PRELIMINARY HYDROMODIFICATION MANAGEMENT STUDY

Brightwater Ranch

County of San Diego, CA

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1. INTRODUCTION

This Preliminary Hydromodification Management Study has been prepared in support of a Tentative Map submittal for the Brightwater Ranch project, which is located in the unincorporated area within the County of San Diego, California near Los Coches Road. The project's name was formerly known as Los Coches during previous entitlement work. This report is a companion report to the following project technical studies:

- CEQA Preliminary Drainage Study, prepared by Project Design Consultants
- Preliminary Storm Water Management Plan, prepared by Project Design Consultants
- Project Downstream Channel SCCWRP Analysis, prepared by Chang Consultants, entitled "Hydromodification Screening for Brightwater Ranch."

The purpose of this report is to document the project's compliance with the County's Final Hydromodification Management Plan (HMP). The stated purpose of the final hydromodification requirements is "...to manage increases in runoff discharge rates and durations from all Priority Development Projects, where such increased rates and durations are likely to cause increased erosion of channel beds and banks, sediment pollutant generation, or other impacts to beneficial uses and stream habitat due to increased erosive force" (County Final HMP, page ES-1). Flow duration control is the most common form of hydromodification management. Unless a project meets an exemption or is granted prior lawful approval, the County Hydromodification Management Plan (HMP) requires that all priority projects comply with the HMP. Since the project does not qualify for an exemption, the project is required to address the applicability of Final HMP requirements.

2. PROJECT DESCRIPTION

The project is located in the unincorporated area of the County of San Diego (County) and is approximately 0.3 miles west of business route 8, and 0.4 mile south of Los Coches Road. The project is bounded by 1) undeveloped area to the northwest, 2) an existing subdivision to the north, 3) a mobile home park to the south, and 4) a future development named Jackson Ridge to the east. See Vicinity Map, Figure 1, for the project location. Note that at the time of the preparation of this report, the mass grading plans for Jackson Ridge are being processed by Hunsaker and Associates through the County, and therefore it is assumed that Jackson Ridge would be constructed prior to Brightwater Ranch.

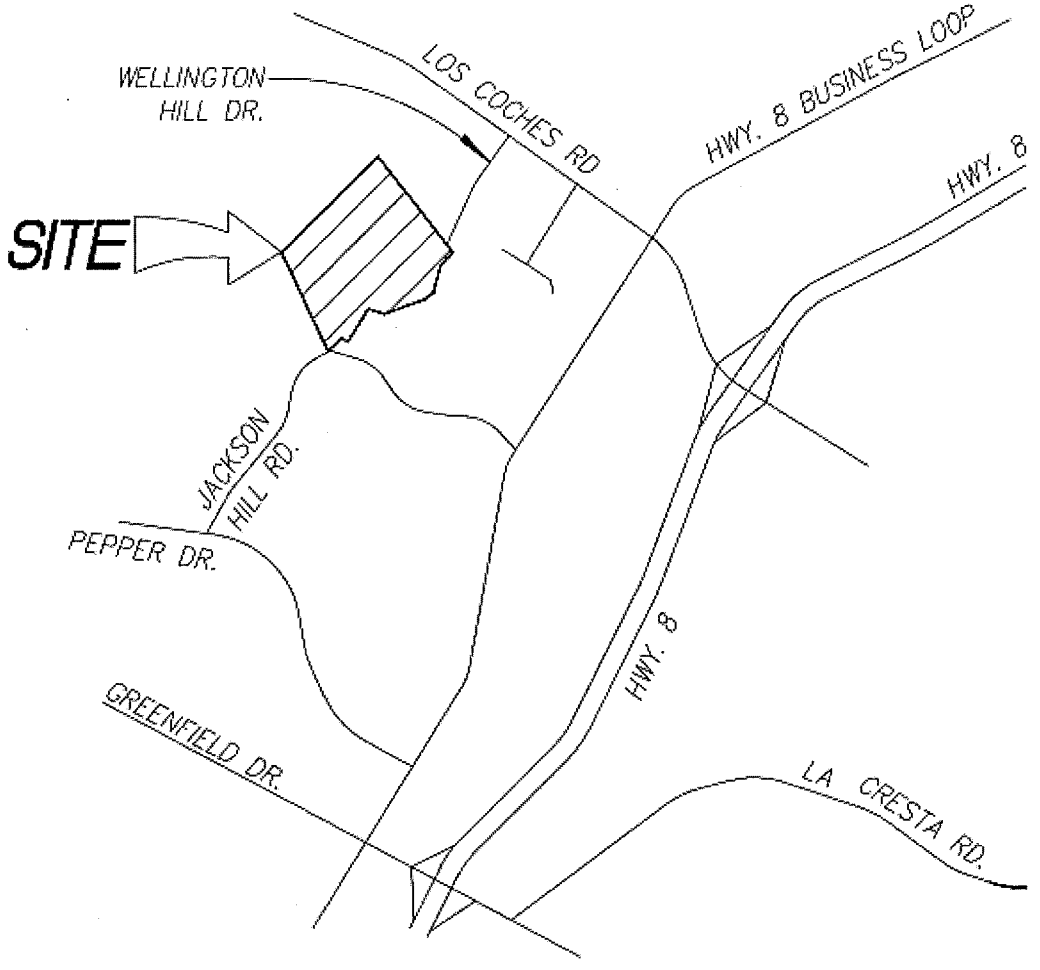


Figure 1: Project Vicinity Map

In general, the project when developed will consist of 66 single-family lots of 10,000 to 36,000 square feet, open space, and public right of way for streets, access easements, and necessary utility easements. The existing drainage pattern of the project flows in a northeasterly direction to two main concentration points at the northeast edge of the project (existing Foxborough Lane and Wellington Hill Drive storm drain systems). The majority of the project's runoff drains to the Wellington Hill Drive storm drain, and a water quality/hydromodification basin is proposed upstream of the connection into the existing Wellington Hill Drive storm drain to mitigate the increased flows and durations from project development.

The project site currently consists of mostly undeveloped land. Offsite areas that contribute runon to the site include a portion of the adjacent mobile home park. Slopes vary from flat to steep and cover is mostly brush with some areas of dense trees. Generally the site consists of steeply sloping terrain. Most of the project drains in an easterly direction towards the existing subdivision to the east.

3. HYDROMODIFICATION MANAGEMENT APPROACH

The project will comply with final hydromodification requirements through flow control management for the portions of the project that require hydromodification mitigation. There are two main points of connection for the storm drain system for the project, and one small minor discharge point in the southwest corner. (A small portion of the southwest corner drains to an existing brow ditch). For the two main discharge points, the northerly pipe is a 30" cast in place concrete pipe within Foxborough Lane and the southerly pipe is a 30" cast in place concrete pipe within Wellington Hill Drive. These two pipes confluence together downstream and discharge into a vegetated channel north of the Burkshire Place cul-de-sac. From there, the regional drainage is conveyed to the upstream end of the improved Los Coches Creek channel approximately 1500 feet downstream. Los Coches Creek eventually drains to the San Diego River. Although the San Diego River is an exempt water body per the County HMP, the project discharge location is not fully lined and/or hardened all the way to the exempt water body, and hence the project is not exempt from hydromodification requirements.

Each of the project discharge locations and their respective drainage areas were reviewed to determine the most appropriate hydromodification management approach on a drainage area by drainage area basis. Because the majority of the site drains to two main outfalls in the existing condition, there were three options to consider for hydromodification management: 1) provide detention at each outfall prior to discharge, 2) provide detention at one outfall and over-detain for the bypass drainage area, or 3) consolidate the outfalls into one outfall. Options 1 and 3 were determined to be undesirable from a site planning perspective, so Option 2 was selected as the hydromodification approach. Because the developed portion of the project draining to the northerly discharge point (Foxborough Lane) was relatively small, it was determined that one hydromodification management facility (basin) would be designed for the southerly discharge location and the northerly basin would be modeled as a bypass basin for the drainage area. Therefore, for this project, there will be one point of compliance (POC) for the hydromodification analysis for the two westerly discharge points (POC #1). POC #2 represents the runoff from the portion of the water easement access road that drains to the existing brown ditch near the southwest corner of the site. Other minor discharge locations surrounding the site are included in the drainage report analysis, but do not require hydromodification analysis because their respective drainage areas do not include any significant proposed impervious areas, and therefore, no hydromodification mitigation is required for those outfalls.

The proposed subdivision is proposed to be located in the flatter areas of the site so that the steeper hillsides upstream of the development are preserved. The storm drain system for the project was designed so that a portion of the hillside areas bypass the proposed hydromodification basin, because they will remain undeveloped and therefore do not need to be commingled for treatment purposes or flow attenuation.

The following is a summary of the major drainage discharge locations within the project. POC 1 includes the majority of the site drainage and drains to the Wellington Hill Drive storm drain system. The drainage area includes a portion of runon from the adjacent mobile home park located to the south of the project. The developed portion of the Foxborough Lane drainage area is modeled as a "bypass area," meaning that the discharge is not routed through a flow-duration control detention facility. In other words, the minor amount of net increase in impervious

surface at POC 1 is adequately mitigated in the basin upstream such that the combined discharge is in compliance with the hydromodification flow-duration requirements.

3.1 Basin Modeling Assumptions

This study identifies one hydromodification management detention basin needed to mitigate the increased rates and durations of stormwater runoff from the main part of the project (POC #1). A small bioretention area was sized for the portion of the water easement access road that drains to the southwest corner of the site (POC #2). This Preliminary Hydromodification Management Study identifies a conservative estimate for the basin sizes and the report will be revised and updated as the design of the project continues to evolve through final design. The proposed hydromodification management basin (POC #1) has been modeled conservatively with no infiltration into native soils. Note that during final engineering, the model may be updated to reflect more refined geotechnical assessment information if applicable.

3.3 Flow Duration Control

The proposed project will comply with the HMP flow control duration criteria through the construction of one onsite hydromodification management basin (POC #1) and one small bioretention area (POC #2). The Final HMP requires that post-project runoff flows and durations comply with the following flow duration criteria:

- For flow rates between the pre-project low flow threshold and the pre-project 10-year event, the post-project discharge rates and durations may not deviate above the pre-project rates and durations by more than 10% over more than 10% of the length of the flow duration curve.

The low-flow threshold used in the analysis for Brightwater Ranch is the 0.5Q2 low-flow threshold for POC #1, as determined by the project geomorphic channel assessment analysis performed by Chang Consultants. (For POC #2, that area was not included in the project geomorphic channel assessment analysis, and therefore, the default 0.1Q2 threshold was used). The San Diego Hydrology Model (SDHM, dated September 13, 2012) was used for the

continuous simulation modeling to determine the minimum required hydromodification management volumes for each proposed hydromodification management basin.

3.4 Dual Purpose for Water Quality Treatment

It is anticipated that the hydromodification management basin (POC #1) and the bioretention area (POC #2) may also fulfill water quality requirements. Therefore, the basin will be dual purpose to achieve the flow-duration requirements set forth in the County HMP, and will also address the stormwater quality treatment criteria set forth in the MS4 Permit as a regional post-construction treatment BMP for the developed area. For more information on the treatment control aspect of the proposed hydromodification/water quality basins, refer to the project Preliminary Storm Water Management Plan.

