Land Cover** | **Area (Acres)** |
| ***Onsite*** | |
| C Pasture, Mod | 12.51 |
| ***Frontage*** | |
| Roads, Mod *(S 3rd Ave)* | 0.44 |
| C Pasture, Mod *(S 3rd Ave)* | 0.23 |
| C Pasture, Mod *(W Brownfield Rd)* | 0.35 |
| **Total Area** | **13.53** |
| **East Basin** | |
| **Land Cover** | **Area (Acres)** |
| ***Onsite*** | |
| C Pasture, Mod (Site) | 8.04 |
| | |
| Roads, Mod *(S Sequim Ave)* | 0.42 |
| C Pasture, Mod *(S Sequim Ave)* | 0.41 |
| C Pasture, Mod *(W Brownfield Rd)* | 1.17 |
| **Total Area** | **10.04** |

Separate ponds are proposed to be constructed for each of the onsite basins. The West Basin Pond will discharge to Bell Creek, matching Natural Discharge Path 1. Meanwhile, the East Basin Pond will discharge to the existing catch basin at the northeast corner of the property, matching the drainage patters of Natural Discharge Path 2.

### 4.1.2 Developed Conditions

The project proposes construction of 104 single-family lots with associated roads, utilities, and open spaces throughout the parcel, as well as frontage improvements to South Third Avenue and to South Sequim Avenue. The project proposes to route all runoff from the site into two detention facilities in order to meet the flow control requirement. Table 4-2 below shows the breakdown of areas for the developed condition as used in WWHM to size the detention facilities. All pervious areas will be modeled as pasture as they will be subject to BMP T5.13, Post-Construction Soil Quality and Depth. An exhibit of the developed condition is also included at the end of this section.

Proposed impervious coverage throughout the project site has been determined as follows:

- *Lots*: Proposed lots have been assumed to have impervious coverage of 50% of each lot area. Additionally, 385 square feet has been assumed for each lot as a driveway.
- *Rights-of-Ways*: Proposed roads have been assumed to be 83% impervious.
- *Frontage Improvements*:
    - S Sequim Ave and S 3rd Ave improvements have been modeled based on the impervious areas proposed as measured in AutoCAD.
    - W Brownfield Rd has been assumed to be 83% impervious.

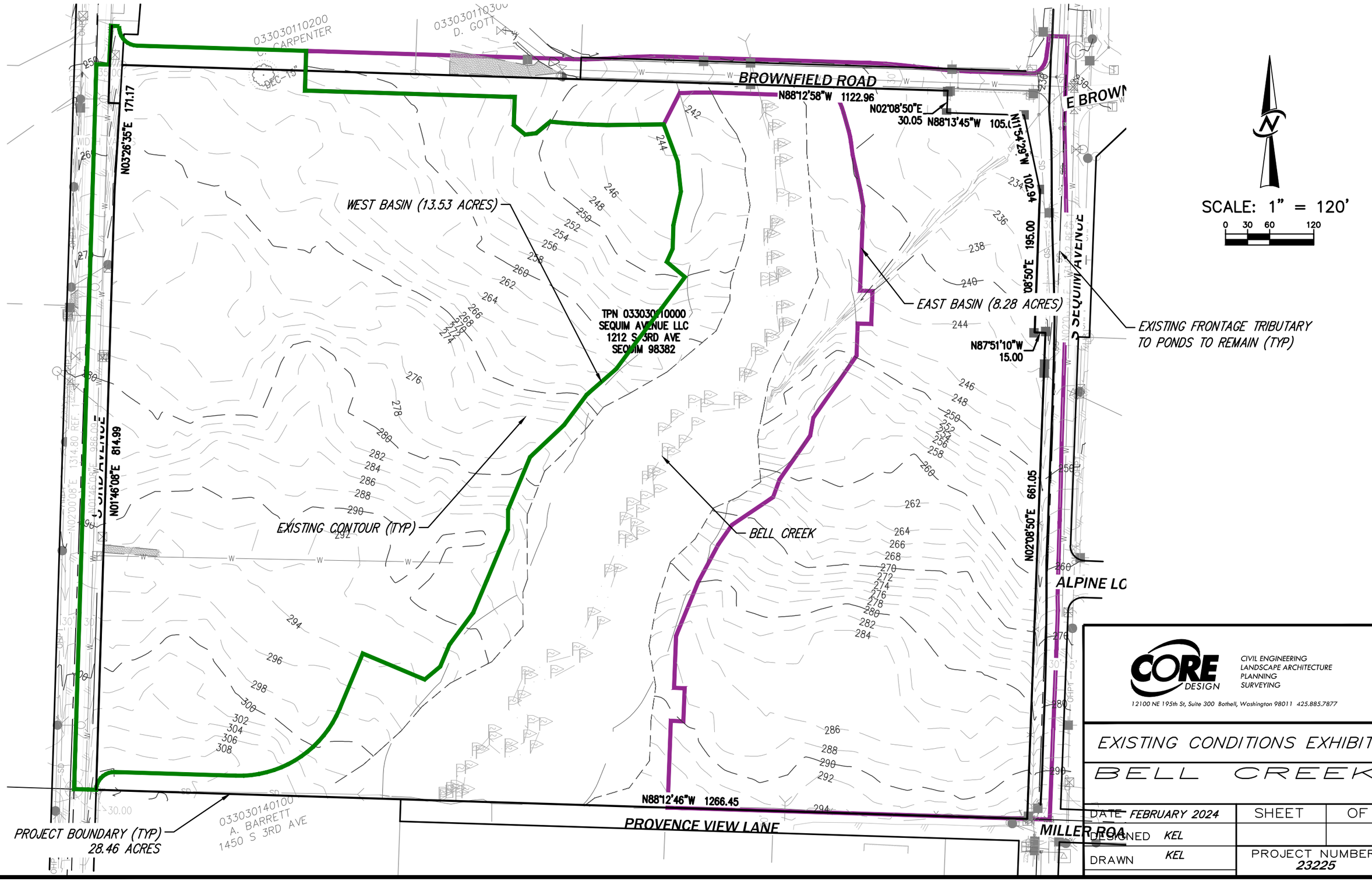
**Table 4-2 Developed Areas**

| **West Basin** | |
|---|---|
| **Land Cover** | **Area (Acres)** |
| Pervious | 5.38 |
| *Onsite* | *5.26* |
| *Frontage* | *0.13* |
| Impervious | 8.14 |
| *Roof Tops* | *4.50* |
| *Driveways* | *0.59* |
| *Roads/Sidewalks* | *2.16* |
| *Frontage Existing* | *0.44* |
| *Frontage Proposed* | *0.42* |
| *Bypass* | *0.03* |
| **Total Area** | **13.52** |

**Table 4-2 cont. Developed Areas**

| East Basin | |
|---|---|
| **Land Cover** | **Area (Acres)** |
| Pervious | 4.06 |
| *Onsite* | *3.93* |
| *Frontage* | *0.23* |
| Impervious | 5.87 |
| *Roof Tops* | *2.50* |
| *Driveways* | *0.33* |
| *Roads/Sidewalks* | *1.28* |
| *Frontage Existing* | *0.42* |
| *Frontage Proposed* | *1.35* |
| **Total Area** | **10.04** |

While the future improvements for West Brownfield Road have been accounted for in the sizing of the onsite ponds, the elevation of the proposed roads restrains the ability for runoff to enter the ponds upon full buildout. As the onsite ponds are over-detaining in order to account for these areas, it is assumed the runoff from these areas will be able to be safely discharged without additional flow control to bottomless catch basins, as is common throughout the jurisdiction. If additional protection is desired, and the land is available, a limited infiltration basin at the north eastern end of the road, adjacent to the low point, is expected to be adequate to directly provide flow control and water quality for the area. These mitigation efforts for the W Brownfield Road improvements are included conceptually only until such time the city receives the ROW and funding to construct the improvements.




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# EXISTING CONDITIONS EXHIBIT

## BELL CREEK

| | | |
|---|---|---|
| DATE FEBRUARY 2024 | SHEET | OF |
| DESIGNED KEL | | |
| DRAWN KEL | PROJECT NUMBER 23225 | |

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PROPOSED WEST POND
101,930 CF REQUIRED STORAGE

WEST POND OUTFALL
TO BELL CREEK (TYP)

BROWNFIELD TRIBUTARY
TO EAST POND

BROWNFIELD
BYPASS

BROWNFIELD TRIBUTARY
TO WEST POND

EAST POND OUTFALL TO
EX DRAINAGE SYSTEM (TYP)

WEST BASIN (13.53 ACRES)

PROPOSED EAST POND
76,926 CF REQUIRED STORAGE

EAST BASIN (10.04 ACRES)

PROPOSED CONTOUR (TYP)

BELL CREEK

EXISTING FRONTAGE
COLLECTED IN SYSTEM (TYP)

PROPOSED FRONTAGE IMPROVEMENTS (TYP)

033030140100
A. BARRETT
1450 S 3RD AVE

PROJECT BOUNDARY (TYP)
28.46 ACRES

SCALE: 1" = 60'

0 15 30 60

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# DEVELOPED CONDITIONS EXHIBIT

## RAINSHADOW LOOP

| | | |
|---|---|---|
| DATE DECEMBER 2023 | SHEET | OF |
| DESIGNED KEL | | |
| DRAWN KEL | PROJECT NUMBER 23225 | |

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## 4.2 Flow Control Design and Analysis

As discussed in Sections 2 and 4.1 of this report, the project proposes to provide flow control through the use of two stormwater facilities. The project has also elected to implement BMP T5.16 Tree Retention and Tree Planting to reduce target impervious areas during the sizing of the stormwater facilities. Proposed Evergreen and Deciduous trees per the proposed landscape plan, as split between the west and east basins, are tabulated below in Table 4.3. the equivalent impervious credits for each basin are included in the table. As such, the total Tree BMP Credit will be removed from the developed condition of each pond basin, the West Basin has removed the equivalent area from the Brownfield Frontage Bypass area and a portion of onsite road area, while the East Basin has removed the equivalent area from a portion of onsite road area.

**Table 4-3 Tree Planting BMP Credit**

| ***Tree Type*** | | ***Credit*** | |
|---|---|---|---|
| Evergreen | | 50 sf per tree | |
| Deciduous | | 20 sf per tree | |
| **West Basin** | | | |
| **Tree Type** | **Count** | **Credit (sf)** | **Credit (ac)** |
| Evergreen | 39 | 1950 | 0.05 |
| Deciduous | 137 | 2740 | 0.06 |
| | ***Total*** | ***4690*** | ***0.11*** |
| **East Basin** | | | |
| **Tree Type** | **Count** | **Credit (sf)** | **Credit (ac)** |
| Evergreen | 42 | 2100 | 0.05 |
| Deciduous | 69 | 1380 | 0.03 |
| | ***Total*** | ***3480*** | ***0.08*** |

The first facility, the West Pond, will provide detention of runoff from the West Basin. The second facility, the East Pond, will provide detention of runoff from the East Basin. These ponds have been sized using WWHM2012 and the areas provided in Tables 4-1 and 4-2 of this report, less the credit areas presented in Table 4-3. See Appendix A for the West Pond WWHM Report, and Appendix B for the East Pond WWHM Report.

**West Pond Required Live Storage Volume: 2.340 acre-feet (101,930 cubic feet)**

The proposed pond provides 105,500 cubic feet, which exceeds the required live storage volume for the West Pond. Therefore, adequate flow control has been provided for the West Basin.

**East Pond Required Live Storage Volume: 1.766 acre-feet (76,926 cubic feet)**

The proposed pond provides 80,831 cubic feet, which exceeds the required live storage volume for the East Pond. Therefore, adequate flow control has been provided for the East Basin.

### 4.2.1 Overflow Design

The primary and emergency overflow for the two ponds were calculated assuming all orifices on the risers are plugged. The flow rates for this condition, as modeled in WWHM, are provided in the flow frequency output from WWHM below.

The primary overflow for the ponds shall be via overtopping the control structure. In order to accommodate this, the freeboard required above the max water surface to contain the 100-year, 15-minute flow has been calculated through the use of the following equation:

$$Q = 9.739DH^{\frac{3}{2}}$$

Where: Q is the undetained 100-year, 15-minute peak flow, D is the diameter of the riser (1' for both ponds), and H is the required freeboard in feet.

The required freeboard for the primary overflow of each pond, assuming a 12-inch riser, is detailed in Table 4.5 at the end of this section.

An emergency overflow spillway will function as the emergency overflow for the west pond. The spillway has been sized per the broad crested weird equation with the assumptions held in the 2019 DOE Manual. This results in an equation for the length of the spillway of:

$$L = \left[\frac{Q_{100}}{3.21H_E^{3/2}}\right] - 2.4H_E$$

Where: L is the length of the spillway (6 feet minimum), $Q_{100}$ is the undetained 100 year, 15-minute peak flow, and $H_E$ is the height of water over the weir (0.2 feet minimum).