4. METHODOLOGY FOR HYDROMODIFICATION ANALYSIS

The hydromodification analysis includes continuous simulation of hourly rainfall, evaporation, infiltration, depression storage, and runoff for the entire continuous rainfall record using SDHM. Note that since the time step of the data is hourly, the calculated rainfall flow rates are extremely low and are not comparable to any sort of synthetic hydrology model such as the Rational Method. The rainfall gauge data selected for this project is the Flinn Springs gauge, which represents the project appropriately based on isopluvial and precipitation zone characteristics and has hourly data for the period of record of 1963 to 2008. The Flinn Springs rain gauge is close to the site, is close to the same elevation, and, after reviewing the Flinn Springs rain gauge data set, Project Design Consultants determined it to be the most appropriate data set to use for the project. County staff confirmed the approval of the rain gauge selection with an email to PDC dated August 12, 2013. SDHM uses the Hydrologic Simulation Program Fortran (HSPF) software as its computational engine to run rainfall-runoff algorithms. Input values into the model include the soil type, slope, land cover, drainage management areas, and rainfall data. Based on the output from the continuous simulation over the entire rainfall record, the program computes a flow duration curve for each point of compliance (POC) and compares the pre-project and post-project flow duration curves to the criteria established in the HMP. The low-

flow and upper-flow thresholds are determined internally by the SDHM program using partial duration statistics. Partial duration statistics are required to estimate the statistics appropriately, since statistics based on peak annual series are inappropriate for estimating values for frequent return intervals such as the 2-year return period. Table 1 below summarizes the input data for the continuous simulation model.

Table 1. Continuous Simulation Model Input Parameters

Total Drainage Area	43.03 acres POC #1 (with 6.16 ac bypass), 2.52 acres POC #2
Pre-project land cover	Soil Type B and C. Slope ranges from Flat to Steep, Grass Cover, with some impervious areas (for example, the existing imperviousness in the runon area of the adjacent mobile home park). For specifics of the pre-project land cover, refer to tabular summary in Appendix 1 and Pre-project land cover exhibit.
Post-project land cover	Soil Type B and C. Slope ranges from Flat to Steep, Grass Cover and impervious areas. Refer to tabular summary in Appendix 1 and Post-project land cover exhibit.
Rainfall Gage	Flinn Springs
Low Flow Threshold	0.5Q2 low-flow threshold for POC #1, based on SCCWRP Analysis & SDHM partial duration statistics. 0.1Q2 low-flow threshold for POC #2, based on default value assumption & SDHM partial duration statistics
Upper Flow Threshold	Q10 based on SDHM partial duration statistics

4.1 Soil Type Analysis

Based on the NRCS soil data maps in Appendix 3, the soils within the entire onsite project area are characterized as Hydrologic Soil Type B and C. The majority of the site's soils are Soil Type B. Type B soils have moderate infiltration rates.

4.2 Land Cover and Slope Analysis

The input values for the SDHM model were developed by breaking the drainage area to the POC into discrete drainage management areas (DMAs). The drainage areas of the model were separated into discrete areas with uniform cover properties for modeling purposes within SDHM. All pervious areas were modeled with grass cover. All pervious areas were categorized into

slope categories of flat (0-5%), moderate (5-10%), or steep (greater than 10%). For the pre-project condition, a slope analysis was performed on the pre-project topography using GIS to separate the drainage areas into the various slope categories. For the post-project condition, the land cover analysis was performed on the post-project topography. The level of imperviousness was estimated based on the imperviousness value used in the hydrologic modeling for each subarea, in order to be consistent with the impervious values used in the Drainage Study. Future refinements of the site plan during final engineering may warrant refinements to the input data used in the SDHM model.

The modeling elements used for this project and available in SDHM include the following options:

- Standard drainage basin: Used to model either impervious or pervious areas that drain directly to a hydromodification management facility or POC.
- Bypass drainage basin: Used to model either impervious or pervious areas that bypass a hydromodification management facility and drain directly to the POC.

Refer to the pre-project and post-project HMP Exhibits in Appendix 5 for the area and location of the DMAs. The DMAs that bypass the hydromodification management basins (those areas draining directly to the stream without detention) were modeled as bypass basins.

4.3 Basin Stage-Volume-Discharge Modeling

For the SDHM model (POC#1), the basin was modeled with a composite outlet structure and the preliminary stage-volume relationship based on the current grading design with no infiltration. The stage/area/volume/discharge relationship was calculated with PondPack and then input into SDHM with an SSD table to model the preliminary design for the outlet structure. This procedure was selected in order to model both the water quality and hydromodification mitigation requirements and to accurately represent the bottom stages of the basin for accurate low-flow orifice sizing. For the SDHM model for POC #2, the SDHM bioretention modeling tool was used.

5. HYDROMODIFICATION ANALYSIS RESULTS

The SDHM models for the basin (POC1-0.5Q2.whm) and the bioretention area (POC2-0.1Q2.whm), represents the proposed site plan for the hydromodification analysis included for this study. Based on the selected basin outlet configurations and basin elevation-volume relationship, the flow-duration requirements are satisfied with the proposed design. During final engineering, further refinements to the design will be required to support the final construction drawings.

Table 2. Summary of Proposed Hydromodification Management BMPs

Hydromodification Control	Location & Description	Modeled Size
Hydromodification/Water Quality Basin (POC #1)	Large basin upstream of Wellington Hill Drive	2.2 AF, modeled based on contours (stage/volume curve from plans)
Hydromodification/Water Quality Bioretention Area (POC #2)	Small bioretention area in southwest corner of project that treats runoff from a portion of the water easement access road.	998 SF

5.1 Drawdown Calculations

Per Section 6.4.6 of the County HMP, the minimum drawdown time to comply with Department of Environmental Health (DEH) guidelines is 96 hours. This standard has been set to minimize mosquito habitat and reduce the public health risk for West Nile Virus. This project complies with the DEH guidelines and, therefore, a separate vector control maintenance plan is not required. The basin drawdown calculations are summarized in the results summary table in Appendix 2, and indicate that each of the drawdown times for the basin is less than the 96 hour time limit.

6. CONCLUSION

This Preliminary Hydromodification Management report documents how the proposed project design complies with the new requirements presented in the County's Final HMP. The report and analysis presented herein supports the preliminary design of the storm drain improvements and hydromodification management facilities for the Tentative Map for the Brightwater Ranch project. The results indicate that the proposed hydromodification management basin (POC #1) and bioretention area (POC #2) mitigates for increased flows and durations per the criteria set forth in the County HMP. In addition, the facilities satisfy the DEH drawdown guidelines for vector control.

APPENDIX 1

Input Summary Tables

Pre-Project Hydromodification Report

Jan 29, 2015

Basin	Soil	Slope_Cover	SqFt	Acres
Bypass				
	B			
		Flat	1,138	0.03
		Moderate	15,838	0.36
		Steep	218,833	5.02
	C			
		Flat	11,637	0.27
		Moderate	6,901	0.16
		Steep	14,148	0.32
Detention basin				
	B			
		Flat	85,962	1.97
		Impervious	141,912	3.26
		Moderate	61,183	1.4
		Steep	1,030,553	24.66
	C			
		Flat	17,550	0.4
		Impervious	15,925	0.37
		Moderate	191,507	4.4
		Steep	286,141	6.57
Bioretention Area				
	B			
		Flat	435	0.01
		Moderate	872	0.02
		Steep	108,464	2.49

Post-Project Hydromodification Report

Jan 29, 2015

Basin	Soil	Slope_Cover	SUM_SqFt	SUM_Acres
Bypass				
	B			
		Flat	70,657	1.62
		Impervious	90,820	2.08
		Moderate	7,526	0.17
		Steep	66,805	1.53
	C			
		Flat	4,196	0.1
		Impervious	2,119	0.05
		Moderate	1,475	0.03
		Steep	24,896	0.57
Detention basin				
	B			
		Flat	190,977	4.38
		Impervious	267,686	6.15
		Moderate	36,669	0.84
		Steep	872,628	20.03
	C			
		Flat	157,720	3.62
		Impervious	221,248	5.08
		Moderate	14,245	0.33
		Steep	113,119	2.60
Bioretention Area				
	B			
		Flat	435	0.01
		Impervious	90,820	0.13
		Moderate	872	0.02
		Steep	102,802	2.36

APPENDIX 2

Results Summary Table & SDHM Output

Input Data SDHM - Brighwater Ranch - Preliminary Sizing

WQ 85th Percentile depth= 0.7

SDHM RESULTS

Results-Basin #1, modeled with SSD table - Flinn Springs - 0.5Q2

	Total Drainage Area to Basin (not including bypass) (ac)	Impervious Area Draining to Basin (ac)	C(WQ)	WQ Volume (AF)	Basin Volume (AF)	LFT (cfs)	WQ Volume Drawdown (hours)
1	43.03	11.23	0.3	0.84	2.3	2.68	25

SDHM

PROJECT REPORT

General Model Information

Project Name:	POC1-0.5Q2
Site Name:	Brightwater Ranch
Site Address:	
City:	
Report Date:	1/29/2015
Gage:	FLINN SP
Data Start:	10/01/1963
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.00
Version:	2013/04/05

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data
Predeveloped Land Use

Pre-project

Bypass: No

GroundWater: No

Pervious Land Use	Acres
B,Grass,FLAT(0-5%)	1.97
B,Grass,MOD(5-10%)	1.4
B,Grass,STEEP(10-20	24.66
C,Grass,FLAT(0-5%)	0.4
C,Grass,MOD(5-10%)	4.4
C,Grass,STEEP(10-20	6.57
Pervious Total	39.4

Impervious Land Use	Acres
IMPERVIOUS	3.63
Impervious Total	3.63
Basin Total	43.03

Element Flows To:

Surface	Interflow	Groundwater

BYPASS

Bypass:	No
GroundWater:	No

Pervious Land Use	Acres
B,Grass,FLAT(0-5%)	0.03
B,Grass,MOD(5-10%)	0.36
B,Grass,STEEP(10-20	5.02
C,Grass,FLAT(0-5%)	0.27
C,Grass,MOD(5-10%)	0.16
C,Grass,STEEP(10-20	0.32
Pervious Total	6.16

Impervious Land Use	Acres
Impervious Total	0
Basin Total	6.16

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

to basin

Bypass: No

GroundWater: No

Pervious Land Use	Acres
B,Grass,STEEP(10-20	20.03
B,Grass,FLAT(0-5%)	4.38
B,Grass,MOD(5-10%)	0.84
C,Grass,FLAT(0-5%)	3.62
C,Grass,MOD(5-10%)	0.33
C,Grass,STEEP(10-20	2.6
Pervious Total	31.8

Impervious Land Use	Acres
IMPERVIOUS	11.23
Impervious Total	11.23
Basin Total	43.03

Element Flows To:

Surface	Interflow	Groundwater
SSD Table 1	SSD Table 1	

bypass

Bypass: Yes

GroundWater: No

Pervious Land Use	Acres
B,Grass,STEEP(10-20	1.53
B,Grass,FLAT(0-5%)	1.62
B,Grass,MOD(5-10%)	0.17
C,Grass,FLAT(0-5%)	0.1
C,Grass,MOD(5-10%)	0.03
C,Grass,STEEP(10-20	0.57
Pervious Total	4.02

Impervious Land Use	Acres
IMPERVIOUS	2.13
Impervious Total	2.13

Basin Total 6.15

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Routing

SSD Table 1

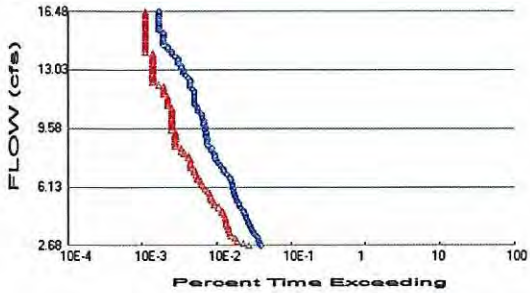
Depth: 8 ft.
Element Flows To:
Outlet 1 Outlet 2

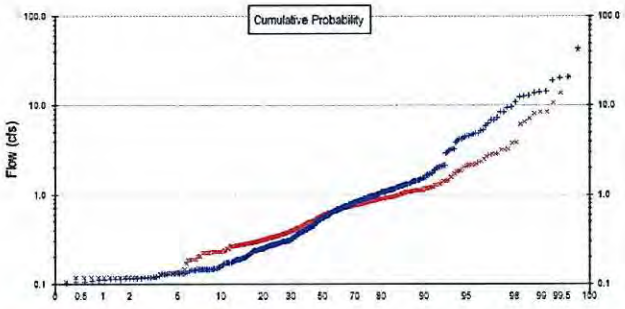
SSD Table Hydraulic Table

Stage (ft)	Area (ac)	Volume (ac-ft)	Manual	Manual	NotUsed	NotUsed	NotUsed
0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.300	0.008	0.001	0.110	0.000	0.000	0.000	0.000
0.400	0.014	0.002	0.140	0.000	0.000	0.000	0.000
0.500	0.020	0.004	0.160	0.000	0.000	0.000	0.000
0.600	0.028	0.006	0.180	0.000	0.000	0.000	0.000
0.700	0.037	0.009	0.200	0.000	0.000	0.000	0.000
0.800	0.047	0.014	0.220	0.000	0.000	0.000	0.000
0.900	0.059	0.019	0.230	0.000	0.000	0.000	0.000
1.000	0.072	0.025	0.250	0.000	0.000	0.000	0.000
1.100	0.086	0.033	0.260	0.000	0.000	0.000	0.000
1.200	0.102	0.043	0.270	0.000	0.000	0.000	0.000
1.300	0.119	0.054	0.290	0.000	0.000	0.000	0.000
1.400	0.137	0.067	0.300	0.000	0.000	0.000	0.000
1.500	0.156	0.081	0.310	0.000	0.000	0.000	0.000
1.600	0.177	0.098	0.320	0.000	0.000	0.000	0.000
1.700	0.199	0.117	0.330	0.000	0.000	0.000	0.000
1.800	0.222	0.138	0.340	0.000	0.000	0.000	0.000
1.900	0.247	0.161	0.350	0.000	0.000	0.000	0.000
2.000	0.272	0.187	0.360	0.000	0.000	0.000	0.000
2.100	0.275	0.214	0.370	0.000	0.000	0.000	0.000
2.200	0.277	0.242	0.380	0.000	0.000	0.000	0.000
2.300	0.279	0.270	0.390	0.000	0.000	0.000	0.000
2.400	0.282	0.298	0.400	0.000	0.000	0.000	0.000
2.500	0.284	0.326	0.410	0.000	0.000	0.000	0.000
2.600	0.287	0.355	0.420	0.000	0.000	0.000	0.000
2.700	0.289	0.383	0.420	0.000	0.000	0.000	0.000
2.800	0.291	0.413	0.430	0.000	0.000	0.000	0.000
2.900	0.294	0.442	0.440	0.000	0.000	0.000	0.000
3.000	0.296	0.471	0.450	0.000	0.000	0.000	0.000
3.100	0.299	0.501	0.460	0.000	0.000	0.000	0.000
3.200	0.301	0.531	0.460	0.000	0.000	0.000	0.000
3.300	0.304	0.561	0.470	0.000	0.000	0.000	0.000
3.400	0.306	0.592	0.480	0.000	0.000	0.000	0.000
3.500	0.309	0.623	0.480	0.000	0.000	0.000	0.000
3.600	0.311	0.654	0.490	0.000	0.000	0.000	0.000
3.700	0.314	0.685	0.500	0.000	0.000	0.000	0.000
3.800	0.316	0.716	0.510	0.000	0.000	0.000	0.000
3.900	0.319	0.748	0.510	0.000	0.000	0.000	0.000
4.000	0.321	0.780	0.520	0.000	0.000	0.000	0.000
4.100	0.324	0.812	0.570	0.000	0.000	0.000	0.000
4.200	0.326	0.845	0.690	0.000	0.000	0.000	0.000
4.300	0.329	0.878	0.870	0.000	0.000	0.000	0.000
4.400	0.331	0.911	1.090	0.000	0.000	0.000	0.000
4.500	0.334	0.944	1.340	0.000	0.000	0.000	0.000
4.600	0.336	0.977	1.480	0.000	0.000	0.000	0.000

4.700	0.339	1.011	1.590	0.000	0.000	0.000	0.000
4.800	0.341	1.045	1.700	0.000	0.000	0.000	0.000
4.900	0.344	1.079	1.800	0.000	0.000	0.000	0.000
5.000	0.347	1.114	1.890	0.000	0.000	0.000	0.000
5.100	0.349	1.149	1.970	0.000	0.000	0.000	0.000
5.200	0.352	1.184	2.050	0.000	0.000	0.000	0.000
5.300	0.354	1.219	2.130	0.000	0.000	0.000	0.000
5.400	0.357	1.255	2.210	0.000	0.000	0.000	0.000
5.500	0.360	1.290	2.280	0.000	0.000	0.000	0.000
5.600	0.362	1.327	2.350	0.000	0.000	0.000	0.000
5.700	0.365	1.363	2.410	0.000	0.000	0.000	0.000
5.800	0.367	1.399	2.480	0.000	0.000	0.000	0.000
5.900	0.370	1.436	2.540	0.000	0.000	0.000	0.000
6.000	0.373	1.473	2.600	0.000	0.000	0.000	0.000
6.100	0.375	1.511	4.150	0.000	0.000	0.000	0.000
6.200	0.378	1.549	6.930	0.000	0.000	0.000	0.000
6.300	0.381	1.586	10.52	0.000	0.000	0.000	0.000
6.400	0.383	1.625	14.75	0.000	0.000	0.000	0.000
6.500	0.386	1.663	19.55	0.000	0.000	0.000	0.000
6.600	0.388	1.702	24.84	0.000	0.000	0.000	0.000
6.700	0.391	1.741	30.59	0.000	0.000	0.000	0.000
6.800	0.394	1.780	36.76	0.000	0.000	0.000	0.000
6.900	0.396	1.820	43.33	0.000	0.000	0.000	0.000
7.000	0.399	1.859	50.27	0.000	0.000	0.000	0.000
7.100	0.402	1.899	57.56	0.000	0.000	0.000	0.000
7.200	0.405	1.940	65.19	0.000	0.000	0.000	0.000
7.300	0.407	1.980	73.14	0.000	0.000	0.000	0.000
7.400	0.410	2.021	81.40	0.000	0.000	0.000	0.000
7.500	0.413	2.062	89.96	0.000	0.000	0.000	0.000
7.600	0.416	2.104	98.80	0.000	0.000	0.000	0.000
7.700	0.418	2.145	107.9	0.000	0.000	0.000	0.000
7.800	0.421	2.187	117.3	0.000	0.000	0.000	0.000
7.900	0.424	2.230	127.0	0.000	0.000	0.000	0.000
8.000	0.427	2.272	136.9	0.000	0.000	0.000	0.000

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 45.56
Total Impervious Area: 3.63

Mitigated Landuse Totals for POC #1
Total Pervious Area: 35.82
Total Impervious Area: 13.36

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	5.358691
5 year	12.826244
10 year	16.482671
25 year	20.778947

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	2.513335
5 year	6.778923
10 year	9.464903
25 year	20.557894

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
2.6793	140	97	69	Pass
2.8188	137	81	59	Pass
2.9582	132	68	51	Pass
3.0976	129	63	48	Pass
3.2371	123	56	45	Pass
3.3765	114	54	47	Pass
3.5159	110	53	48	Pass
3.6553	105	52	49	Pass
3.7948	101	51	50	Pass
3.9342	98	48	48	Pass
4.0736	94	48	51	Pass
4.2130	91	48	52	Pass
4.3525	88	47	53	Pass
4.4919	87	45	51	Pass
4.6313	83	42	50	Pass
4.7708	81	42	51	Pass
4.9102	75	38	50	Pass
5.0496	72	33	45	Pass
5.1890	70	33	47	Pass
5.3285	67	31	46	Pass
5.4679	65	30	46	Pass
5.6073	63	30	47	Pass
5.7468	61	29	47	Pass
5.8862	60	27	45	Pass
6.0256	59	25	42	Pass
6.1650	58	24	41	Pass
6.3045	58	23	39	Pass
6.4439	56	22	39	Pass
6.5833	55	20	36	Pass
6.7227	53	20	37	Pass
6.8622	50	19	38	Pass
7.0016	45	18	40	Pass
7.1410	44	18	40	Pass
7.2805	42	16	38	Pass
7.4199	40	16	40	Pass
7.5593	37	16	43	Pass
7.6987	35	16	45	Pass
7.8382	34	15	44	Pass
7.9776	34	15	44	Pass
8.1170	33	13	39	Pass
8.2564	31	12	38	Pass
8.3959	31	12	38	Pass
8.5353	28	10	35	Pass
8.6747	27	10	37	Pass
8.8142	27	10	37	Pass
8.9536	27	10	37	Pass
9.0930	26	10	38	Pass
9.2324	26	10	38	Pass
9.3719	26	10	38	Pass
9.5113	25	9	36	Pass
9.6507	25	9	36	Pass
9.7901	24	9	37	Pass
9.9296	24	9	37	Pass

10.0690	24	9	37	Pass
10.2084	23	9	39	Pass
10.3479	23	9	39	Pass
10.4873	22	9	40	Pass
10.6267	20	9	45	Pass
10.7661	20	9	45	Pass
10.9056	19	8	42	Pass
11.0450	18	8	44	Pass
11.1844	18	8	44	Pass
11.3239	18	8	44	Pass
11.4633	18	8	44	Pass
11.6027	18	7	38	Pass
11.7421	18	7	38	Pass
11.8816	17	7	41	Pass
12.0210	16	7	43	Pass
12.1604	16	6	37	Pass
12.2998	16	5	31	Pass
12.4393	16	5	31	Pass
12.5787	15	5	33	Pass
12.7181	14	5	35	Pass
12.8576	13	5	38	Pass
12.9970	13	5	38	Pass
13.1364	12	5	41	Pass
13.2758	12	5	41	Pass
13.4153	11	5	45	Pass
13.5547	11	5	45	Pass
13.6941	11	5	45	Pass
13.8335	10	5	50	Pass
13.9730	9	5	55	Pass
14.1124	9	4	44	Pass
14.2518	8	4	50	Pass
14.3913	8	4	50	Pass
14.5307	7	4	57	Pass
14.6701	7	4	57	Pass
14.8095	7	4	57	Pass
14.9490	7	4	57	Pass
15.0884	7	4	57	Pass
15.2278	7	4	57	Pass
15.3673	6	4	66	Pass
15.5067	6	4	66	Pass
15.6461	6	4	66	Pass
15.7855	6	4	66	Pass
15.9250	6	4	66	Pass
16.0644	6	4	66	Pass
16.2038	6	4	66	Pass
16.3432	6	4	66	Pass
16.4827	6	4	66	Pass

Model Default Modifications

Total of 0 changes have been made.