The inputs and calculated overflow sizes for the required freeboard and length of the emergency spillway are provided Table 4.5 below.

An emergency overflow spillway is required for the East Pond as well. Due to the location of the pond and surrounding topography, a safe flow path for the emergency overflow spillway cannot be provided. As such, a secondary emergency riser with a birdcage is proposed to serve as the emergency overflow. The pipe will route emergency flows to Bell Creek, providing a safe overflow path. The required freeboard for this secondary overflow structure was calculated using the broad-crested weir equation assuming a 12-inch diameter riser.

| Table 4.4 Pond Overflow Sizing | | |
|---|---|---|
| **West Pond** | 100-year, 15-minute flow ($Q_{100}$) | 5.8456 cfs |
| | Primary Overflow Required Freeboard (H) | 0.93 ft |
| | Spillway Length (L) | 8 ft |
| | Height of water over spillway ($H_E$) | 0.6 ft |
| **East Pond** | 100-year, 15-minute flow ($Q_{100}$) | 4.5929 cfs |
| | Required Freeboard (H) | 0.98 ft |
| | Emergency Overflow Required Freeboard ($H_E$) | 0.85 ft |
| | Emergency Overflow Riser Diameter ($D_E$) | 18 in |

```
Flow Frequency
Flow(cfs)  0701 15m
2 Year   =    2.3854
5 Year   =    3.2490
10 Year  =    3.8447
25 Year  =    4.6250
50 Year  =    5.2265
100 Year =    5.8456
200 Year =    6.5380
500 Year =    7.3123
```

*West Pond Basin Developed Undetained Flows*

```
Flow Frequency
Flow(cfs)  0701 15m
2 Year   =    1.8803
5 Year   =    2.5581
10 Year  =    3.0253
25 Year  =    3.6369
50 Year  =    4.1081
100 Year =    4.5929
200 Year =    5.1348
500 Year =    5.7407
```

*East Pond Basin Developed Undetained Flows*

The primary overflow for both ponds will match the primary discharge location from the ponds, while the emergency overflows will be routed to Bell Creek.

## 4.3 Water Quality Design and Analysis

As discussed in Section 2 of this report, Basic Runoff Treatment is required for the project site. In order to meet this requirement, the project has proposed to provide dead storage in both ponds. The required volume of dead storage for each of the ponds was calculated using WWHM, see Figures 4-1 and 4-1 for the WWHM Water Quality Output for the West and East Basins respectively.

**West Pond Required Dead Storage Volume: 0.2019 acre-feet (8,795 cubic feet)**

The proposed pond provides 26,040 cubic feet of dead storage, which exceeds the required dead storage volume for the West Pond. Therefore, adequate water quality has been provided for the West Basin.

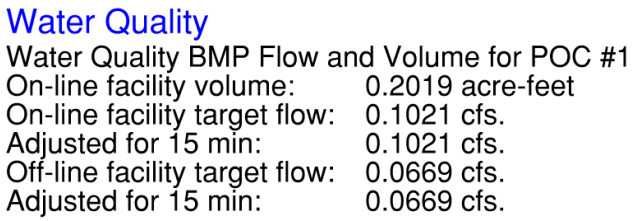



*Figure 4-1 West Pond WWHM Water Quality Output*

**East Pond Required Dead Storage Volume: 0.173. acre-feet (7,680 cubic feet)**

The proposed pond provides 25,569 cubic feet of dead storage, which exceeds the required dead storage volume for the East Pond. Therefore, adequate water quality has been provided for the East Basin.

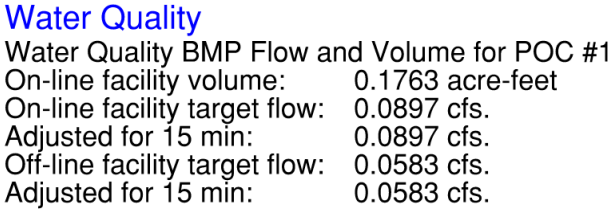



*Figure 4-2 East Pond WWHM Water Quality Output*

The water quality berms in each of the ponds have been designed such that the berm will be lowered on the opposite side of the pond from the inlet, to maximize the water quality flow path. See civil plans for details.

## 4.4 Stormwater BMP Design and Analysis

Per List #2, as presented in Table I-3.2 of the 2019 SWMMWW, the following BMPs were considered for the site:

Lawn and Landscaped areas:

- BMP T5.13: Post Construction Soil Quality and Depth
    - Response: This site will employ amended soils in lawn and landscape areas and will follow guidelines presented in the 2014 DOE Manual for Soil retention and Soil Quality.

Roofs:

- BMP T5.30: Full Dispersion or BMP T5.10A: Downspout Full Infiltration

    - Response: Infiltration was found to be infeasible on site per the geotechnical report. Full dispersion requires 65% of the site to be protected in a forest or native condition. The proposed development on this site will be unable to retain 65% in its native condition and is therefore not feasible.
- BMP T7.30: Bioretention
    - Response: Bioretention was found to be infeasible due to the infiltration rate of 0 inches/hour per the Geotech Report.
- BMP T5.10B: Downspout Dispersion Systems
    - Response: Downspout dispersion systems may be feasible on a lot-by-lot basis and will be evaluated further at final design.
- BMP T5.10C: Perforated Sub-out Connections
    - Response: Perforated Stub-out Connections may be feasible and will be evaluated further at final design.

Other Hard Surfaces:

- BMP T5.30: Full Dispersion
    - Response: Full dispersion requires 65% of the site to be protected in a forest or native condition. The proposed development on this site will be unable to retain 65% in its native condition and is therefore not feasible.
- BMP T5.15: Permeable Pavement
    - Response: Per the Geotechnical Report, onsite soils have low infiltration potential, so permeable pavement is considered infeasible.
- BMP T7.30: Bioretention
    - Response: Bioretention was found to be infeasible due to the infiltration rate of 0 inches/hour per the Geotech Report.
- BMP T5.12: Sheet Flow Dispersion or BMP T5.11 Concentrated Flow Dispersion
    - Response: Sheet Flow dispersion will be applied to pathways in areas where a ten (10)-foot minimum vegetated flow path can be accomplished while maintaining clearances from property lines.

# 5. Conveyance System and Analysis and Design

To be provided at final engineering design.

# 6. Special Reports and Studies

The following reports have been submitted under separate cover.

**The following reports and assessments are provided for reference and informational purposes only. Core Design takes no responsibility or liability for these reports, assessments or designs as they were not completed under the direct supervision of Core Design.**

- Geotechnical Engineering Report
  Dated March 9, 2020, prepared by Krazan & Associates Inc.

# Appendix A

## West Pond WWHM Report

# WWHM2012

# PROJECT REPORT

# General Model Information

WWHM2012 Project Name: West

| | |
|---|---|
| Site Name: | Bell Creek |
| Site Address: | |
| City: | Sequim |
| Report Date: | 9/27/2024 |
| Gage: | Port Angelis |
| Data Start: | 1948/10/01 |
| Data End: | 2009/09/30 |
| Timestep: | 15 Minute |
| Precip Scale: | 0.800 |
| Version Date: | 2024/06/28 |
| Version: | 4.3.1 |

## POC Thresholds

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

# *Landuse Basin Data*

## *Predeveloped Land Use*

### West Basin

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |

| Pervious Land Use | acre |
|---|---|
| C, Pasture, Mod | 13.09 |
| Pervious Total | 13.09 |

| Impervious Land Use | acre |
|---|---|
| ROADS MOD | 0.44 |
| Impervious Total | 0.44 |
| Basin Total | 13.53 |

Element Flow Componants:

| Surface | Interflow | Groundwater |
|---|---|---|
| Componant Flows To: | | |
| POC 1 | POC 1 | |

## *Mitigated Land Use*

### Onsite

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |

| Pervious Land Use | acre |
|---|---|
| C, Pasture, Mod | 5.26 |
| Pervious Total | 5.26 |

| Impervious Land Use | acre |
|---|---|
| ROADS MOD | 2.08 |
| ROOF TOPS FLAT | 4.5 |
| DRIVEWAYS FLAT | 0.59 |
| Impervious Total | 7.17 |
| Basin Total | 12.43 |

Element Flow Componants:

| Surface | Interflow | Groundwater |
|---|---|---|
| Componant Flows To: | | |
| Trapezoidal Pond 1 | Trapezoidal Pond 1 | |

## Frontage

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |

| Pervious Land Use | acre |
|---|---|
| C, Pasture, Mod | 0.13 |
| Pervious Total | 0.13 |

| Impervious Land Use | acre |
|---|---|
| ROADS MOD | 0.86 |
| Impervious Total | 0.86 |
| Basin Total | 0.99 |

Element Flow Componants:

| Surface | Interflow | Groundwater |
|---|---|---|
| Componant Flows To: | | |
| Trapezoidal Pond 1 | Trapezoidal Pond 1 | |

# Routing Elements
## Predeveloped Routing

## *Mitigated Routing*

### Trapezoidal Pond 1

Bottom Length: 120.00 ft.
Bottom Width: 66.00 ft.
Depth: 9 ft.
Volume at riser head: 2.3399 acre-feet.
Side slope 1: 3 To 1
Side slope 2: 0 To 1
Side slope 3: 4 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 8 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 1.380 in. Elevation:0 ft.
Orifice 2 Diameter: 1.531 in. Elevation:5.29 ft.
Orifice 3 Diameter: 2.000 in. Elevation:6.15 ft.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Pond Hydraulic Table

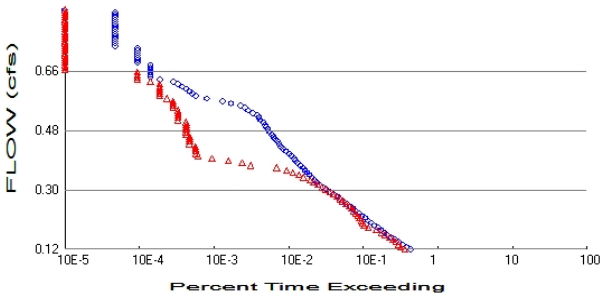
| Stage(feet) | Area(ac.) | Volume(ac-ft.) | Discharge(cfs) | Infilt(cfs) |
|---|---|---|---|---|
| 0.0000 | 0.181 | 0.000 | 0.000 | 0.000 |
| 0.1000 | 0.184 | 0.018 | 0.016 | 0.000 |
| 0.2000 | 0.186 | 0.036 | 0.023 | 0.000 |
| 0.3000 | 0.189 | 0.055 | 0.028 | 0.000 |
| 0.4000 | 0.191 | 0.074 | 0.032 | 0.000 |
| 0.5000 | 0.193 | 0.093 | 0.036 | 0.000 |
| 0.6000 | 0.196 | 0.113 | 0.040 | 0.000 |
| 0.7000 | 0.198 | 0.133 | 0.043 | 0.000 |
| 0.8000 | 0.201 | 0.153 | 0.046 | 0.000 |
| 0.9000 | 0.203 | 0.173 | 0.049 | 0.000 |
| 1.0000 | 0.206 | 0.193 | 0.051 | 0.000 |
| 1.1000 | 0.208 | 0.214 | 0.054 | 0.000 |
| 1.2000 | 0.211 | 0.235 | 0.056 | 0.000 |
| 1.3000 | 0.213 | 0.256 | 0.058 | 0.000 |
| 1.4000 | 0.216 | 0.278 | 0.061 | 0.000 |
| 1.5000 | 0.218 | 0.300 | 0.063 | 0.000 |
| 1.6000 | 0.221 | 0.322 | 0.065 | 0.000 |
| 1.7000 | 0.223 | 0.344 | 0.067 | 0.000 |
| 1.8000 | 0.226 | 0.366 | 0.069 | 0.000 |
| 1.9000 | 0.228 | 0.389 | 0.071 | 0.000 |
| 2.0000 | 0.231 | 0.412 | 0.073 | 0.000 |
| 2.1000 | 0.234 | 0.435 | 0.074 | 0.000 |
| 2.2000 | 0.236 | 0.459 | 0.076 | 0.000 |
| 2.3000 | 0.239 | 0.483 | 0.078 | 0.000 |
| 2.4000 | 0.241 | 0.507 | 0.080 | 0.000 |
| 2.5000 | 0.244 | 0.531 | 0.081 | 0.000 |
| 2.6000 | 0.247 | 0.556 | 0.083 | 0.000 |
| 2.7000 | 0.249 | 0.580 | 0.084 | 0.000 |
| 2.8000 | 0.252 | 0.606 | 0.086 | 0.000 |
| 2.9000 | 0.255 | 0.631 | 0.088 | 0.000 |
| 3.0000 | 0.257 | 0.657 | 0.089 | 0.000 |
| 3.1000 | 0.260 | 0.682 | 0.091 | 0.000 |

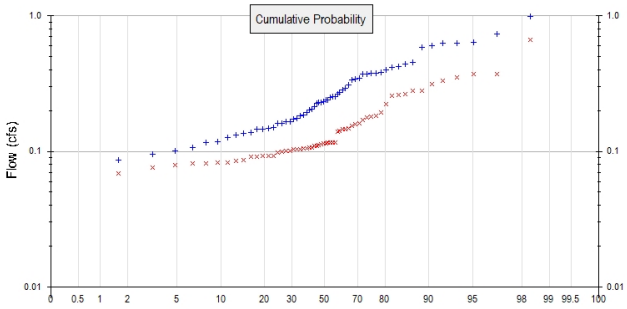
| | | | | |
|---|---|---|---|---|
| 3.2000 | 0.263 | 0.709 | 0.092 | 0.000 |
| 3.3000 | 0.265 | 0.735 | 0.093 | 0.000 |
| 3.4000 | 0.268 | 0.762 | 0.095 | 0.000 |
| 3.5000 | 0.271 | 0.789 | 0.096 | 0.000 |
| 3.6000 | 0.273 | 0.816 | 0.098 | 0.000 |
| 3.7000 | 0.276 | 0.844 | 0.099 | 0.000 |
| 3.8000 | 0.279 | 0.871 | 0.100 | 0.000 |
| 3.9000 | 0.282 | 0.899 | 0.102 | 0.000 |
| 4.0000 | 0.284 | 0.928 | 0.103 | 0.000 |
| 4.1000 | 0.287 | 0.956 | 0.104 | 0.000 |
| 4.2000 | 0.290 | 0.985 | 0.105 | 0.000 |
| 4.3000 | 0.293 | 1.014 | 0.107 | 0.000 |
| 4.4000 | 0.296 | 1.044 | 0.108 | 0.000 |
| 4.5000 | 0.298 | 1.074 | 0.109 | 0.000 |
| 4.6000 | 0.301 | 1.104 | 0.110 | 0.000 |
| 4.7000 | 0.304 | 1.134 | 0.112 | 0.000 |
| 4.8000 | 0.307 | 1.165 | 0.113 | 0.000 |
| 4.9000 | 0.310 | 1.195 | 0.114 | 0.000 |
| 5.0000 | 0.313 | 1.227 | 0.115 | 0.000 |
| 5.1000 | 0.315 | 1.258 | 0.116 | 0.000 |
| 5.2000 | 0.318 | 1.290 | 0.117 | 0.000 |
| 5.3000 | 0.321 | 1.322 | 0.125 | 0.000 |
| 5.4000 | 0.324 | 1.354 | 0.141 | 0.000 |
| 5.5000 | 0.327 | 1.387 | 0.150 | 0.000 |
| 5.6000 | 0.330 | 1.420 | 0.157 | 0.000 |
| 5.7000 | 0.333 | 1.453 | 0.164 | 0.000 |
| 5.8000 | 0.336 | 1.486 | 0.169 | 0.000 |
| 5.9000 | 0.339 | 1.520 | 0.175 | 0.000 |
| 6.0000 | 0.342 | 1.554 | 0.180 | 0.000 |
| 6.1000 | 0.345 | 1.588 | 0.184 | 0.000 |
| 6.2000 | 0.348 | 1.623 | 0.213 | 0.000 |
| 6.3000 | 0.351 | 1.658 | 0.235 | 0.000 |
| 6.4000 | 0.354 | 1.693 | 0.252 | 0.000 |
| 6.5000 | 0.357 | 1.729 | 0.266 | 0.000 |
| 6.6000 | 0.360 | 1.765 | 0.278 | 0.000 |
| 6.7000 | 0.363 | 1.801 | 0.289 | 0.000 |
| 6.8000 | 0.366 | 1.837 | 0.300 | 0.000 |
| 6.9000 | 0.369 | 1.874 | 0.310 | 0.000 |
| 7.0000 | 0.372 | 1.911 | 0.320 | 0.000 |
| 7.1000 | 0.375 | 1.949 | 0.329 | 0.000 |
| 7.2000 | 0.378 | 1.986 | 0.337 | 0.000 |
| 7.3000 | 0.381 | 2.024 | 0.346 | 0.000 |
| 7.4000 | 0.384 | 2.063 | 0.354 | 0.000 |
| 7.5000 | 0.387 | 2.101 | 0.362 | 0.000 |
| 7.6000 | 0.390 | 2.140 | 0.369 | 0.000 |
| 7.7000 | 0.393 | 2.179 | 0.377 | 0.000 |
| 7.8000 | 0.397 | 2.219 | 0.384 | 0.000 |
| 7.9000 | 0.400 | 2.259 | 0.391 | 0.000 |
| 8.0000 | 0.403 | 2.299 | 0.398 | 0.000 |
| 8.1000 | 0.406 | 2.339 | 0.907 | 0.000 |
| 8.2000 | 0.409 | 2.380 | 1.816 | 0.000 |
| 8.3000 | 0.412 | 2.421 | 2.919 | 0.000 |
| 8.4000 | 0.416 | 2.463 | 4.057 | 0.000 |
| 8.5000 | 0.419 | 2.505 | 5.070 | 0.000 |
| 8.6000 | 0.422 | 2.547 | 5.838 | 0.000 |
| 8.7000 | 0.425 | 2.589 | 6.335 | 0.000 |
| 8.8000 | 0.428 | 2.632 | 6.787 | 0.000 |
| 8.9000 | 0.432 | 2.675 | 7.178 | 0.000 |

| | | | | |
|---|---|---|---|---|
| 9.0000 | 0.435 | 2.718 | 7.547 | 0.000 |
| 9.1000 | 0.438 | 2.762 | 7.899 | 0.000 |

# Analysis Results

## POC 1




\+ Predeveloped  x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 13.09
Total Impervious Area: 0.44

Mitigated Landuse Totals for POC #1
Total Pervious Area: 5.39
Total Impervious Area: 8.03

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.23658 |
| 5 year | 0.389815 |
| 10 year | 0.511721 |
| 25 year | 0.689817 |
| 50 year | 0.840545 |
| 100 year | 1.007246 |

Flow Frequency Return Periods for Mitigated. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.129478 |
| 5 year | 0.202941 |
| 10 year | 0.264376 |
| 25 year | 0.358724 |
| 50 year | 0.442612 |
| 100 year | 0.539464 |

## Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

| **Year** | **Predeveloped** | **Mitigated** |
|---|---|---|
| 1949 | 0.264 | 0.182 |
| 1950 | 0.231 | 0.114 |
| 1951 | 0.253 | 0.106 |
| 1952 | 0.132 | 0.067 |
| 1953 | 0.239 | 0.104 |
| 1954 | 0.631 | 0.662 |
| 1955 | 0.452 | 0.160 |
| 1956 | 0.175 | 0.141 |
| 1957 | 0.249 | 0.114 |
| 1958 | 0.167 | 0.093 |

| | | |
|---|---|---|
| 1959 | 0.273 | 0.255 |
| 1960 | 0.374 | 0.116 |
| 1961 | 0.440 | 0.224 |
| 1962 | 0.166 | 0.075 |
| 1963 | 0.147 | 0.101 |
| 1964 | 0.294 | 0.106 |
| 1965 | 0.162 | 0.103 |
| 1966 | 0.226 | 0.083 |
| 1967 | 0.401 | 0.193 |
| 1968 | 0.150 | 0.082 |
| 1969 | 0.146 | 0.080 |
| 1970 | 0.206 | 0.092 |
| 1971 | 0.995 | 0.091 |
| 1972 | 0.635 | 0.147 |
| 1973 | 0.230 | 0.139 |
| 1974 | 0.101 | 0.170 |
| 1975 | 0.183 | 0.103 |
| 1976 | 0.172 | 0.155 |
| 1977 | 0.118 | 0.106 |
| 1978 | 0.117 | 0.082 |
| 1979 | 0.215 | 0.116 |
| 1980 | 0.336 | 0.315 |
| 1981 | 0.255 | 0.333 |
| 1982 | 0.371 | 0.109 |
| 1983 | 0.308 | 0.160 |
| 1984 | 0.148 | 0.092 |
| 1985 | 0.583 | 0.279 |
| 1986 | 0.628 | 0.372 |
| 1987 | 0.348 | 0.113 |
| 1988 | 0.192 | 0.265 |
| 1989 | 0.161 | 0.092 |
| 1990 | 0.201 | 0.109 |
| 1991 | 0.422 | 0.260 |
| 1992 | 0.385 | 0.181 |
| 1993 | 0.107 | 0.086 |
| 1994 | 0.095 | 0.083 |
| 1995 | 0.074 | 0.098 |
| 1996 | 0.238 | 0.099 |
| 1997 | 0.415 | 0.282 |
| 1998 | 0.126 | 0.069 |
| 1999 | 0.603 | 0.373 |
| 2000 | 0.283 | 0.100 |
| 2001 | 0.086 | 0.084 |
| 2002 | 0.378 | 0.145 |
| 2003 | 0.228 | 0.115 |
| 2004 | 0.374 | 0.351 |
| 2005 | 0.186 | 0.107 |
| 2006 | 0.340 | 0.112 |
| 2007 | 0.737 | 0.147 |
| 2008 | 0.135 | 0.178 |
| 2009 | 0.139 | 0.116 |

## Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated.  POC #1

| Rank | Predeveloped | Mitigated |
|---|---|---|
| 1 | 0.9948 | 0.6616 |
| 2 | 0.7371 | 0.3733 |
| 3 | 0.6351 | 0.3718 |

| | | |
|---|---|---|
| 4 | 0.6312 | 0.3513 |
| 5 | 0.6277 | 0.3325 |
| 6 | 0.6028 | 0.3152 |
| 7 | 0.5833 | 0.2815 |
| 8 | 0.4521 | 0.2788 |
| 9 | 0.4397 | 0.2651 |
| 10 | 0.4215 | 0.2596 |
| 11 | 0.4147 | 0.2554 |
| 12 | 0.4007 | 0.2238 |
| 13 | 0.3849 | 0.1926 |
| 14 | 0.3778 | 0.1820 |
| 15 | 0.3743 | 0.1807 |
| 16 | 0.3739 | 0.1782 |
| 17 | 0.3710 | 0.1697 |
| 18 | 0.3483 | 0.1600 |
| 19 | 0.3395 | 0.1597 |
| 20 | 0.3359 | 0.1545 |
| 21 | 0.3076 | 0.1469 |
| 22 | 0.2940 | 0.1466 |
| 23 | 0.2829 | 0.1449 |
| 24 | 0.2735 | 0.1412 |
| 25 | 0.2643 | 0.1394 |
| 26 | 0.2551 | 0.1161 |
| 27 | 0.2534 | 0.1159 |
| 28 | 0.2491 | 0.1158 |
| 29 | 0.2391 | 0.1154 |
| 30 | 0.2381 | 0.1144 |
| 31 | 0.2312 | 0.1142 |
| 32 | 0.2303 | 0.1134 |
| 33 | 0.2284 | 0.1120 |
| 34 | 0.2257 | 0.1095 |
| 35 | 0.2145 | 0.1094 |
| 36 | 0.2061 | 0.1070 |
| 37 | 0.2011 | 0.1060 |
| 38 | 0.1924 | 0.1059 |
| 39 | 0.1859 | 0.1058 |
| 40 | 0.1826 | 0.1043 |
| 41 | 0.1745 | 0.1031 |
| 42 | 0.1723 | 0.1030 |
| 43 | 0.1666 | 0.1010 |
| 44 | 0.1665 | 0.1002 |
| 45 | 0.1621 | 0.0991 |
| 46 | 0.1606 | 0.0980 |
| 47 | 0.1497 | 0.0931 |
| 48 | 0.1480 | 0.0922 |
| 49 | 0.1465 | 0.0921 |
| 50 | 0.1455 | 0.0919 |
| 51 | 0.1385 | 0.0906 |
| 52 | 0.1353 | 0.0862 |
| 53 | 0.1321 | 0.0845 |
| 54 | 0.1256 | 0.0831 |
| 55 | 0.1181 | 0.0827 |
| 56 | 0.1169 | 0.0816 |
| 57 | 0.1073 | 0.0816 |
| 58 | 0.1009 | 0.0795 |
| 59 | 0.0947 | 0.0754 |
| 60 | 0.0856 | 0.0689 |
| 61 | 0.0743 | 0.0665 |