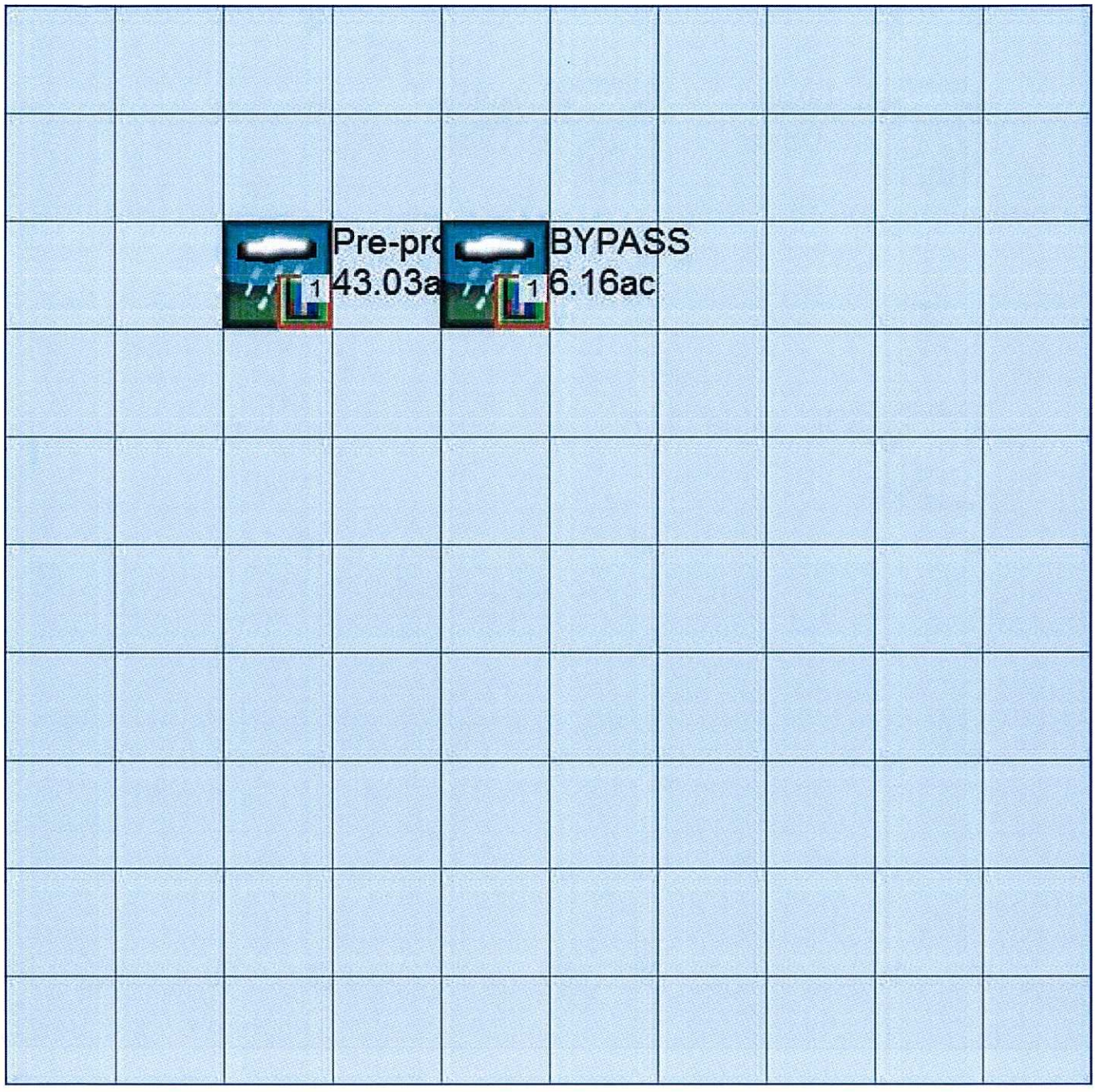
PERLND Changes

No PERLND changes have been made.

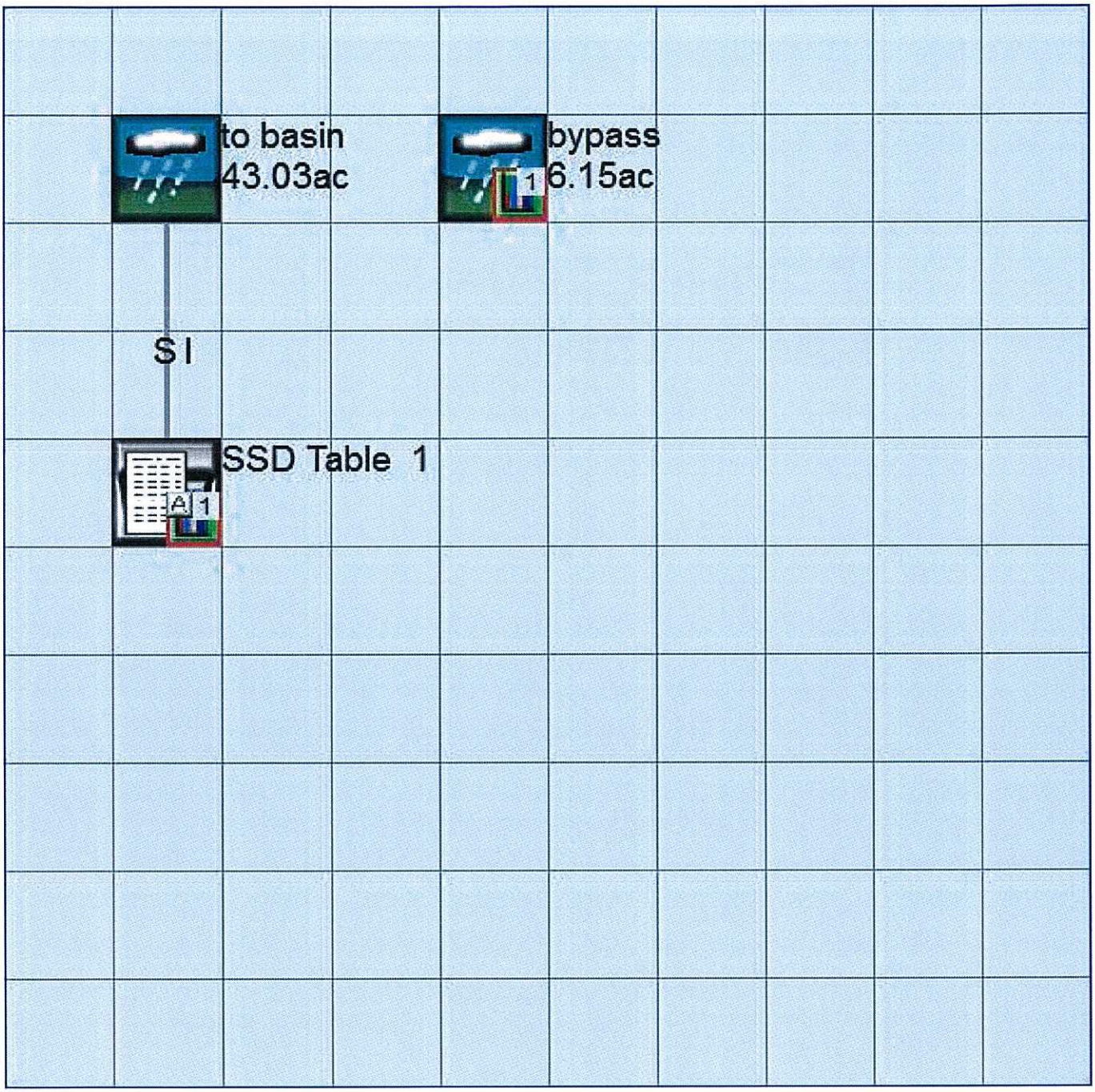
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic



Mitigated Schematic



```
RUN

GLOBAL
  WWHM4 model simulation
  START       1963 10 01        END    2004 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   POC1-0.5Q2.wdm
MESSU       25   PrePOC1-0.5Q2.MES
            27   PrePOC1-0.5Q2.L61
            28   PrePOC1-0.5Q2.L62
            30   POCPOC1-0.5Q21.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND       10
      PERLND       11
      PERLND       12
      PERLND       19
      PERLND       20
      PERLND       21
      IMPLND        1
      COPY        501
      DISPLY        1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Pre-project                 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             ***
   10       B,Grass,FLAT(0-5%)      1    1    1    1   27    0
   11       B,Grass,MOD(5-10%)      1    1    1    1   27    0
   12       B,Grass,STEEP(10-20     1    1    1    1   27    0
   19       C,Grass,FLAT(0-5%)      1    1    1    1   27    0
   20       C,Grass,MOD(5-10%)      1    1    1    1   27    0
   21       C,Grass,STEEP(10-20     1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
```

```
  20        0.4   0.4   0.4   0.4   0.6   0.6   0.6   0.6   0.6   0.4   0.4   0.4
  21        0.4   0.4   0.4   0.4   0.6   0.6   0.6   0.6   0.6   0.4   0.4   0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >       PWATER input info: Part 3          ***
    # -   #  JAN   FEB   MAR   APR   MAY   JUN   JUL   AUG   SEP   OCT   NOV   DEC  ***
   10        0.1   0.1   0.1   0.1 0.06  0.06  0.06  0.06  0.06   0.1   0.1   0.1
   11        0.1   0.1   0.1   0.1 0.06  0.06  0.06  0.06  0.06   0.1   0.1   0.1
   12        0.1   0.1   0.1   0.1 0.06  0.06  0.06  0.06  0.06   0.1   0.1   0.1
   19        0.1   0.1   0.1   0.1 0.06  0.06  0.06  0.06  0.06   0.1   0.1   0.1
   20        0.1   0.1   0.1   0.1 0.06  0.06  0.06  0.06  0.06   0.1   0.1   0.1
   21        0.1   0.1   0.1   0.1 0.06  0.06  0.06  0.06  0.06   0.1   0.1   0.1
  END MON-INTERCEP

  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
   10              0         0      0.15          0         4       0.05          0
   11              0         0      0.15          0         4       0.05          0
   12              0         0      0.15          0         4       0.05          0
   19              0         0      0.15          0         4       0.05          0
   20              0         0      0.15          0         4       0.05          0
   21              0         0      0.15          0         4       0.05          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name-------->   Unit-systems   Printer ***
    # -   #                     User  t-series Engl Metr ***
                                      in  out             ***
    1      IMPERVIOUS               1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL     *********
    1         0    0    6    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -   # CSNO RTOP  VRS  VNN RTLI      ***
    1         0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >       IWATER input info: Part 2          ***
    # -   # ***  LSUR      SLSUR      NSUR      RETSC
    1             100      0.035      0.05        0.1
  END IWAT-PARM2

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

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

```
    1              0          0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                    <--Area-->      <-Target->   MBLK    ***
<Name>   #                    <-factor->      <Name>   #   Tbl#    ***
Pre-project***
PERLND  10                         1.97      COPY   501      12
PERLND  10                         1.97      COPY   501      13
PERLND  11                          1.4      COPY   501      12
PERLND  11                          1.4      COPY   501      13
PERLND  12                        24.66      COPY   501      12
PERLND  12                        24.66      COPY   501      13
PERLND  19                          0.4      COPY   501      12
PERLND  19                          0.4      COPY   501      13
PERLND  20                          4.4      COPY   501      12
PERLND  20                          4.4      COPY   501      13
PERLND  21                         6.57      COPY   501      12
PERLND  21                         6.57      COPY   501      13
IMPLND   1                         3.63      COPY   501      15
BYPASS***
PERLND  10                         0.03      COPY   501      12
PERLND  10                         0.03      COPY   501      13
PERLND  11                         0.36      COPY   501      12
PERLND  11                         0.36      COPY   501      13
PERLND  12                         5.02      COPY   501      12
PERLND  12                         5.02      COPY   501      13
PERLND  19                         0.27      COPY   501      12
PERLND  19                         0.27      COPY   501      13
PERLND  20                         0.16      COPY   501      12
PERLND  20                         0.16      COPY   501      13
PERLND  21                         0.32      COPY   501      12
PERLND  21                         0.32      COPY   501      13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        DISPLY   1     INPUT  TIMSER 1