## Duration Flows

The Facility PASSED

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.1183 | 9201 | 7670 | 83 | Pass |
| 0.1256 | 8102 | 6731 | 83 | Pass |
| 0.1329 | 7189 | 6280 | 87 | Pass |
| 0.1402 | 6280 | 5856 | 93 | Pass |
| 0.1475 | 5619 | 5302 | 94 | Pass |
| 0.1548 | 5039 | 4827 | 95 | Pass |
| 0.1621 | 4466 | 4186 | 93 | Pass |
| 0.1694 | 4055 | 3711 | 91 | Pass |
| 0.1767 | 3681 | 3185 | 86 | Pass |
| 0.1839 | 3343 | 2481 | 74 | Pass |
| 0.1912 | 2988 | 2186 | 73 | Pass |
| 0.1985 | 2725 | 2087 | 76 | Pass |
| 0.2058 | 2496 | 1998 | 80 | Pass |
| 0.2131 | 2257 | 1910 | 84 | Pass |
| 0.2204 | 2054 | 1791 | 87 | Pass |
| 0.2277 | 1886 | 1676 | 88 | Pass |
| 0.2350 | 1686 | 1578 | 93 | Pass |
| 0.2423 | 1542 | 1497 | 97 | Pass |
| 0.2496 | 1395 | 1388 | 99 | Pass |
| 0.2569 | 1269 | 1252 | 98 | Pass |
| 0.2642 | 1146 | 1133 | 98 | Pass |
| 0.2715 | 1032 | 1056 | 102 | Pass |
| 0.2788 | 953 | 948 | 99 | Pass |
| 0.2861 | 843 | 845 | 100 | Pass |
| 0.2934 | 755 | 762 | 100 | Pass |
| 0.3007 | 674 | 671 | 99 | Pass |
| 0.3080 | 611 | 597 | 97 | Pass |
| 0.3153 | 542 | 523 | 96 | Pass |
| 0.3226 | 510 | 465 | 91 | Pass |
| 0.3299 | 475 | 411 | 86 | Pass |
| 0.3372 | 440 | 339 | 77 | Pass |
| 0.3445 | 405 | 292 | 72 | Pass |
| 0.3517 | 374 | 244 | 65 | Pass |
| 0.3590 | 351 | 199 | 56 | Pass |
| 0.3663 | 330 | 148 | 44 | Pass |
| 0.3736 | 306 | 66 | 21 | Pass |
| 0.3809 | 280 | 51 | 18 | Pass |
| 0.3882 | 262 | 33 | 12 | Pass |
| 0.3955 | 251 | 20 | 7 | Pass |
| 0.4028 | 232 | 13 | 5 | Pass |
| 0.4101 | 217 | 12 | 5 | Pass |
| 0.4174 | 196 | 12 | 6 | Pass |
| 0.4247 | 181 | 12 | 6 | Pass |
| 0.4320 | 166 | 12 | 7 | Pass |
| 0.4393 | 159 | 10 | 6 | Pass |
| 0.4466 | 152 | 10 | 6 | Pass |
| 0.4539 | 142 | 10 | 7 | Pass |
| 0.4612 | 133 | 10 | 7 | Pass |
| 0.4685 | 126 | 9 | 7 | Pass |
| 0.4758 | 119 | 9 | 7 | Pass |
| 0.4831 | 112 | 9 | 8 | Pass |
| 0.4904 | 106 | 9 | 8 | Pass |
| 0.4977 | 102 | 9 | 8 | Pass |

| | | | | |
|---|---|---|---|---|
| 0.5050 | 98 | 9 | 9 | Pass |
| 0.5122 | 89 | 7 | 7 | Pass |
| 0.5195 | 85 | 7 | 8 | Pass |
| 0.5268 | 81 | 7 | 8 | Pass |
| 0.5341 | 70 | 7 | 10 | Pass |
| 0.5414 | 61 | 7 | 11 | Pass |
| 0.5487 | 55 | 6 | 10 | Pass |
| 0.5560 | 48 | 6 | 12 | Pass |
| 0.5633 | 36 | 6 | 16 | Pass |
| 0.5706 | 28 | 6 | 21 | Pass |
| 0.5779 | 17 | 5 | 29 | Pass |
| 0.5852 | 12 | 4 | 33 | Pass |
| 0.5925 | 11 | 4 | 36 | Pass |
| 0.5998 | 10 | 4 | 40 | Pass |
| 0.6071 | 9 | 4 | 44 | Pass |
| 0.6144 | 8 | 4 | 50 | Pass |
| 0.6217 | 7 | 4 | 57 | Pass |
| 0.6290 | 6 | 3 | 50 | Pass |
| 0.6363 | 4 | 2 | 50 | Pass |
| 0.6436 | 3 | 2 | 66 | Pass |
| 0.6509 | 3 | 2 | 66 | Pass |
| 0.6582 | 3 | 2 | 66 | Pass |
| 0.6655 | 3 | 0 | 0 | Pass |
| 0.6727 | 3 | 0 | 0 | Pass |
| 0.6800 | 3 | 0 | 0 | Pass |
| 0.6873 | 2 | 0 | 0 | Pass |
| 0.6946 | 2 | 0 | 0 | Pass |
| 0.7019 | 2 | 0 | 0 | Pass |
| 0.7092 | 2 | 0 | 0 | Pass |
| 0.7165 | 2 | 0 | 0 | Pass |
| 0.7238 | 2 | 0 | 0 | Pass |
| 0.7311 | 2 | 0 | 0 | Pass |
| 0.7384 | 1 | 0 | 0 | Pass |
| 0.7457 | 1 | 0 | 0 | Pass |
| 0.7530 | 1 | 0 | 0 | Pass |
| 0.7603 | 1 | 0 | 0 | Pass |
| 0.7676 | 1 | 0 | 0 | Pass |
| 0.7749 | 1 | 0 | 0 | Pass |
| 0.7822 | 1 | 0 | 0 | Pass |
| 0.7895 | 1 | 0 | 0 | Pass |
| 0.7968 | 1 | 0 | 0 | Pass |
| 0.8041 | 1 | 0 | 0 | Pass |
| 0.8114 | 1 | 0 | 0 | Pass |
| 0.8187 | 1 | 0 | 0 | Pass |
| 0.8260 | 1 | 0 | 0 | Pass |
| 0.8332 | 1 | 0 | 0 | Pass |
| 0.8405 | 1 | 0 | 0 | Pass |

## Water Quality

Water Quality BMP Flow and Volume for POC #1

| | |
|---|---|
| On-line facility volume: | 0.2019 acre-feet |
| On-line facility target flow: | 0.1021 cfs. |
| Adjusted for 15 min: | 0.1021 cfs. |
| Off-line facility target flow: | 0.0669 cfs. |
| Adjusted for 15 min: | 0.0669 cfs. |

# Model Default Modifications

Total of 0 changes have been made.

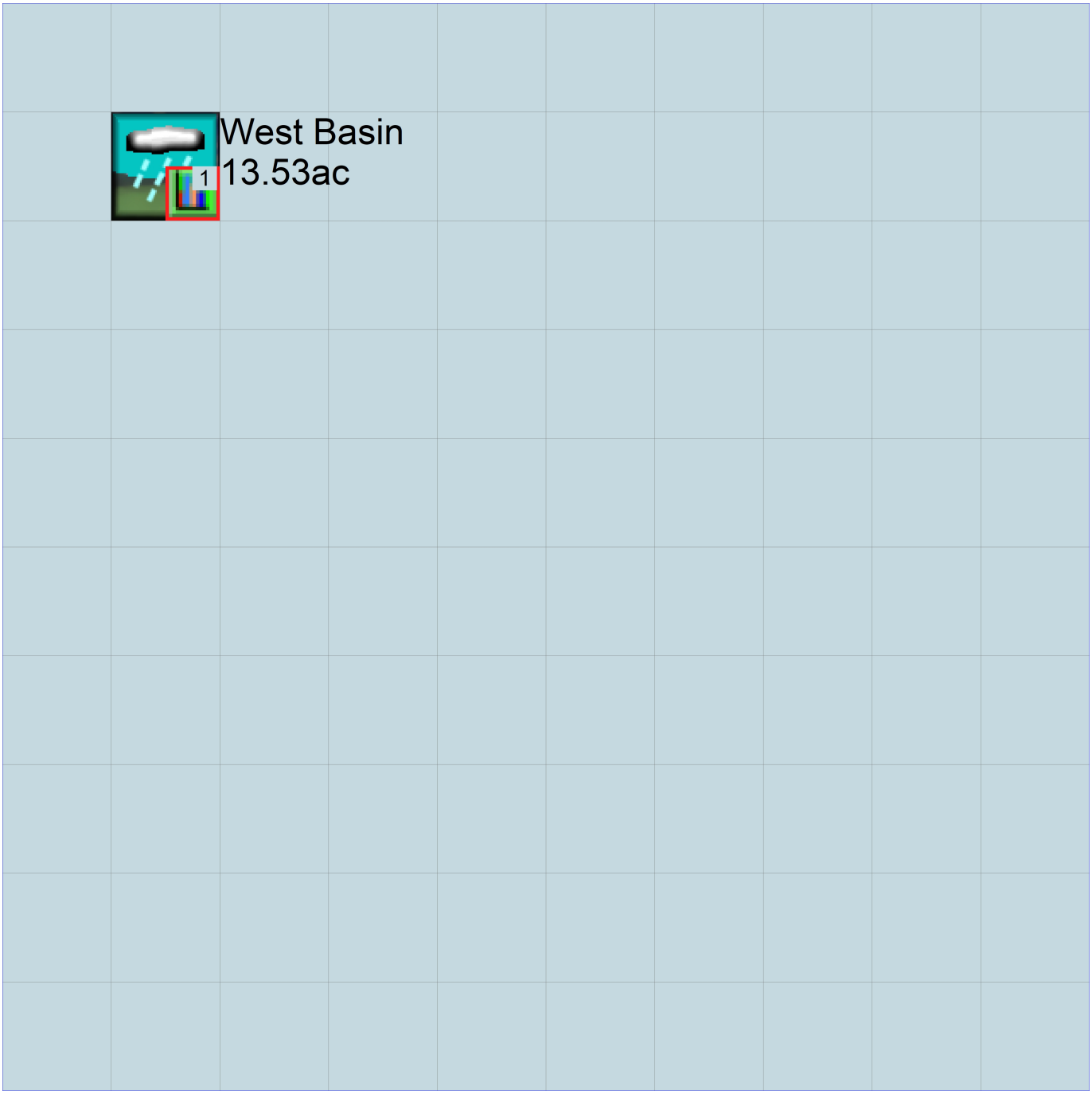
## PERLND Changes

No PERLND changes have been made.

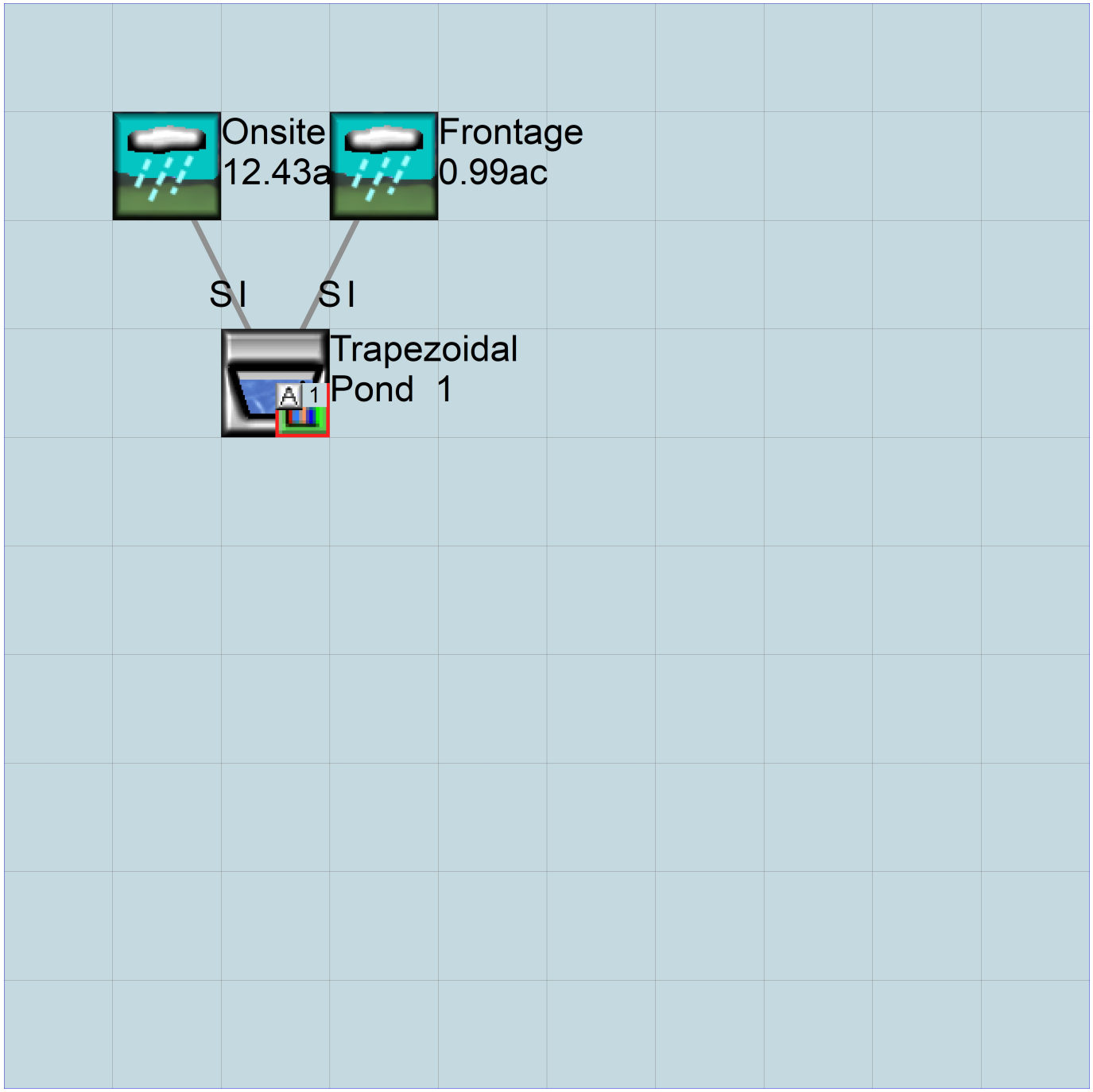
## IMPLND Changes

No IMPLND changes have been made.

# *Appendix*
## *Predeveloped Schematic*



## *Mitigated Schematic*



## *Predeveloped UCI File*

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   West.wdm
MESSU       25   PreWest.MES
            27   PreWest.L61
            28   PreWest.L62
            30   POCWest1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      14
      IMPLND       2
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        West Basin                 MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
   14     C, Pasture, Mod         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   14         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  *********
   14         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 ***
   14         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
   14              0       4.5      0.06       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   14              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   14           0.15       0.4       0.3         6       0.5       0.4
  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
   14              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           ***
    2      ROADS/MOD              1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    4    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            400      0.05       0.1      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
```

```
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                    <--Area-->     <-Target->   MBLK   ***
<Name>   #                    <-factor->     <Name>   #   Tbl#   ***
West Basin***
PERLND  14                         13.09     COPY   501     12
PERLND  14                         13.09     COPY   501     13
IMPLND   2                          0.44     COPY   501     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



<-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    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

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

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

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

  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   West.wdm
MESSU       25   MitWest.MES
            27   MitWest.L61
            28   MitWest.L62
            30   POCWest1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      14
      IMPLND       2
      IMPLND       4
      IMPLND       5
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Trapezoidal Pond  1         MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   14     C, Pasture, Mod         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   14         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  *********
   14         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 ***
   14         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
   14              0       4.5      0.06       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   14              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   14           0.15       0.4       0.3         6       0.5       0.4
  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
   14              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           ***
    2      ROADS/MOD              1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
    5      DRIVEWAYS/FLAT         1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
    4         0    0    1    0    0    0
    5         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    4    1    9
    4         0    0    4    0    0    0    1    9
    5         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     ***
    2         0    0    0    0    0
    4         0    0    0    0    0
    5         0    0    0    0    0
```

```
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >       IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            400      0.05       0.1      0.08
    4            400      0.01       0.1       0.1
    5            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >       IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
    4              0         0
    5              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
    4              0         0
    5              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Onsite***
PERLND  14                        5.26     RCHRES   1      2
PERLND  14                        5.26     RCHRES   1      3
IMPLND   2                        2.08     RCHRES   1      5
IMPLND   4                         4.5     RCHRES   1      5
IMPLND   5                        0.59     RCHRES   1      5
Frontage***
PERLND  14                        0.13     RCHRES   1      2
PERLND  14                        0.13     RCHRES   1      3
IMPLND   2                        0.86     RCHRES   1      5

******Routing******
PERLND  14                        5.26     COPY     1     12
IMPLND   2                        2.08     COPY     1     15
IMPLND   4                         4.5     COPY     1     15
IMPLND   5                        0.59     COPY     1     15
PERLND  14                        5.26     COPY     1     13
PERLND  14                        0.13     COPY     1     12
IMPLND   2                        0.86     COPY     1     15
PERLND  14                        0.13     COPY     1     13
RCHRES   1                           1     COPY   501     16
END SCHEMATIC

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



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

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
```

```
    1     Trapezoidal Pond-005    1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

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

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

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

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

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.181818  0.000000  0.000000
  0.100000  0.184206  0.018301  0.016342
  0.200000  0.186603  0.036842  0.023112
  0.300000  0.189010  0.055622  0.028306
  0.400000  0.191427  0.074644  0.032685
  0.500000  0.193853  0.093908  0.036543
  0.600000  0.196289  0.113415  0.040031
  0.700000  0.198735  0.133167  0.043238
  0.800000  0.201190  0.153163  0.046223
  0.900000  0.203655  0.173405  0.049027
  1.000000  0.206129  0.193894  0.051679
  1.100000  0.208614  0.214631  0.054202
  1.200000  0.211107  0.235617  0.056612
  1.300000  0.213611  0.256853  0.058924
  1.400000  0.216124  0.278340  0.061148
  1.500000  0.218647  0.300079  0.063294
  1.600000  0.221179  0.322070  0.065370
  1.700000  0.223721  0.344315  0.067382
  1.800000  0.226273  0.366815  0.069335
  1.900000  0.228834  0.389570  0.071235
  2.000000  0.231405  0.412582  0.073086
  2.100000  0.233986  0.435851  0.074890
  2.200000  0.236576  0.459380  0.076653
  2.300000  0.239176  0.483167  0.078376
  2.400000  0.241785  0.507215  0.080061
```

```
  2.500000  0.244404  0.531525  0.081712
  2.600000  0.247033  0.556096  0.083330
  2.700000  0.249671  0.580932  0.084918
  2.800000  0.252320  0.606031  0.086476
  2.900000  0.254977  0.631396  0.088007
  3.000000  0.257645  0.657027  0.089511
  3.100000  0.260322  0.682926  0.090991
  3.200000  0.263008  0.709092  0.092447
  3.300000  0.265705  0.735528  0.093880
  3.400000  0.268410  0.762233  0.095292
  3.500000  0.271126  0.789210  0.096683
  3.600000  0.273851  0.816459  0.098055
  3.700000  0.276586  0.843981  0.099407
  3.800000  0.279331  0.871777  0.100742
  3.900000  0.282085  0.899848  0.102059
  4.000000  0.284848  0.928194  0.103359
  4.100000  0.287622  0.956818  0.104643
  4.200000  0.290405  0.985719  0.105911
  4.300000  0.293198  1.014899  0.107165
  4.400000  0.296000  1.044359  0.108403
  4.500000  0.298812  1.074100  0.109628
  4.600000  0.301634  1.104122  0.110840
  4.700000  0.304465  1.134427  0.112038
  4.800000  0.307306  1.165015  0.113224
  4.900000  0.310156  1.195889  0.114397
  5.000000  0.313017  1.227047  0.115559
  5.100000  0.315886  1.258492  0.116708
  5.200000  0.318766  1.290225  0.117847
  5.300000  0.321655  1.322246  0.125338
  5.400000  0.324554  1.354556  0.141195
  5.500000  0.327462  1.387157  0.150357
  5.600000  0.330380  1.420049  0.157722
  5.700000  0.333308  1.453234  0.164125
  5.800000  0.336245  1.486711  0.169900
  5.900000  0.339192  1.520483  0.175224
  6.000000  0.342149  1.554550  0.180202
  6.100000  0.345115  1.588913  0.184904
  6.200000  0.348091  1.623574  0.213650
  6.300000  0.351076  1.658532  0.235700
  6.400000  0.354072  1.693790  0.252050
  6.500000  0.357076  1.729347  0.265966
  6.600000  0.360091  1.765205  0.278408
  6.700000  0.363115  1.801366  0.289824
  6.800000  0.366149  1.837829  0.300465
  6.900000  0.369192  1.874596  0.310491
  7.000000  0.372245  1.911668  0.320011
  7.100000  0.375308  1.949045  0.329106
  7.200000  0.378380  1.986730  0.337834
  7.300000  0.381462  2.024722  0.346243
  7.400000  0.384554  2.063023  0.354368
  7.500000  0.387655  2.101633  0.362241
  7.600000  0.390766  2.140554  0.369885
  7.700000  0.393886  2.179787  0.377322
  7.800000  0.397017  2.219332  0.384570
  7.900000  0.400156  2.259191  0.391644
  8.000000  0.403306  2.299364  0.398557
  8.100000  0.406465  2.339852  0.907499
  8.200000  0.409634  2.380657  1.816409
  8.300000  0.412812  2.421779  2.919701
  8.400000  0.416000  2.463220  4.057013
  8.500000  0.419198  2.504980  5.070161
  8.600000  0.422405  2.547060  5.838439
  8.700000  0.425622  2.589461  6.335799
  8.800000  0.428848  2.632185  6.787724
  8.900000  0.432085  2.675232  7.178077
  9.000000  0.435331  2.718602  7.547511
  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    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL       REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL       REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL       REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL       REPL
END EXT TARGETS