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

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

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

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

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
```

```
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
             FG FG FG FG  possible  exit  *** possible  exit      possible  exit
              *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

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

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              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     12.1      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       1963 10 01         END    2004 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   POC1-0.5Q2.wdm
MESSU       25   MitPOC1-0.5Q2.MES
            27   MitPOC1-0.5Q2.L61
            28   MitPOC1-0.5Q2.L62
            30   POCPOC1-0.5Q21.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:60
      PERLND      12
      PERLND      10
      PERLND      11
      PERLND      19
      PERLND      20
      PERLND      21
      IMPLND       1
      RCHRES       1
      COPY         1
      COPY       501
      COPY       601
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        SSD Table  1               MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1          1    1
  501          1    1
  601          1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                        in  out              ***
   12       B,Grass,STEEP(10-20     1    1    1    1   27    0
   10       B,Grass,FLAT(0-5%)      1    1    1    1   27    0
   11       B,Grass,MOD(5-10%)      1    1    1    1   27    0
   19       C,Grass,FLAT(0-5%)      1    1    1    1   27    0
   20       C,Grass,MOD(5-10%)      1    1    1    1   27    0
   21       C,Grass,STEEP(10-20     1    1    1    1   27    0
```

```
END GEN-INFO
*** Section PWATER***

ACTIVITY
  <PLS > ************ Active Sections ******************************
  # -   # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
 12         0    0    1    0    0    0    0    0    0    0    0    0
 10         0    0    1    0    0    0    0    0    0    0    0    0
 11         0    0    1    0    0    0    0    0    0    0    0    0
 19         0    0    1    0    0    0    0    0    0    0    0    0
 20         0    0    1    0    0    0    0    0    0    0    0    0
 21         0    0    1    0    0    0    0    0    0    0    0    0
END ACTIVITY

PRINT-INFO
  <PLS > ***************** Print-flags ***************************** PIVL  PYR
  # -   # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
 12         0    0    4    0    0    0    0    0    0    0    0    0    1     9
 10         0    0    4    0    0    0    0    0    0    0    0    0    1     9
 11         0    0    4    0    0    0    0    0    0    0    0    0    1     9
 19         0    0    4    0    0    0    0    0    0    0    0    0    1     9
 20         0    0    4    0    0    0    0    0    0    0    0    0    1     9
 21         0    0    4    0    0    0    0    0    0    0    0    0    1     9
END PRINT-INFO

PWAT-PARM1
  <PLS >  PWATER variable monthly parameter value flags  ***
  # -   # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
 12         0    1    1    1    0    0    0    0    1    1    0
 10         0    1    1    1    0    0    0    0    1    1    0
 11         0    1    1    1    0    0    0    0    1    1    0
 19         0    1    1    1    0    0    0    0    1    1    0
 20         0    1    1    1    0    0    0    0    1    1    0
 21         0    1    1    1    0    0    0    0    1    1    0
END PWAT-PARM1

PWAT-PARM2
  <PLS >      PWATER input info: Part 2          ***
  # -   # ***FOREST      LZSN     INFILT      LSUR     SLSUR      KVARY      AGWRC
 12               0       4.4       0.04       200      0.15          3       0.92
 10               0         5       0.07       200      0.05          3       0.92
 11               0       4.7      0.055       200       0.1          3       0.92
 19               0       4.8       0.05       200      0.05          3       0.92
 20               0       4.5       0.04       200       0.1          3       0.92
 21               0       4.2       0.03       200      0.15          3       0.92
END PWAT-PARM2

PWAT-PARM3
  <PLS >      PWATER input info: Part 3          ***
  # -   # ***PETMAX    PETMIN     INFEXP     INFILD     DEEPFR     BASETP     AGWETP
 12              35         30          2          2        0.4       0.05       0.05
 10              35         30          2          2        0.4       0.05       0.05
 11              35         30          2          2        0.4       0.05       0.05
 19              35         30          2          2        0.4       0.05       0.05
 20              35         30          2          2        0.4       0.05       0.05
 21              35         30          2          2        0.4       0.05       0.05
END PWAT-PARM3
PWAT-PARM4
  <PLS >     PWATER input info: Part 4                                    ***
  # -   #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
 12          0.08       0.6       0.2       1.5       0.7       0.5
 10          0.08       0.6       0.2       1.5       0.7       0.5
 11          0.08       0.6       0.2       1.5       0.7       0.5
 19          0.08       0.6       0.2       1.5       0.7       0.5
 20          0.08       0.6       0.2       1.5       0.7       0.5
 21          0.08       0.6       0.2       1.5       0.7       0.5
END PWAT-PARM4
MON-LZETPARM
  <PLS >      PWATER input info: Part 3          ***
  # -   #  JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC  ***
```

```
   12        0.4   0.4   0.4   0.4   0.6   0.6   0.6   0.6   0.6   0.4   0.4   0.4
   10        0.4   0.4   0.4   0.4   0.6   0.6   0.6   0.6   0.6   0.4   0.4   0.4
   11        0.4   0.4   0.4   0.4   0.6   0.6   0.6   0.6   0.6   0.4   0.4   0.4
   19        0.4   0.4   0.4   0.4   0.6   0.6   0.6   0.6   0.6   0.4   0.4   0.4
   20        0.4   0.4   0.4   0.4   0.6   0.6   0.6   0.6   0.6   0.4   0.4   0.4
   21        0.4   0.4   0.4   0.4   0.6   0.6   0.6   0.6   0.6   0.4   0.4   0.4
  END MON-LZETPARM
  MON-INTERCEP
    <PLS >       PWATER input info: Part 3          ***
    # -   #  JAN   FEB   MAR   APR   MAY   JUN   JUL   AUG   SEP   OCT   NOV   DEC  ***
   12        0.1   0.1   0.1   0.1  0.06  0.06  0.06  0.06  0.06   0.1   0.1   0.1
   10        0.1   0.1   0.1   0.1  0.06  0.06  0.06  0.06  0.06   0.1   0.1   0.1
   11        0.1   0.1   0.1   0.1  0.06  0.06  0.06  0.06  0.06   0.1   0.1   0.1
   19        0.1   0.1   0.1   0.1  0.06  0.06  0.06  0.06  0.06   0.1   0.1   0.1
   20        0.1   0.1   0.1   0.1  0.06  0.06  0.06  0.06  0.06   0.1   0.1   0.1
   21        0.1   0.1   0.1   0.1  0.06  0.06  0.06  0.06  0.06   0.1   0.1   0.1
  END MON-INTERCEP

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -   # ***  CEPS      SURS       UZS       IFWS       LZS       AGWS       GWVS
   12              0         0      0.15          0         4       0.05          0
   10              0         0      0.15          0         4       0.05          0
   11              0         0      0.15          0         4       0.05          0
   19              0         0      0.15          0         4       0.05          0
   20              0         0      0.15          0         4       0.05          0
   21              0         0      0.15          0         4       0.05          0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -   #                    User  t-series Engl Metr ***
                                     in   out            ***
    1       IMPERVIOUS             1     1    1   27    0
  END GEN-INFO
  *** Section IWATER***

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

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -   # ATMP SNOW IWAT  SLD  IWG IQAL     *********
    1          0    0    6    0    0    0     1     9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -   # CSNO RTOP  VRS  VNN RTLI      ***
    1          0    0    0    0    1
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >       IWATER input info: Part 2          ***
    # -   # ***  LSUR      SLSUR      NSUR      RETSC
    1            100      0.035      0.05        0.1
  END IWAT-PARM2

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

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

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK    ***
<Name>   #                 <-factor->     <Name>   #   Tbl#    ***
to basin***
PERLND  12                      20.03     RCHRES   1      2
PERLND  12                      20.03     RCHRES   1      3
PERLND  10                       4.38     RCHRES   1      2
PERLND  10                       4.38     RCHRES   1      3
PERLND  11                       0.84     RCHRES   1      2
PERLND  11                       0.84     RCHRES   1      3
PERLND  19                       3.62     RCHRES   1      2
PERLND  19                       3.62     RCHRES   1      3
PERLND  20                       0.33     RCHRES   1      2
PERLND  20                       0.33     RCHRES   1      3
PERLND  21                        2.6     RCHRES   1      2
PERLND  21                        2.6     RCHRES   1      3
IMPLND   1                      11.23     RCHRES   1      5
bypass***
PERLND  12                       1.53     COPY   501     12
PERLND  12                       1.53     COPY   601     12
PERLND  12                       1.53     COPY   501     13
PERLND  12                       1.53     COPY   601     13
PERLND  10                       1.62     COPY   501     12
PERLND  10                       1.62     COPY   601     12
PERLND  10                       1.62     COPY   501     13
PERLND  10                       1.62     COPY   601     13
PERLND  11                       0.17     COPY   501     12
PERLND  11                       0.17     COPY   601     12
PERLND  11                       0.17     COPY   501     13
PERLND  11                       0.17     COPY   601     13
PERLND  19                        0.1     COPY   501     12
PERLND  19                        0.1     COPY   601     12
PERLND  19                        0.1     COPY   501     13
PERLND  19                        0.1     COPY   601     13
PERLND  20                       0.03     COPY   501     12
PERLND  20                       0.03     COPY   601     12
PERLND  20                       0.03     COPY   501     13
PERLND  20                       0.03     COPY   601     13
PERLND  21                       0.57     COPY   501     12
PERLND  21                       0.57     COPY   601     12
PERLND  21                       0.57     COPY   501     13
PERLND  21                       0.57     COPY   601     13
IMPLND   1                       2.13     COPY   501     15
IMPLND   1                       2.13     COPY   601     15

******Routing******
PERLND  12                      20.03     COPY     1     12
PERLND  10                       4.38     COPY     1     12
PERLND  11                       0.84     COPY     1     12
PERLND  19                       3.62     COPY     1     12
PERLND  20                       0.33     COPY     1     12
PERLND  21                        2.6     COPY     1     12
IMPLND   1                      11.23     COPY     1     15
PERLND  12                      20.03     COPY     1     13
PERLND  10                       4.38     COPY     1     13
PERLND  11                       0.84     COPY     1     13
PERLND  19                       3.62     COPY     1     13
PERLND  20                       0.33     COPY     1     13
PERLND  21                        2.6     COPY     1     13
RCHRES   1                          1     COPY   501     17
END SCHEMATIC
```