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

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

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

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

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

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

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


END MASS-LINK

END RUN
```

## *Predeveloped HSPF Message File*

## *Mitigated HSPF Message File*

# Disclaimer

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# Appendix B

## East Pond WWHM Report

# WWHM2012

# PROJECT REPORT

# General Model Information

WWHM2012 Project Name: Bell Creek East

| | |
|---|---|
| Site Name: | Bell Creek East |
| Site Address: | |
| City: | Sequim |
| Report Date: | 9/27/2024 |
| Gage: | Port Angelis |
| Data Start: | 1948/10/01 |
| Data End: | 2009/09/30 |
| Timestep: | 15 Minute |
| Precip Scale: | 0.800 |
| Version Date: | 2024/06/28 |
| Version: | 4.3.1 |

## POC Thresholds

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

# *Landuse Basin Data*
## *Predeveloped Land Use*

### Basin 1

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |

| Pervious Land Use | acre |
|---|---|
| C, Pasture, Mod | 9.62 |
| Pervious Total | 9.62 |

| Impervious Land Use | acre |
|---|---|
| ROADS MOD | 0.42 |
| Impervious Total | 0.42 |
| Basin Total | 10.04 |

Element Flow Componants:

| Surface | Interflow | Groundwater |
|---|---|---|
| Componant Flows To: | | |
| POC 1 | POC 1 | |

## *Mitigated Land Use*

### Onsite

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |

| Pervious Land Use | acre |
|---|---|
| C, Pasture, Mod | 3.93 |
| Pervious Total | 3.93 |

| Impervious Land Use | acre |
|---|---|
| ROADS MOD | 1.2 |
| ROOF TOPS FLAT | 2.5 |
| DRIVEWAYS FLAT | 0.33 |
| Impervious Total | 4.03 |
| Basin Total | 7.96 |

Element Flow Componants:

| Surface | Interflow | Groundwater |
|---|---|---|

Componant Flows To:

| | | | |
|---|---|---|---|
| Trapezoidal Pond | 1 | Trapezoidal Pond | 1 |

## Frontage

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |

| Pervious Land Use | acre |
|---|---|
| C, Pasture, Mod | 0.23 |
| Pervious Total | 0.23 |

| Impervious Land Use | acre |
|---|---|
| ROADS FLAT | 0.42 |
| ROADS MOD | 1.35 |
| Impervious Total | 1.77 |
| Basin Total | 2 |

Element Flow Componants:

| Surface | Interflow | Groundwater |
|---|---|---|
| Componant Flows To: | | |
| Trapezoidal Pond 1 | Trapezoidal Pond 1 | |

# Routing Elements
## Predeveloped Routing

## *Mitigated Routing*

### Trapezoidal Pond 1

Bottom Length: 100.00 ft.
Bottom Width: 74.00 ft.
Depth: 7.5 ft.
Volume at riser head: 1.7663 acre-feet.
Side slope 1: 3 To 1
Side slope 2: 4 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 6.5 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 1.344 in. Elevation:0 ft.
Orifice 2 Diameter: 1.375 in. Elevation:4.39 ft.
Orifice 3 Diameter: 1.750 in. Elevation:5.08 ft.
Element Outlets:
Outlet 1 Outlet 2
Outlet Flows To:

Pond Hydraulic Table

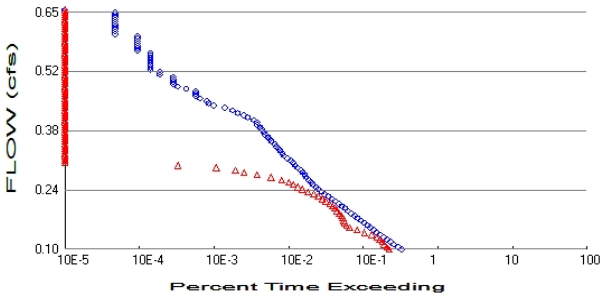
| Stage(feet) | Area(ac.) | Volume(ac-ft.) | Discharge(cfs) | Infilt(cfs) |
|---|---|---|---|---|
| 0.0000 | 0.169 | 0.000 | 0.000 | 0.000 |
| 0.0833 | 0.172 | 0.014 | 0.014 | 0.000 |
| 0.1667 | 0.174 | 0.028 | 0.020 | 0.000 |
| 0.2500 | 0.176 | 0.043 | 0.024 | 0.000 |
| 0.3333 | 0.178 | 0.058 | 0.028 | 0.000 |
| 0.4167 | 0.180 | 0.073 | 0.031 | 0.000 |
| 0.5000 | 0.183 | 0.088 | 0.034 | 0.000 |
| 0.5833 | 0.185 | 0.103 | 0.037 | 0.000 |
| 0.6667 | 0.187 | 0.119 | 0.040 | 0.000 |
| 0.7500 | 0.189 | 0.134 | 0.042 | 0.000 |
| 0.8333 | 0.191 | 0.150 | 0.044 | 0.000 |
| 0.9167 | 0.194 | 0.166 | 0.046 | 0.000 |
| 1.0000 | 0.196 | 0.183 | 0.049 | 0.000 |
| 1.0833 | 0.198 | 0.199 | 0.051 | 0.000 |
| 1.1667 | 0.201 | 0.216 | 0.052 | 0.000 |
| 1.2500 | 0.203 | 0.233 | 0.054 | 0.000 |
| 1.3333 | 0.205 | 0.250 | 0.056 | 0.000 |
| 1.4167 | 0.208 | 0.267 | 0.058 | 0.000 |
| 1.5000 | 0.210 | 0.284 | 0.060 | 0.000 |
| 1.5833 | 0.212 | 0.302 | 0.061 | 0.000 |
| 1.6667 | 0.215 | 0.320 | 0.063 | 0.000 |
| 1.7500 | 0.217 | 0.338 | 0.064 | 0.000 |
| 1.8333 | 0.220 | 0.356 | 0.066 | 0.000 |
| 1.9167 | 0.222 | 0.375 | 0.067 | 0.000 |
| 2.0000 | 0.225 | 0.393 | 0.069 | 0.000 |
| 2.0833 | 0.227 | 0.412 | 0.070 | 0.000 |
| 2.1667 | 0.230 | 0.431 | 0.072 | 0.000 |
| 2.2500 | 0.232 | 0.450 | 0.073 | 0.000 |
| 2.3333 | 0.235 | 0.470 | 0.074 | 0.000 |
| 2.4167 | 0.237 | 0.490 | 0.076 | 0.000 |
| 2.5000 | 0.240 | 0.509 | 0.077 | 0.000 |
| 2.5833 | 0.242 | 0.530 | 0.078 | 0.000 |

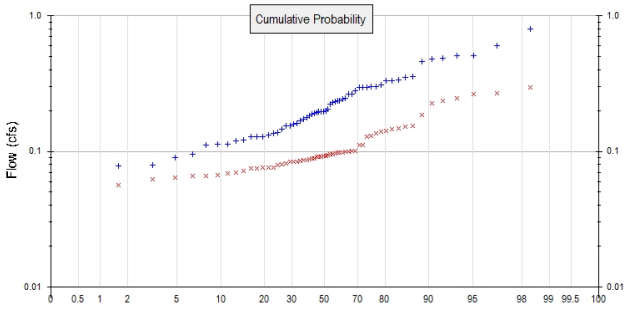
| | | | | |
|---|---|---|---|---|
| 2.6667 | 0.245 | 0.550 | 0.080 | 0.000 |
| 2.7500 | 0.247 | 0.570 | 0.081 | 0.000 |
| 2.8333 | 0.250 | 0.591 | 0.082 | 0.000 |
| 2.9167 | 0.252 | 0.612 | 0.083 | 0.000 |
| 3.0000 | 0.255 | 0.633 | 0.084 | 0.000 |
| 3.0833 | 0.258 | 0.655 | 0.086 | 0.000 |
| 3.1667 | 0.260 | 0.676 | 0.087 | 0.000 |
| 3.2500 | 0.263 | 0.698 | 0.088 | 0.000 |
| 3.3333 | 0.266 | 0.720 | 0.089 | 0.000 |
| 3.4167 | 0.268 | 0.743 | 0.090 | 0.000 |
| 3.5000 | 0.271 | 0.765 | 0.091 | 0.000 |
| 3.5833 | 0.274 | 0.788 | 0.092 | 0.000 |
| 3.6667 | 0.277 | 0.811 | 0.093 | 0.000 |
| 3.7500 | 0.279 | 0.834 | 0.094 | 0.000 |
| 3.8333 | 0.282 | 0.857 | 0.095 | 0.000 |
| 3.9167 | 0.285 | 0.881 | 0.097 | 0.000 |
| 4.0000 | 0.288 | 0.905 | 0.098 | 0.000 |
| 4.0833 | 0.290 | 0.929 | 0.099 | 0.000 |
| 4.1667 | 0.293 | 0.953 | 0.100 | 0.000 |
| 4.2500 | 0.296 | 0.978 | 0.101 | 0.000 |
| 4.3333 | 0.299 | 1.003 | 0.102 | 0.000 |
| 4.4167 | 0.302 | 1.028 | 0.111 | 0.000 |
| 4.5000 | 0.304 | 1.053 | 0.121 | 0.000 |
| 4.5833 | 0.307 | 1.079 | 0.127 | 0.000 |
| 4.6667 | 0.310 | 1.104 | 0.132 | 0.000 |
| 4.7500 | 0.313 | 1.130 | 0.137 | 0.000 |
| 4.8333 | 0.316 | 1.157 | 0.141 | 0.000 |
| 4.9167 | 0.319 | 1.183 | 0.145 | 0.000 |
| 5.0000 | 0.322 | 1.210 | 0.149 | 0.000 |
| 5.0833 | 0.325 | 1.237 | 0.158 | 0.000 |
| 5.1667 | 0.328 | 1.264 | 0.181 | 0.000 |
| 5.2500 | 0.331 | 1.292 | 0.194 | 0.000 |
| 5.3333 | 0.334 | 1.319 | 0.204 | 0.000 |
| 5.4167 | 0.337 | 1.347 | 0.214 | 0.000 |
| 5.5000 | 0.340 | 1.376 | 0.222 | 0.000 |
| 5.5833 | 0.343 | 1.404 | 0.230 | 0.000 |
| 5.6667 | 0.346 | 1.433 | 0.238 | 0.000 |
| 5.7500 | 0.349 | 1.462 | 0.245 | 0.000 |
| 5.8333 | 0.352 | 1.491 | 0.252 | 0.000 |
| 5.9167 | 0.355 | 1.520 | 0.258 | 0.000 |
| 6.0000 | 0.358 | 1.550 | 0.264 | 0.000 |
| 6.0833 | 0.361 | 1.580 | 0.270 | 0.000 |
| 6.1667 | 0.364 | 1.611 | 0.276 | 0.000 |
| 6.2500 | 0.368 | 1.641 | 0.282 | 0.000 |
| 6.3333 | 0.371 | 1.672 | 0.287 | 0.000 |
| 6.4167 | 0.374 | 1.703 | 0.293 | 0.000 |
| 6.5000 | 0.377 | 1.734 | 0.298 | 0.000 |
| 6.5833 | 0.380 | 1.766 | 0.557 | 0.000 |
| 6.6667 | 0.383 | 1.798 | 1.012 | 0.000 |
| 6.7500 | 0.387 | 1.830 | 1.531 | 0.000 |
| 6.8333 | 0.390 | 1.862 | 2.001 | 0.000 |
| 6.9167 | 0.393 | 1.895 | 2.336 | 0.000 |
| 7.0000 | 0.396 | 1.928 | 2.531 | 0.000 |
| 7.0833 | 0.400 | 1.961 | 2.737 | 0.000 |
| 7.1667 | 0.403 | 1.994 | 2.908 | 0.000 |
| 7.2500 | 0.406 | 2.028 | 3.068 | 0.000 |
| 7.3333 | 0.409 | 2.062 | 3.220 | 0.000 |
| 7.4167 | 0.413 | 2.097 | 3.365 | 0.000 |

| | | | | |
|---|---|---|---|---|
| 7.5000 | 0.416 | 2.131 | 3.503 | 0.000 |
| 7.5833 | 0.420 | 2.166 | 3.636 | 0.000 |

# Analysis Results

## POC 1




\+ Predeveloped  x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 9.62
Total Impervious Area: 0.42

Mitigated Landuse Totals for POC #1
Total Pervious Area: 4.16
Total Impervious Area: 5.8

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.20416 |
| 5 year | 0.322718 |
| 10 year | 0.414167 |
| 25 year | 0.544623 |
| 50 year | 0.652813 |
| 100 year | 0.770606 |

Flow Frequency Return Periods for Mitigated. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.097111 |
| 5 year | 0.1398 |
| 10 year | 0.173922 |
| 25 year | 0.224414 |
| 50 year | 0.267876 |
| 100 year | 0.316783 |

## Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

| **Year** | **Predeveloped** | **Mitigated** |
|---|---|---|
| 1949 | 0.236 | 0.136 |
| 1950 | 0.189 | 0.093 |
| 1951 | 0.242 | 0.086 |
| 1952 | 0.120 | 0.053 |
| 1953 | 0.228 | 0.084 |
| 1954 | 0.506 | 0.297 |
| 1955 | 0.358 | 0.112 |
| 1956 | 0.154 | 0.100 |
| 1957 | 0.199 | 0.093 |
| 1958 | 0.159 | 0.076 |

| | | |
|---|---|---|
| 1959 | 0.224 | 0.145 |
| 1960 | 0.294 | 0.097 |
| 1961 | 0.350 | 0.142 |
| 1962 | 0.155 | 0.062 |
| 1963 | 0.132 | 0.083 |
| 1964 | 0.279 | 0.088 |
| 1965 | 0.138 | 0.084 |
| 1966 | 0.196 | 0.066 |
| 1967 | 0.309 | 0.139 |
| 1968 | 0.129 | 0.066 |
| 1969 | 0.137 | 0.064 |
| 1970 | 0.196 | 0.075 |
| 1971 | 0.795 | 0.075 |
| 1972 | 0.506 | 0.098 |
| 1973 | 0.195 | 0.097 |
| 1974 | 0.080 | 0.111 |
| 1975 | 0.174 | 0.085 |
| 1976 | 0.161 | 0.101 |
| 1977 | 0.113 | 0.086 |
| 1978 | 0.111 | 0.066 |
| 1979 | 0.204 | 0.097 |
| 1980 | 0.265 | 0.227 |
| 1981 | 0.234 | 0.237 |
| 1982 | 0.296 | 0.088 |
| 1983 | 0.246 | 0.101 |
| 1984 | 0.128 | 0.075 |
| 1985 | 0.479 | 0.155 |
| 1986 | 0.484 | 0.266 |
| 1987 | 0.332 | 0.091 |
| 1988 | 0.168 | 0.153 |
| 1989 | 0.145 | 0.076 |
| 1990 | 0.190 | 0.091 |
| 1991 | 0.336 | 0.149 |
| 1992 | 0.302 | 0.128 |
| 1993 | 0.096 | 0.071 |
| 1994 | 0.090 | 0.069 |
| 1995 | 0.070 | 0.079 |
| 1996 | 0.193 | 0.081 |
| 1997 | 0.333 | 0.186 |
| 1998 | 0.120 | 0.057 |
| 1999 | 0.457 | 0.267 |
| 2000 | 0.235 | 0.082 |
| 2001 | 0.078 | 0.070 |
| 2002 | 0.301 | 0.100 |
| 2003 | 0.183 | 0.095 |
| 2004 | 0.296 | 0.247 |
| 2005 | 0.177 | 0.088 |
| 2006 | 0.265 | 0.092 |
| 2007 | 0.601 | 0.094 |
| 2008 | 0.129 | 0.131 |
| 2009 | 0.112 | 0.095 |

## Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated.  POC #1

| Rank | Predeveloped | Mitigated |
|---|---|---|
| 1 | 0.7953 | 0.2965 |
| 2 | 0.6013 | 0.2667 |
| 3 | 0.5061 | 0.2657 |

| | | |
|---|---|---|
| 4 | 0.5059 | 0.2471 |
| 5 | 0.4842 | 0.2372 |
| 6 | 0.4794 | 0.2271 |
| 7 | 0.4572 | 0.1857 |
| 8 | 0.3577 | 0.1549 |
| 9 | 0.3499 | 0.1530 |
| 10 | 0.3357 | 0.1486 |
| 11 | 0.3330 | 0.1453 |
| 12 | 0.3320 | 0.1422 |
| 13 | 0.3093 | 0.1395 |
| 14 | 0.3017 | 0.1357 |
| 15 | 0.3010 | 0.1309 |
| 16 | 0.2963 | 0.1276 |
| 17 | 0.2955 | 0.1121 |
| 18 | 0.2942 | 0.1111 |
| 19 | 0.2789 | 0.1009 |
| 20 | 0.2655 | 0.1006 |
| 21 | 0.2647 | 0.1000 |
| 22 | 0.2458 | 0.0996 |
| 23 | 0.2418 | 0.0982 |
| 24 | 0.2355 | 0.0974 |
| 25 | 0.2348 | 0.0973 |
| 26 | 0.2342 | 0.0967 |
| 27 | 0.2280 | 0.0955 |
| 28 | 0.2242 | 0.0952 |
| 29 | 0.2036 | 0.0944 |
| 30 | 0.1990 | 0.0932 |
| 31 | 0.1963 | 0.0927 |
| 32 | 0.1956 | 0.0916 |
| 33 | 0.1952 | 0.0908 |
| 34 | 0.1934 | 0.0907 |
| 35 | 0.1896 | 0.0884 |
| 36 | 0.1891 | 0.0882 |
| 37 | 0.1825 | 0.0880 |
| 38 | 0.1772 | 0.0863 |
| 39 | 0.1738 | 0.0862 |
| 40 | 0.1677 | 0.0849 |
| 41 | 0.1610 | 0.0836 |
| 42 | 0.1587 | 0.0836 |
| 43 | 0.1552 | 0.0832 |
| 44 | 0.1538 | 0.0819 |
| 45 | 0.1453 | 0.0806 |
| 46 | 0.1384 | 0.0793 |
| 47 | 0.1365 | 0.0761 |
| 48 | 0.1321 | 0.0758 |
| 49 | 0.1288 | 0.0755 |
| 50 | 0.1288 | 0.0750 |
| 51 | 0.1279 | 0.0746 |
| 52 | 0.1204 | 0.0714 |
| 53 | 0.1198 | 0.0700 |
| 54 | 0.1126 | 0.0685 |
| 55 | 0.1124 | 0.0664 |
| 56 | 0.1107 | 0.0661 |
| 57 | 0.0958 | 0.0659 |
| 58 | 0.0903 | 0.0640 |
| 59 | 0.0796 | 0.0619 |
| 60 | 0.0777 | 0.0565 |
| 61 | 0.0701 | 0.0532 |

## Duration Flows

The Facility PASSED

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.1021 | 6951 | 4729 | 68 | Pass |
| 0.1076 | 6265 | 4415 | 70 | Pass |
| 0.1132 | 5486 | 4081 | 74 | Pass |
| 0.1188 | 4930 | 3835 | 77 | Pass |
| 0.1243 | 4404 | 3521 | 79 | Pass |
| 0.1299 | 4013 | 3243 | 80 | Pass |
| 0.1355 | 3595 | 2787 | 77 | Pass |
| 0.1410 | 3202 | 2212 | 69 | Pass |
| 0.1466 | 2928 | 1758 | 60 | Pass |
| 0.1521 | 2637 | 1395 | 52 | Pass |
| 0.1577 | 2415 | 1275 | 52 | Pass |
| 0.1633 | 2182 | 1213 | 55 | Pass |
| 0.1688 | 1992 | 1175 | 58 | Pass |
| 0.1744 | 1783 | 1130 | 63 | Pass |
| 0.1800 | 1643 | 1087 | 66 | Pass |
| 0.1855 | 1481 | 1013 | 68 | Pass |
| 0.1911 | 1337 | 951 | 71 | Pass |
| 0.1967 | 1215 | 896 | 73 | Pass |
| 0.2022 | 1091 | 822 | 75 | Pass |
| 0.2078 | 1010 | 755 | 74 | Pass |
| 0.2133 | 897 | 677 | 75 | Pass |
| 0.2189 | 813 | 606 | 74 | Pass |
| 0.2245 | 722 | 533 | 73 | Pass |
| 0.2300 | 643 | 464 | 72 | Pass |
| 0.2356 | 587 | 384 | 65 | Pass |
| 0.2412 | 532 | 329 | 61 | Pass |
| 0.2467 | 497 | 286 | 57 | Pass |
| 0.2523 | 449 | 245 | 54 | Pass |
| 0.2578 | 422 | 214 | 50 | Pass |
| 0.2634 | 394 | 172 | 43 | Pass |
| 0.2690 | 370 | 124 | 33 | Pass |
| 0.2745 | 349 | 80 | 22 | Pass |
| 0.2801 | 328 | 54 | 16 | Pass |
| 0.2857 | 309 | 41 | 13 | Pass |
| 0.2912 | 280 | 23 | 8 | Pass |
| 0.2968 | 264 | 7 | 2 | Pass |
| 0.3023 | 243 | 0 | 0 | Pass |
| 0.3079 | 226 | 0 | 0 | Pass |
| 0.3135 | 204 | 0 | 0 | Pass |
| 0.3190 | 184 | 0 | 0 | Pass |
| 0.3246 | 175 | 0 | 0 | Pass |
| 0.3302 | 165 | 0 | 0 | Pass |
| 0.3357 | 156 | 0 | 0 | Pass |
| 0.3413 | 144 | 0 | 0 | Pass |
| 0.3469 | 138 | 0 | 0 | Pass |
| 0.3524 | 125 | 0 | 0 | Pass |
| 0.3580 | 119 | 0 | 0 | Pass |
| 0.3635 | 112 | 0 | 0 | Pass |
| 0.3691 | 102 | 0 | 0 | Pass |
| 0.3747 | 100 | 0 | 0 | Pass |
| 0.3802 | 93 | 0 | 0 | Pass |
| 0.3858 | 88 | 0 | 0 | Pass |
| 0.3914 | 81 | 0 | 0 | Pass |

| | | | | |
|---|---|---|---|---|
| 0.3969 | 80 | 0 | 0 | Pass |
| 0.4025 | 73 | 0 | 0 | Pass |
| 0.4080 | 60 | 0 | 0 | Pass |
| 0.4136 | 53 | 0 | 0 | Pass |
| 0.4192 | 44 | 0 | 0 | Pass |
| 0.4247 | 38 | 0 | 0 | Pass |
| 0.4303 | 30 | 0 | 0 | Pass |
| 0.4359 | 21 | 0 | 0 | Pass |
| 0.4414 | 18 | 0 | 0 | Pass |
| 0.4470 | 17 | 0 | 0 | Pass |
| 0.4525 | 14 | 0 | 0 | Pass |
| 0.4581 | 12 | 0 | 0 | Pass |
| 0.4637 | 12 | 0 | 0 | Pass |
| 0.4692 | 12 | 0 | 0 | Pass |
| 0.4748 | 9 | 0 | 0 | Pass |
| 0.4804 | 7 | 0 | 0 | Pass |
| 0.4859 | 6 | 0 | 0 | Pass |
| 0.4915 | 6 | 0 | 0 | Pass |
| 0.4971 | 6 | 0 | 0 | Pass |
| 0.5026 | 6 | 0 | 0 | Pass |
| 0.5082 | 4 | 0 | 0 | Pass |
| 0.5137 | 4 | 0 | 0 | Pass |
| 0.5193 | 3 | 0 | 0 | Pass |
| 0.5249 | 3 | 0 | 0 | Pass |
| 0.5304 | 3 | 0 | 0 | Pass |
| 0.5360 | 3 | 0 | 0 | Pass |
| 0.5416 | 3 | 0 | 0 | Pass |
| 0.5471 | 3 | 0 | 0 | Pass |
| 0.5527 | 3 | 0 | 0 | Pass |
| 0.5582 | 3 | 0 | 0 | Pass |
| 0.5638 | 2 | 0 | 0 | Pass |
| 0.5694 | 2 | 0 | 0 | Pass |
| 0.5749 | 2 | 0 | 0 | Pass |
| 0.5805 | 2 | 0 | 0 | Pass |
| 0.5861 | 2 | 0 | 0 | Pass |
| 0.5916 | 2 | 0 | 0 | Pass |
| 0.5972 | 2 | 0 | 0 | Pass |
| 0.6027 | 1 | 0 | 0 | Pass |
| 0.6083 | 1 | 0 | 0 | Pass |
| 0.6139 | 1 | 0 | 0 | Pass |
| 0.6194 | 1 | 0 | 0 | Pass |
| 0.6250 | 1 | 0 | 0 | Pass |
| 0.6306 | 1 | 0 | 0 | Pass |
| 0.6361 | 1 | 0 | 0 | Pass |
| 0.6417 | 1 | 0 | 0 | Pass |
| 0.6473 | 1 | 0 | 0 | Pass |
| 0.6528 | 1 | 0 | 0 | Pass |

## Water Quality

Water Quality BMP Flow and Volume for POC #1

| | |
|---|---|
| On-line facility volume: | 0.1763 acre-feet |
| On-line facility target flow: | 0.0897 cfs. |
| Adjusted for 15 min: | 0.0897 cfs. |
| Off-line facility target flow: | 0.0583 cfs. |
| Adjusted for 15 min: | 0.0583 cfs. |

# Model Default Modifications

Total of 0 changes have been made.

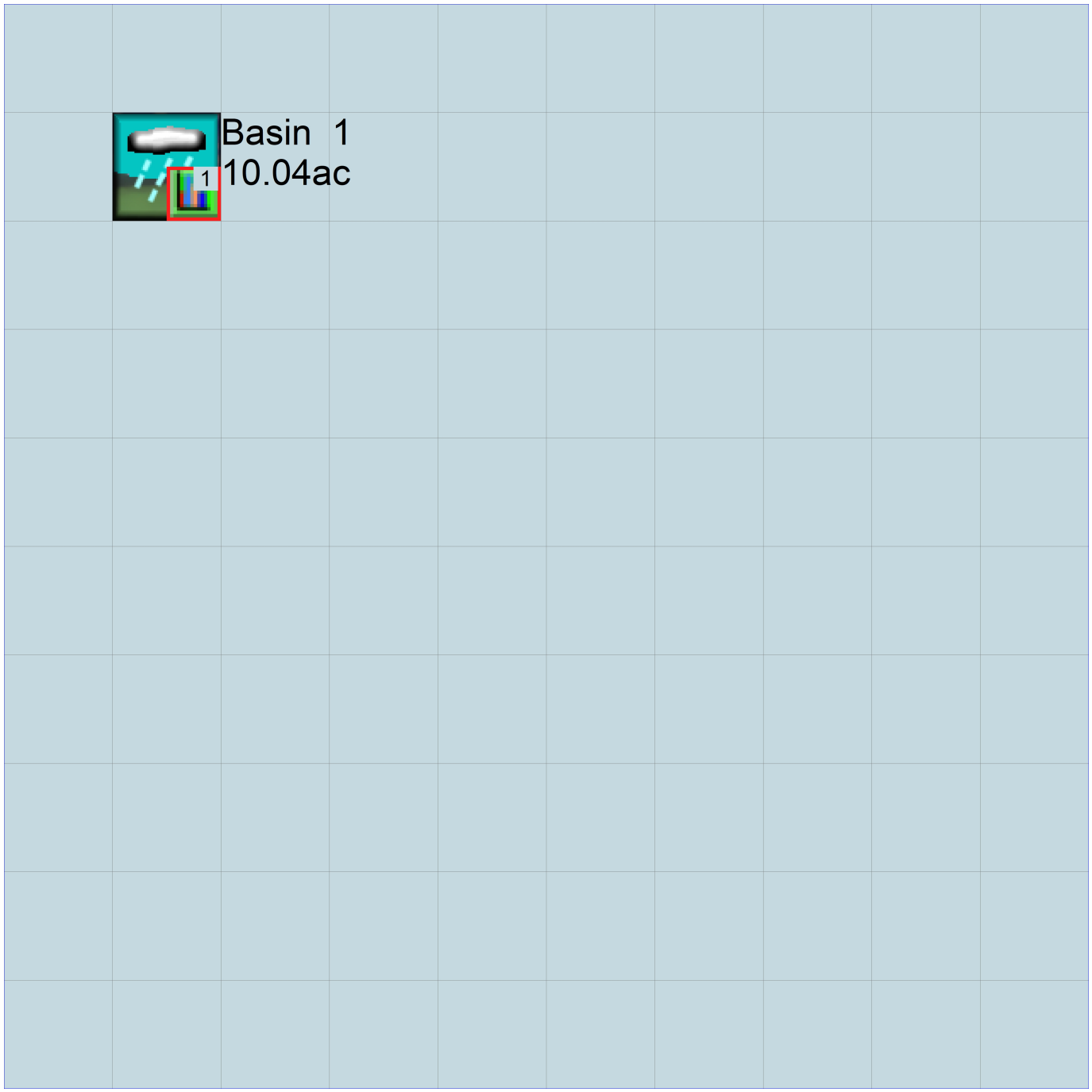
## PERLND Changes

No PERLND changes have been made.

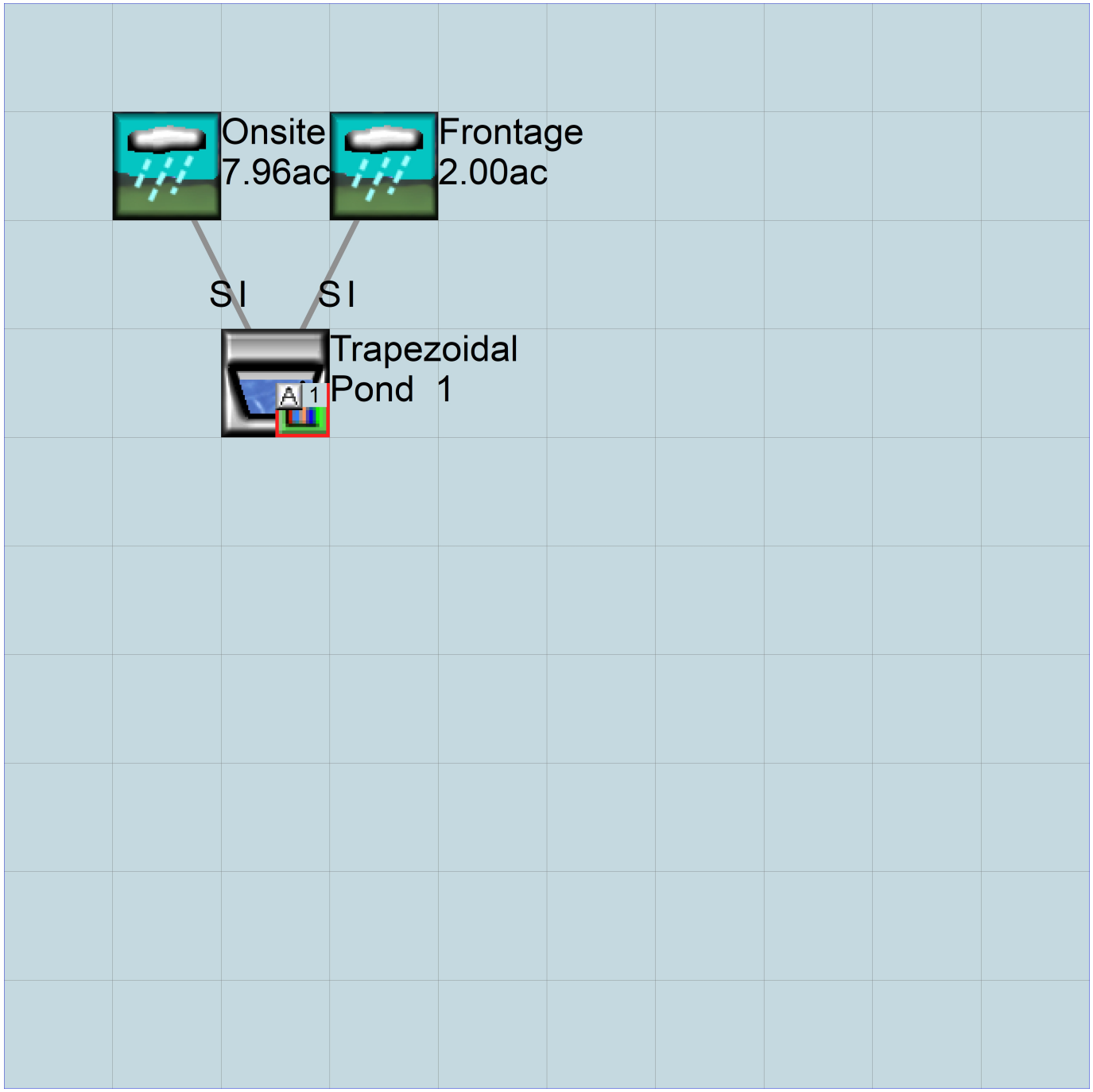
## IMPLND Changes

No IMPLND changes have been made.

# *Appendix*
## *Predeveloped Schematic*



## *Mitigated Schematic*



## *Predeveloped UCI File*

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1948 10 01        END    2009 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Bell Creek East.wdm
MESSU       25   PreBell Creek East.MES
            27   PreBell Creek East.L61
            28   PreBell Creek East.L62
            30   POCBell Creek East1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      14
      IMPLND       2
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
   14     C, Pasture, Mod         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   14         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  *********
   14         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 ***
   14         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
   14              0       4.5      0.06       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   14              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   14           0.15       0.4       0.3         6       0.5       0.4
  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
   14              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           ***
    2      ROADS/MOD              1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    4    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    2         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            400      0.05       0.1      0.08
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
```

```
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2            0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                    <--Area-->    <-Target->   MBLK   ***
<Name>   #                    <-factor->    <Name>   #   Tbl#   ***
Basin  1***
PERLND  14                          9.62    COPY   501     12
PERLND  14                          9.62    COPY   501     13
IMPLND   2                          0.42    COPY   501     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



<-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    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

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

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

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

  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   Bell Creek East.wdm
MESSU       25   MitBell Creek East.MES
            27   MitBell Creek East.L61
            28   MitBell Creek East.L62
            30   POCBell Creek East1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      14
      IMPLND       2
      IMPLND       4
      IMPLND       5
      IMPLND       1
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Trapezoidal Pond  1         MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out           ***
   14     C, Pasture, Mod         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   14         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  *********
   14         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 ***
   14         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
   14              0       4.5      0.06       400       0.1       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   14              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                  ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   14           0.15       0.4       0.3         6       0.5       0.4
  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
   14              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           ***
    2      ROADS/MOD              1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
    5      DRIVEWAYS/FLAT         1    1    1   27    0
    1      ROADS/FLAT             1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
    4         0    0    1    0    0    0
    5         0    0    1    0    0    0
    1         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    4    1    9
    4         0    0    4    0    0    0    1    9
    5         0    0    4    0    0    0    1    9
    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     ***
    2         0    0    0    0    0
    4         0    0    0    0    0
    5         0    0    0    0    0
    1         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    2            400      0.05       0.1      0.08
    4            400      0.01       0.1       0.1
    5            400      0.01       0.1       0.1
    1            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
    4              0         0
    5              0         0
    1              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
    4              0         0
    5              0         0
    1              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Onsite***
PERLND  14                       3.93     RCHRES   1      2
PERLND  14                       3.93     RCHRES   1      3
IMPLND   2                        1.2     RCHRES   1      5
IMPLND   4                        2.5     RCHRES   1      5
IMPLND   5                       0.33     RCHRES   1      5
Frontage***
PERLND  14                       0.23     RCHRES   1      2
PERLND  14                       0.23     RCHRES   1      3
IMPLND   1                       0.42     RCHRES   1      5
IMPLND   2                       1.35     RCHRES   1      5

******Routing******
PERLND  14                       3.93     COPY     1     12
IMPLND   2                        1.2     COPY     1     15
IMPLND   4                        2.5     COPY     1     15
IMPLND   5                       0.33     COPY     1     15
PERLND  14                       3.93     COPY     1     13
PERLND  14                       0.23     COPY     1     12
IMPLND   1                       0.42     COPY     1     15
IMPLND   2                       1.35     COPY     1     15
PERLND  14                       0.23     COPY     1     13
RCHRES   1                          1     COPY   501     16
END SCHEMATIC

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

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

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                        in  out                             ***
    1     Trapezoidal Pond-005    1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

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

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

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

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

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.169881  0.000000  0.000000
  0.083333  0.172026  0.014246  0.014145
  0.166667  0.174185  0.028672  0.020004
  0.250000  0.176357  0.043278  0.024500
  0.333333  0.178543  0.058065  0.028290
  0.416667  0.180742  0.073035  0.031629
  0.500000  0.182955  0.088189  0.034648
  0.583333  0.185180  0.103528  0.037424
  0.666667  0.187420  0.119053  0.040008
  0.750000  0.189672  0.134765  0.042435
  0.833333  0.191938  0.150666  0.044731
  0.916667  0.194218  0.166756  0.046914
  1.000000  0.196511  0.183036  0.049000
  1.083333  0.198817  0.199508  0.051001
  1.166667  0.201136  0.216173  0.052926
```