```
NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   12.1        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     SSD Table  10014        2    1    1    1    28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  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  5  0  0  0        0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH      STCOR         KS       DB50        ***
  <------><--------><--------><--------><--------><--------><-------->        ***
    1            1      0.01       0.0        0.0        0.5        0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1         0            4.0  5.0  0.0  0.0  0.0         0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE       1
   79    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)    (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.000229  0.000000  0.000000  0.000000
  0.300000  0.008310  0.001000  0.110000  0.000000
  0.400000  0.013572  0.002000  0.140000  0.000000
  0.500000  0.020118  0.004000  0.160000  0.000000
  0.600000  0.027948  0.006000  0.180000  0.000000
  0.700000  0.037061  0.009000  0.200000  0.000000
  0.800000  0.047459  0.014000  0.220000  0.000000
  0.900000  0.059141  0.019000  0.230000  0.000000
```

1.000000	0.072106	0.025000	0.250000	0.000000
1.100000	0.086356	0.033000	0.260000	0.000000
1.200000	0.101890	0.043000	0.270000	0.000000
1.300000	0.118707	0.054000	0.290000	0.000000
1.400000	0.136809	0.067000	0.300000	0.000000
1.500000	0.156195	0.081000	0.310000	0.000000
1.600000	0.176864	0.098000	0.320000	0.000000
1.700000	0.198818	0.117000	0.330000	0.000000
1.800000	0.222055	0.138000	0.340000	0.000000
1.900000	0.246577	0.161000	0.350000	0.000000
2.000000	0.272382	0.187000	0.360000	0.000000
2.100000	0.274735	0.214000	0.370000	0.000000
2.200000	0.277097	0.242000	0.380000	0.000000
2.300000	0.279469	0.270000	0.390000	0.000000
2.400000	0.281852	0.298000	0.400000	0.000000
2.500000	0.284245	0.326000	0.410000	0.000000
2.600000	0.286648	0.355000	0.420000	0.000000
2.700000	0.289061	0.383000	0.420000	0.000000
2.800000	0.291484	0.413000	0.430000	0.000000
2.900000	0.293917	0.442000	0.440000	0.000000
3.000000	0.296360	0.471000	0.450000	0.000000
3.100000	0.298814	0.501000	0.460000	0.000000
3.200000	0.301277	0.531000	0.460000	0.000000
3.300000	0.303751	0.561000	0.470000	0.000000
3.400000	0.306234	0.592000	0.480000	0.000000
3.500000	0.308728	0.623000	0.480000	0.000000
3.600000	0.311232	0.654000	0.490000	0.000000
3.700000	0.313746	0.685000	0.500000	0.000000
3.800000	0.316271	0.716000	0.510000	0.000000
3.900000	0.318805	0.748000	0.510000	0.000000
4.000000	0.321349	0.780000	0.520000	0.000000
4.100000	0.323826	0.812000	0.570000	0.000000
4.200000	0.326313	0.845000	0.690000	0.000000
4.300000	0.328809	0.878000	0.870000	0.000000
4.400000	0.331314	0.911000	1.090000	0.000000
4.500000	0.333829	0.944000	1.340000	0.000000
4.600000	0.336353	0.977000	1.480000	0.000000
4.700000	0.338887	1.011000	1.590000	0.000000
4.800000	0.341431	1.045000	1.700000	0.000000
4.900000	0.343984	1.079000	1.800000	0.000000
5.000000	0.346546	1.114000	1.890000	0.000000
5.100000	0.349118	1.149000	1.970000	0.000000
5.200000	0.351700	1.184000	2.050000	0.000000
5.300000	0.354291	1.219000	2.130000	0.000000
5.400000	0.356891	1.255000	2.210000	0.000000
5.500000	0.359501	1.290000	2.280000	0.000000
5.600000	0.362121	1.327000	2.350000	0.000000
5.700000	0.364750	1.363000	2.410000	0.000000
5.800000	0.367388	1.399000	2.480000	0.000000
5.900000	0.370036	1.436000	2.540000	0.000000
6.000000	0.372694	1.473000	2.600000	0.000000
6.100000	0.375302	1.511000	4.150000	0.000000
6.200000	0.377919	1.549000	6.930000	0.000000
6.300000	0.380545	1.586000	10.52000	0.000000
6.400000	0.383180	1.625000	14.75000	0.000000
6.500000	0.385824	1.663000	19.55000	0.000000
6.600000	0.388478	1.702000	24.84000	0.000000
6.700000	0.391140	1.741000	30.59000	0.000000
6.800000	0.393812	1.780000	36.76000	0.000000
6.900000	0.396493	1.820000	43.33000	0.000000
7.000000	0.399182	1.859000	50.27000	0.000000
7.100000	0.401881	1.899000	57.56000	0.000000
7.200000	0.404589	1.940000	65.19000	0.000000
7.300000	0.407306	1.980000	73.14000	0.000000
7.400000	0.410032	2.021000	81.40000	0.000000
7.500000	0.412768	2.062000	89.96000	0.000000
7.600000	0.415512	2.104000	98.80000	0.000000
7.700000	0.418265	2.145000	107.9300	0.000000
7.800000	0.421028	2.187000	117.3300	0.000000
7.900000	0.423799	2.230000	126.9800	0.000000

```
  8.000000  0.426580  2.272000  136.9000  0.000000
  END FTABLE  1
END FTABLES

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

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     12.1      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     12.1      WDM    801 FLOW     ENGL      REPL
COPY   601 OUTPUT MEAN   1 1     12.1      WDM    901 FLOW     ENGL      REPL
RCHRES   1 HYDR   RO     1 1        1      WDM   1012 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1014 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1        1      WDM   1015 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1013 STAG     ENGL      REPL
END EXT TARGETS

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

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

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

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

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

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

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

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SDHM

PROJECT REPORT

General Model Information

Project Name:	POC2-0.1Q2
Site Name:	Brightwater Ranch
Site Address:	
City:	
Report Date:	01/29/2015
Gage:	FLINN SP
Data Start:	10/01/1963
Data End:	09/30/2004
Timestep:	Hourly
Precip Scale:	1.00
Version:	2014/11/07

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year

Landuse Basin Data
Predeveloped Land Use

Pre-project

Bypass:	No
GroundWater:	No

Pervious Land Use	Acres
B,Grass,FLAT(0-5%)	0.01
B,Grass,MOD(5-10%)	0.02
B,Grass,STEEP(10-20	2.49
Pervious Total	2.52

Impervious Land Use	Acres
Impervious Total	0
Basin Total	2.52

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

to basin

Bypass: No

GroundWater: No

Pervious Land Use	Acres
B,Grass,STEEP(10-20	2.36
B,Grass,MOD(5-10%)	0.02
B,Grass,FLAT(0-5%)	0.01
Pervious Total	2.39

Impervious Land Use	Acres
IMPERVIOUS	0.13
Impervious Total	0.13
Basin Total	2.52

Element Flows To:

Surface	Interflow	Groundwater
Surface .5	Surface .5	

Mitigated Routing

.5

Bottom Length:	42.00 ft.
Bottom Width:	11.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	ASTM 9
Material thickness of second layer:	0.5
Material type for second layer:	GRAVEL
Material thickness of third layer:	0.5
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.2
Infiltration safety factor:	1
Wetted surface area On	
Total Volume Infiltrated (ac-ft):	8.79
Total Volume Through Riser (ac-ft):	4.571
Total Volume Through Facility (ac-ft):	13.361
Percent Infiltrated:	65.79
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Underdrain not used	
Discharge Structure	
Riser Height:	0.83 ft.
Riser Diameter:	8 in.
Element Flows To:	
Outlet 1	Outlet 2

Landscape Swale Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0251	0.0000	0.0000	0.0000
0.0531	0.0250	0.0002	0.0000	0.0000
0.1062	0.0247	0.0005	0.0000	0.0000
0.1592	0.0243	0.0007	0.0000	0.0000
0.2123	0.0240	0.0010	0.0000	0.0002
0.2654	0.0236	0.0013	0.0000	0.0005
0.3185	0.0233	0.0015	0.0000	0.0009
0.3715	0.0229	0.0018	0.0000	0.0016
0.4246	0.0226	0.0021	0.0000	0.0025
0.4777	0.0223	0.0024	0.0000	0.0026
0.5308	0.0219	0.0027	0.0000	0.0027
0.5838	0.0216	0.0030	0.0000	0.0027
0.6369	0.0212	0.0033	0.0000	0.0028
0.6900	0.0209	0.0036	0.0000	0.0029
0.7431	0.0206	0.0039	0.0000	0.0029
0.7962	0.0203	0.0043	0.0000	0.0030
0.8492	0.0199	0.0046	0.0000	0.0030
0.9023	0.0196	0.0049	0.0000	0.0031
0.9554	0.0193	0.0053	0.0000	0.0031
1.0085	0.0190	0.0056	0.0000	0.0032
1.0615	0.0187	0.0060	0.0000	0.0033
1.1146	0.0183	0.0064	0.0000	0.0033
1.1677	0.0180	0.0068	0.0000	0.0034
1.2208	0.0177	0.0071	0.0000	0.0034
1.2738	0.0174	0.0075	0.0000	0.0035

1.3269	0.0171	0.0079	0.0000	0.0036
1.3800	0.0168	0.0083	0.0000	0.0036
1.4331	0.0165	0.0087	0.0000	0.0037
1.4862	0.0162	0.0092	0.0000	0.0038
1.5392	0.0159	0.0096	0.0000	0.0038
1.5923	0.0156	0.0100	0.0000	0.0039
1.6454	0.0153	0.0104	0.0000	0.0040
1.6985	0.0150	0.0109	0.0000	0.0040
1.7515	0.0147	0.0113	0.0000	0.0041
1.8046	0.0144	0.0117	0.0000	0.0042
1.8577	0.0141	0.0122	0.0000	0.0042
1.9108	0.0139	0.0127	0.0000	0.0043
1.9638	0.0136	0.0131	0.0000	0.0044
2.0169	0.0133	0.0136	0.0000	0.0044
2.0700	0.0130	0.0141	0.0000	0.0045
2.1231	0.0127	0.0146	0.0000	0.0046
2.1762	0.0125	0.0151	0.0000	0.0046
2.2292	0.0122	0.0156	0.0000	0.0047
2.2823	0.0119	0.0161	0.0000	0.0048
2.3354	0.0117	0.0166	0.0000	0.0048
2.3885	0.0114	0.0172	0.0000	0.0049
2.4415	0.0111	0.0177	0.0000	0.0050
2.4946	0.0109	0.0183	0.0000	0.0050
2.5000	0.0106	0.0183	0.0000	0.0051

Landscape Swale Hydraulic Table

Stage(ft)	Area(ac)	Volume(ac-ft)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.5000	0.0251	0.0183	0.0000	0.2389	0.0030
2.5531	0.0254	0.0197	0.0000	0.2389	0.0031
2.6062	0.0258	0.0210	0.0000	0.2506	0.0031
2.6592	0.0261	0.0224	0.0000	0.2625	0.0032
2.7123	0.0265	0.0238	0.0000	0.2746	0.0033
2.7654	0.0269	0.0252	0.0000	0.2870	0.0034
2.8185	0.0272	0.0267	0.0000	0.2997	0.0034
2.8715	0.0276	0.0281	0.0000	0.3126	0.0035
2.9246	0.0280	0.0296	0.0000	0.3258	0.0036
2.9777	0.0284	0.0311	0.0000	0.3393	0.0037
3.0308	0.0287	0.0326	0.0000	0.3530	0.0037
3.0838	0.0291	0.0341	0.0000	0.3670	0.0038
3.1369	0.0295	0.0357	0.0000	0.3812	0.0039
3.1900	0.0299	0.0373	0.0000	0.3958	0.0040
3.2431	0.0303	0.0389	0.0000	0.4105	0.0040
3.2962	0.0306	0.0405	0.0000	0.4256	0.0041
3.3492	0.0310	0.0421	0.0173	0.4410	0.0042
3.4023	0.0314	0.0438	0.1262	0.4566	0.0043
3.4554	0.0318	0.0454	0.2883	0.4725	0.0044
3.5085	0.0322	0.0471	0.4895	0.4887	0.0044
3.5615	0.0326	0.0489	0.7234	0.5052	0.0045
3.6146	0.0330	0.0506	0.9858	0.5220	0.0046
3.6677	0.0334	0.0524	1.2741	0.5390	0.0047
3.7208	0.0338	0.0541	1.5860	0.5564	0.0048
3.7738	0.0342	0.0559	1.9199	0.5740	0.0048
3.8269	0.0346	0.0578	2.2743	0.5919	0.0049
3.8800	0.0350	0.0596	2.6483	0.6102	0.0050
3.9331	0.0354	0.0615	3.0408	0.6287	0.0051
3.9862	0.0358	0.0634	3.4509	0.6475	0.0052
4.0392	0.0363	0.0653	3.8780	0.6667	0.0053
4.0923	0.0367	0.0672	4.3213	0.6861	0.0053

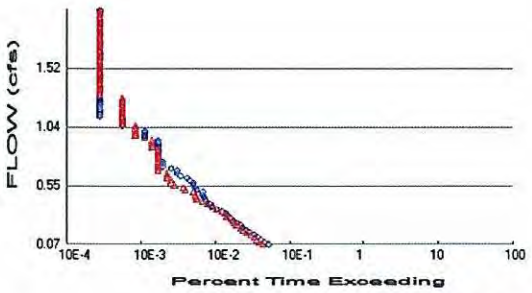
4.1454	0.0371	0.0692	4.7804	0.7059	0.0054
4.1985	0.0375	0.0712	5.2547	0.7259	0.0055
4.2515	0.0379	0.0732	5.7437	0.7463	0.0056
4.3046	0.0384	0.0752	6.2470	0.7670	0.0057
4.3577	0.0388	0.0772	6.7642	0.7880	0.0058
4.4108	0.0392	0.0793	7.2950	0.8093	0.0059
4.4638	0.0396	0.0814	7.8389	0.8309	0.0059
4.5169	0.0401	0.0835	8.3957	0.8529	0.0060
4.5700	0.0405	0.0857	8.9651	0.8751	0.0061
4.6231	0.0410	0.0878	9.5468	0.8977	0.0062
4.6762	0.0414	0.0900	10.141	0.9207	0.0063
4.7292	0.0418	0.0922	10.746	0.9439	0.0064
4.7823	0.0423	0.0945	11.363	0.9675	0.0065
4.8300	0.0427	0.0965	11.992	0.9890	0.0000

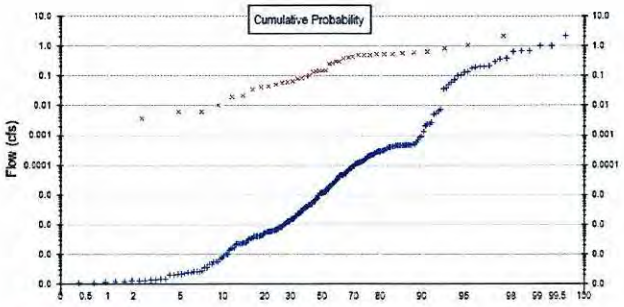
Surface .5

Element Flows To:

Outlet 1	Outlet 2
	.5

Analysis Results
POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 2.52
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 2.39
Total Impervious Area: 0.13

Flow Frequency Method: Cunnane

Flow Frequency Return Periods for Predeveloped. POC #1

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

Flow Frequency Return Periods for Mitigated. POC #1

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

Duration Flows
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0215	605	279	46	Pass
0.0294	353	238	67	Pass
0.0373	277	214	77	Pass
0.0452	240	193	80	Pass
0.0531	216	183	84	Pass
0.0610	205	175	85	Pass
0.0689	191	160	83	Pass
0.0768	181	150	82	Pass
0.0847	168	138	82	Pass
0.0926	159	136	85	Pass
0.1005	151	131	86	Pass
0.1084	144	128	88	Pass
0.1162	136	125	91	Pass
0.1241	132	120	90	Pass
0.1320	129	118	91	Pass
0.1399	121	113	93	Pass
0.1478	118	108	91	Pass
0.1557	112	101	90	Pass
0.1636	106	97	91	Pass
0.1715	100	95	95	Pass
0.1794	98	94	95	Pass
0.1873	91	84	92	Pass
0.1952	88	82	93	Pass
0.2031	86	80	93	Pass
0.2110	83	76	91	Pass
0.2189	78	74	94	Pass
0.2268	78	69	88	Pass
0.2347	73	69	94	Pass
0.2426	71	67	94	Pass
0.2505	66	65	98	Pass
0.2584	65	63	96	Pass
0.2663	62	60	96	Pass
0.2742	58	59	101	Pass
0.2821	56	58	103	Pass
0.2900	56	57	101	Pass
0.2978	54	51	94	Pass
0.3057	54	50	92	Pass
0.3136	52	47	90	Pass
0.3215	51	47	92	Pass
0.3294	49	47	95	Pass
0.3373	47	44	93	Pass
0.3452	42	43	102	Pass
0.3531	41	43	104	Pass
0.3610	38	38	100	Pass
0.3689	36	37	102	Pass
0.3768	34	36	105	Pass
0.3847	32	33	103	Pass
0.3926	31	32	103	Pass
0.4005	30	29	96	Pass
0.4084	29	26	89	Pass
0.4163	28	25	89	Pass
0.4242	27	22	81	Pass
0.4321	27	21	77	Pass

0.4400	27	21	77	Pass
0.4479	25	20	80	Pass
0.4558	25	20	80	Pass
0.4637	25	20	80	Pass
0.4716	25	19	76	Pass
0.4795	24	19	79	Pass
0.4873	24	19	79	Pass
0.4952	24	19	79	Pass
0.5031	24	18	75	Pass
0.5110	23	16	69	Pass
0.5189	20	14	70	Pass
0.5268	19	13	68	Pass
0.5347	19	13	68	Pass
0.5426	18	13	72	Pass
0.5505	18	11	61	Pass
0.5584	18	10	55	Pass
0.5663	18	9	50	Pass
0.5742	18	9	50	Pass
0.5821	17	9	52	Pass
0.5900	17	9	52	Pass
0.5979	16	9	56	Pass
0.6058	16	9	56	Pass
0.6137	15	8	53	Pass
0.6216	14	8	57	Pass
0.6295	13	8	61	Pass
0.6374	12	8	66	Pass
0.6453	11	8	72	Pass
0.6532	11	8	72	Pass
0.6611	11	6	54	Pass
0.6689	11	6	54	Pass
0.6768	10	6	60	Pass
0.6847	10	6	60	Pass
0.6926	9	6	66	Pass
0.7005	9	6	66	Pass
0.7084	8	6	75	Pass
0.7163	7	6	85	Pass
0.7242	7	6	85	Pass
0.7321	7	6	85	Pass
0.7400	7	6	85	Pass
0.7479	7	6	85	Pass
0.7558	7	6	85	Pass
0.7637	6	6	100	Pass
0.7716	6	6	100	Pass
0.7795	6	6	100	Pass
0.7874	6	6	100	Pass
0.7953	6	6	100	Pass
0.8032	6	6	100	Pass

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

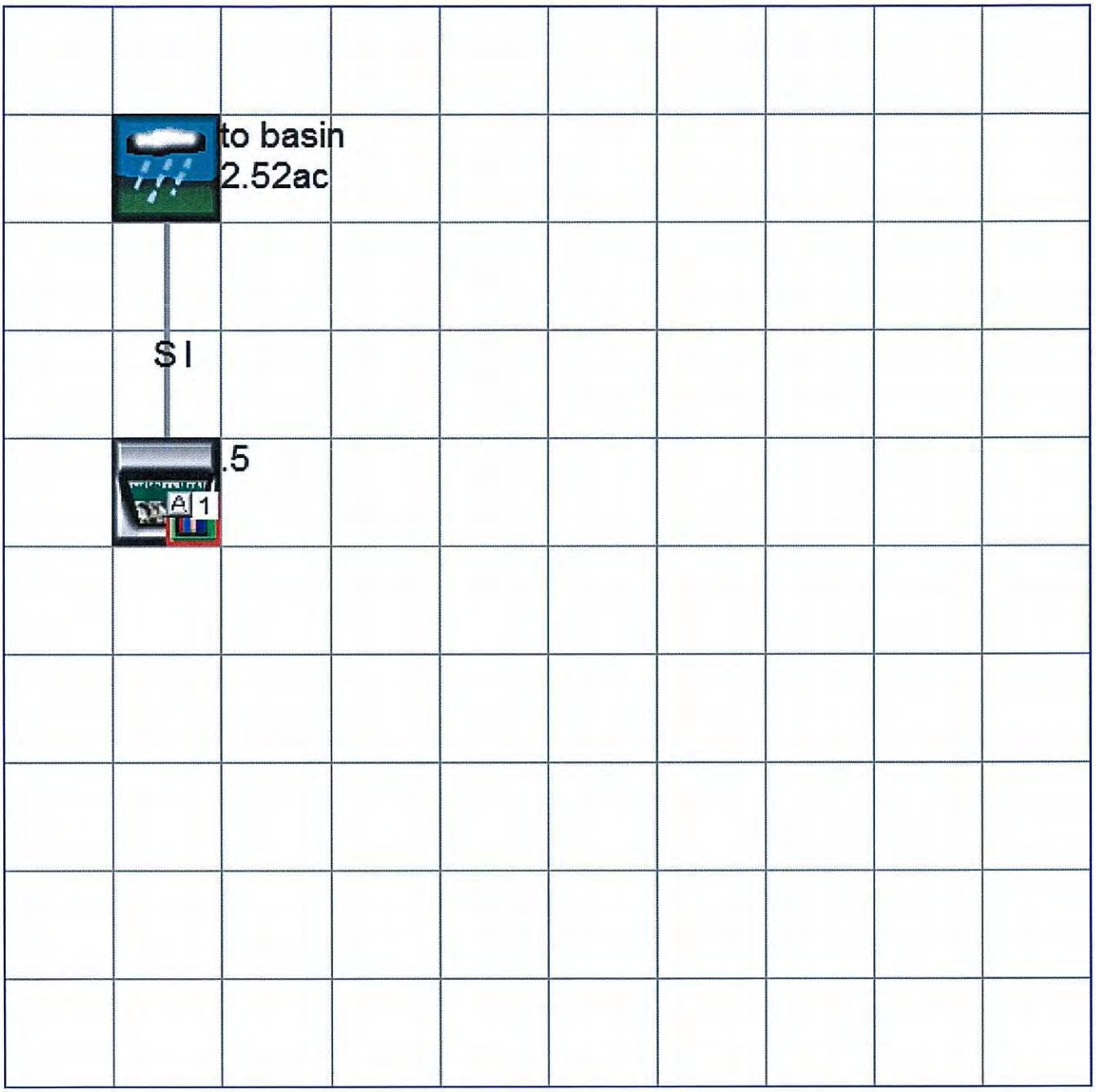
IMPLND Changes

No IMPLND changes have been made.