| | | | |
|---|---|---|---|
| 1.250000 | 0.203469 | 0.233031 | 0.054784 |
| 1.333333 | 0.205816 | 0.250085 | 0.056580 |
| 1.416667 | 0.208176 | 0.267334 | 0.058322 |
| 1.500000 | 0.210549 | 0.284781 | 0.060012 |
| 1.583333 | 0.212935 | 0.302426 | 0.061657 |
| 1.666667 | 0.215335 | 0.320271 | 0.063259 |
| 1.750000 | 0.217749 | 0.338316 | 0.064821 |
| 1.833333 | 0.220175 | 0.356563 | 0.066346 |
| 1.916667 | 0.222615 | 0.375013 | 0.067837 |
| 2.000000 | 0.225069 | 0.393666 | 0.069296 |
| 2.083333 | 0.227536 | 0.412525 | 0.070725 |
| 2.166667 | 0.230016 | 0.431589 | 0.072126 |
| 2.250000 | 0.232510 | 0.450861 | 0.073500 |
| 2.333333 | 0.235017 | 0.470342 | 0.074849 |
| 2.416667 | 0.237537 | 0.490031 | 0.076174 |
| 2.500000 | 0.240071 | 0.509932 | 0.077476 |
| 2.583333 | 0.242618 | 0.530044 | 0.078756 |
| 2.666667 | 0.245179 | 0.550369 | 0.080017 |
| 2.750000 | 0.247753 | 0.570907 | 0.081257 |
| 2.833333 | 0.250341 | 0.591661 | 0.082479 |
| 2.916667 | 0.252941 | 0.612631 | 0.083683 |
| 3.000000 | 0.255556 | 0.633819 | 0.084870 |
| 3.083333 | 0.258183 | 0.655225 | 0.086041 |
| 3.166667 | 0.260824 | 0.676850 | 0.087196 |
| 3.250000 | 0.263479 | 0.698696 | 0.088336 |
| 3.333333 | 0.266146 | 0.720764 | 0.089461 |
| 3.416667 | 0.268827 | 0.743054 | 0.090573 |
| 3.500000 | 0.271522 | 0.765569 | 0.091671 |
| 3.583333 | 0.274230 | 0.788308 | 0.092755 |
| 3.666667 | 0.276951 | 0.811274 | 0.093828 |
| 3.750000 | 0.279686 | 0.834467 | 0.094888 |
| 3.833333 | 0.282434 | 0.857889 | 0.095937 |
| 3.916667 | 0.285196 | 0.881540 | 0.096974 |
| 4.000000 | 0.287971 | 0.905422 | 0.098000 |
| 4.083333 | 0.290759 | 0.929536 | 0.099015 |
| 4.166667 | 0.293561 | 0.953883 | 0.100021 |
| 4.250000 | 0.296376 | 0.978463 | 0.101016 |
| 4.333333 | 0.299204 | 1.003279 | 0.102002 |
| 4.416667 | 0.302046 | 1.028331 | 0.111356 |
| 4.500000 | 0.304901 | 1.053621 | 0.120961 |
| 4.583333 | 0.307770 | 1.079149 | 0.127462 |
| 4.666667 | 0.310652 | 1.104916 | 0.132838 |
| 4.750000 | 0.313547 | 1.130925 | 0.137576 |
| 4.833333 | 0.316456 | 1.157175 | 0.141887 |
| 4.916667 | 0.319378 | 1.183668 | 0.145884 |
| 5.000000 | 0.322314 | 1.210405 | 0.149638 |
| 5.083333 | 0.325263 | 1.237387 | 0.157995 |
| 5.166667 | 0.328225 | 1.264616 | 0.181059 |
| 5.250000 | 0.331201 | 1.292092 | 0.194117 |
| 5.333333 | 0.334190 | 1.319817 | 0.204821 |
| 5.416667 | 0.337193 | 1.347791 | 0.214247 |
| 5.500000 | 0.340209 | 1.376016 | 0.222828 |
| 5.583333 | 0.343238 | 1.404493 | 0.230789 |
| 5.666667 | 0.346281 | 1.433223 | 0.238268 |
| 5.750000 | 0.349337 | 1.462207 | 0.245355 |
| 5.833333 | 0.352407 | 1.491447 | 0.252116 |
| 5.916667 | 0.355490 | 1.520942 | 0.258598 |
| 6.000000 | 0.358586 | 1.550695 | 0.264837 |
| 6.083333 | 0.361696 | 1.580707 | 0.270863 |
| 6.166667 | 0.364819 | 1.610979 | 0.276699 |
| 6.250000 | 0.367955 | 1.641511 | 0.282365 |
| 6.333333 | 0.371105 | 1.672305 | 0.287875 |
| 6.416667 | 0.374268 | 1.703362 | 0.293245 |
| 6.500000 | 0.377445 | 1.734684 | 0.298484 |
| 6.583333 | 0.380635 | 1.766270 | 0.557896 |
| 6.666667 | 0.383838 | 1.798123 | 1.012045 |
| 6.750000 | 0.387055 | 1.830244 | 1.531075 |
| 6.833333 | 0.390285 | 1.862633 | 2.001798 |
| 6.916667 | 0.393529 | 1.895292 | 2.336133 |
| 7.000000 | 0.396786 | 1.928222 | 2.531019 |

```
  7.083333  0.400056  1.961424  2.737808
  7.166667  0.403340  1.994898  2.908380
  7.250000  0.406637  2.028647  3.068785
  7.333333  0.409948  2.062672  3.220671
  7.416667  0.413272  2.096973  3.365281
  7.500000  0.416609  2.131551  3.503584
  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    0.8            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    0.8            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
END EXT TARGETS

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

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

  MASS-LINK        5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

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

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

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

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


END MASS-LINK

END RUN
```

## *Predeveloped HSPF Message File*

## *Mitigated HSPF Message File*

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