Appendix
Predeveloped Schematic

Pre-project
2.52ac

Mitigated Schematic




DRAFT

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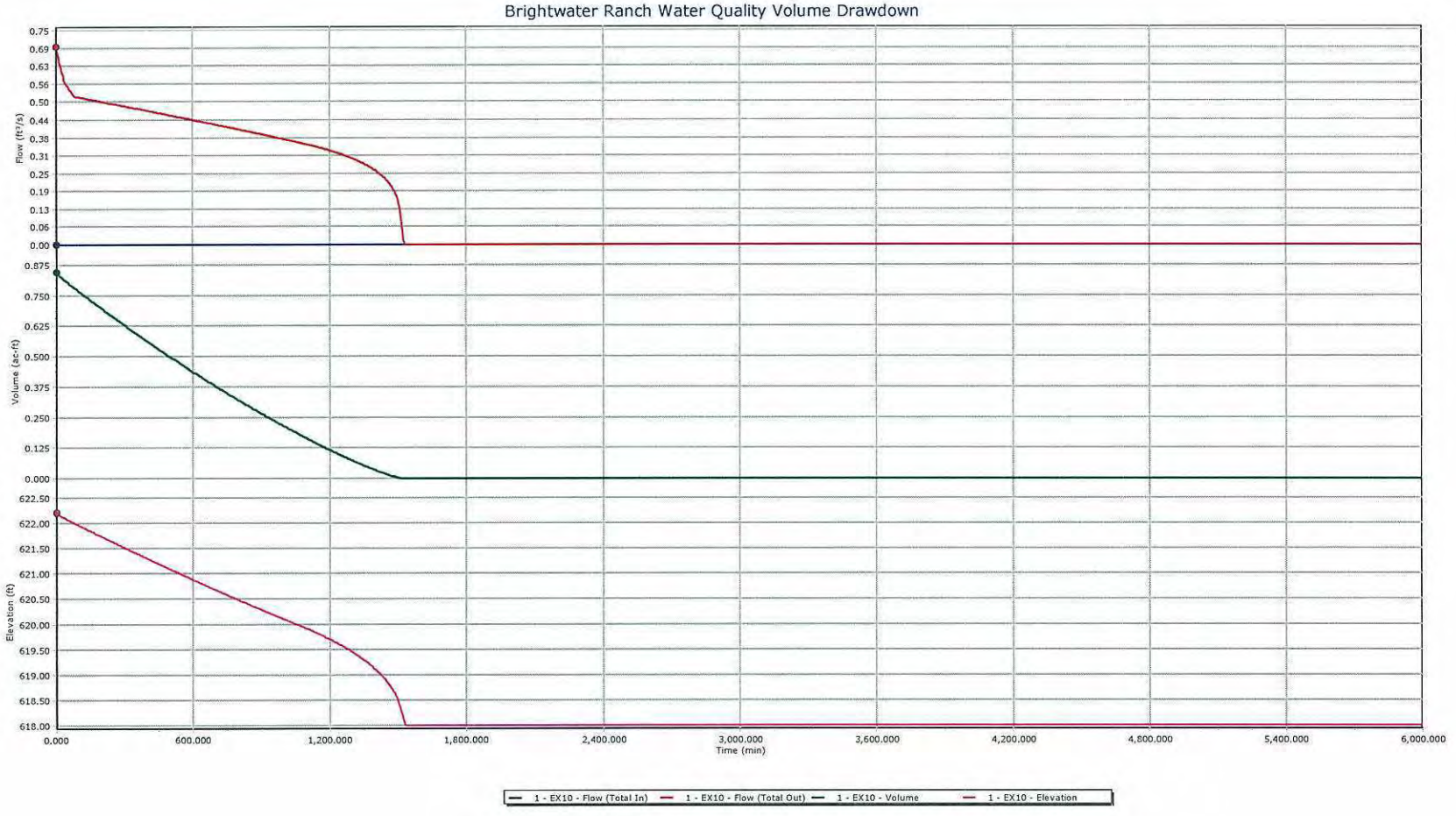
Brightwater Ranch Water Quality Volume Drawdown
Flow (ft³/s)
0.75
0.69
0.63
0.56
0.50
0.44
0.38
0.31
0.25
0.19
0.13
0.06
0.00
Volume (ac-ft)
0.875
0.750
0.625
0.500
0.375
0.250
0.125
0.000
Elevation (ft)
622.50
622.00
621.50
621.00
620.50
620.00
619.50
619.00
618.50
618.00
0.000
600.000
1,200.000
1,800.000
2,400.000
3,000.000
3,600.000
4,200.000
4,800.000
5,400.000
6,000.000
Time (min)
1 - EX10 - Flow (Total In)
1 - EX10 - Flow (Total Out)
1 - EX10 - Volume
1 - EX10 - Elevation

Drawdown-Basin

Project Summary	
Title	Brightwater basin
Engineer	PDC
Company	PDC
Date	1/29/2015

Notes

Table of Contents

Drawdown-Basin

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft^3/s)
CM-1	EX10	0	0.000	0.000	0.00

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft^3/s)
O-1	EX10	0	0.845	0.000	0.69

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (min)	Peak Flow (ft^3/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
1 (IN)	EX10	0	0.000	0.000	0.00	(N/A)	(N/A)
1 (OUT)	EX10	0	0.845	0.000	0.69	622.19	0.840

Drawdown-Basin

Subsection: Time vs. Volume
Label: 1

Return Event: 0 years
Storm Event:

Time vs. Volume (ac-ft)

Output Time increment = 5.000 min
Time on left represents time for first value in each row.

Time (min)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
0.000	0.845	0.840	0.836	0.831	0.827
25.000	0.822	0.818	0.814	0.810	0.807
50.000	0.803	0.799	0.795	0.791	0.788
75.000	0.784	0.781	0.777	0.773	0.770
100.000	0.766	0.763	0.759	0.756	0.752
125.000	0.749	0.745	0.742	0.738	0.734
150.000	0.731	0.727	0.724	0.720	0.717
175.000	0.714	0.710	0.707	0.703	0.700
200.000	0.696	0.693	0.689	0.686	0.682
225.000	0.679	0.676	0.672	0.669	0.665
250.000	0.662	0.659	0.655	0.652	0.648
275.000	0.645	0.642	0.638	0.635	0.632
300.000	0.628	0.625	0.622	0.618	0.615
325.000	0.612	0.608	0.605	0.602	0.598
350.000	0.595	0.592	0.588	0.585	0.582
375.000	0.579	0.575	0.572	0.569	0.566
400.000	0.562	0.559	0.556	0.553	0.549
425.000	0.546	0.543	0.540	0.537	0.533
450.000	0.530	0.527	0.524	0.521	0.517
475.000	0.514	0.511	0.508	0.505	0.502
500.000	0.499	0.496	0.492	0.489	0.486
525.000	0.483	0.480	0.477	0.474	0.471
550.000	0.468	0.465	0.461	0.458	0.455
575.000	0.452	0.449	0.446	0.443	0.440
600.000	0.437	0.434	0.431	0.428	0.425
625.000	0.422	0.419	0.416	0.413	0.410
650.000	0.407	0.404	0.401	0.398	0.395
675.000	0.392	0.390	0.387	0.384	0.381
700.000	0.378	0.375	0.372	0.369	0.366
725.000	0.363	0.361	0.358	0.355	0.352
750.000	0.349	0.346	0.343	0.341	0.338
775.000	0.335	0.332	0.329	0.327	0.324
800.000	0.321	0.318	0.315	0.313	0.310
825.000	0.307	0.304	0.302	0.299	0.296
850.000	0.293	0.291	0.288	0.285	0.282
875.000	0.280	0.277	0.274	0.272	0.269
900.000	0.266	0.264	0.261	0.258	0.256
925.000	0.253	0.250	0.248	0.245	0.243
950.000	0.240	0.237	0.235	0.232	0.230
975.000	0.227	0.224	0.222	0.219	0.217
1,000.000	0.214	0.212	0.209	0.206	0.204

Drawdown-Basin

Subsection: Time vs. Volume
Label: 1

Return Event: 0 years
Storm Event:

Time vs. Volume (ac-ft)

Output Time increment = 5.000 min
Time on left represents time for first value in each row.

Time (min)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
1,025.000	0.201	0.199	0.196	0.194	0.191
1,050.000	0.189	0.186	0.184	0.181	0.179
1,075.000	0.176	0.174	0.171	0.169	0.167
1,100.000	0.164	0.162	0.159	0.157	0.154
1,125.000	0.152	0.150	0.147	0.145	0.143
1,150.000	0.140	0.138	0.136	0.133	0.131
1,175.000	0.128	0.126	0.124	0.122	0.119
1,200.000	0.117	0.115	0.112	0.110	0.108
1,225.000	0.106	0.103	0.101	0.099	0.097
1,250.000	0.095	0.092	0.090	0.088	0.086
1,275.000	0.084	0.082	0.080	0.077	0.075
1,300.000	0.073	0.071	0.069	0.067	0.065
1,325.000	0.063	0.061	0.059	0.057	0.055
1,350.000	0.053	0.051	0.049	0.047	0.045
1,375.000	0.043	0.041	0.040	0.038	0.036
1,400.000	0.034	0.032	0.030	0.029	0.027
1,425.000	0.025	0.024	0.022	0.020	0.019
1,450.000	0.017	0.016	0.014	0.013	0.011
1,475.000	0.010	0.008	0.007	0.006	0.005
1,500.000	0.004	0.002	0.002	0.001	0.000
1,525.000	0.000	0.000	0.000	0.000	0.000
1,550.000	0.000	0.000	0.000	0.000	0.000
1,575.000	0.000	0.000	0.000	0.000	0.000
1,600.000	0.000	0.000	0.000	0.000	0.000
1,625.000	0.000	0.000	0.000	0.000	0.000
1,650.000	0.000	0.000	0.000	0.000	0.000
1,675.000	0.000	0.000	0.000	0.000	0.000
1,700.000	0.000	0.000	0.000	0.000	0.000
1,725.000	0.000	0.000	0.000	0.000	0.000
1,750.000	0.000	0.000	0.000	0.000	0.000
1,775.000	0.000	0.000	0.000	0.000	0.000
1,800.000	0.000	0.000	0.000	0.000	0.000
1,825.000	0.000	0.000	0.000	0.000	0.000
1,850.000	0.000	0.000	0.000	0.000	0.000
1,875.000	0.000	0.000	0.000	0.000	0.000
1,900.000	0.000	0.000	0.000	0.000	0.000
1,925.000	0.000	0.000	0.000	0.000	0.000
1,950.000	0.000	0.000	0.000	0.000	0.000
1,975.000	0.000	0.000	0.000	0.000	0.000
2,000.000	0.000	0.000	0.000	0.000	0.000
2,025.000	0.000	0.000	0.000	0.000	0.000

Drawdown-Basin

Subsection: Time vs. Volume
Label: 1

Return Event: 0 years
Storm Event:

Time vs. Volume (ac-ft)

Output Time increment = 5.000 min
Time on left represents time for first value in each row.

Time (min)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
2,050.000	0.000	0.000	0.000	0.000	0.000
2,075.000	0.000	0.000	0.000	0.000	0.000
2,100.000	0.000	0.000	0.000	0.000	0.000
2,125.000	0.000	0.000	0.000	0.000	0.000
2,150.000	0.000	0.000	0.000	0.000	0.000
2,175.000	0.000	0.000	0.000	0.000	0.000
2,200.000	0.000	0.000	0.000	0.000	0.000
2,225.000	0.000	0.000	0.000	0.000	0.000
2,250.000	0.000	0.000	0.000	0.000	0.000
2,275.000	0.000	0.000	0.000	0.000	0.000
2,300.000	0.000	0.000	0.000	0.000	0.000
2,325.000	0.000	0.000	0.000	0.000	0.000
2,350.000	0.000	0.000	0.000	0.000	0.000
2,375.000	0.000	0.000	0.000	0.000	0.000
2,400.000	0.000	0.000	0.000	0.000	0.000
2,425.000	0.000	0.000	0.000	0.000	0.000
2,450.000	0.000	0.000	0.000	0.000	0.000
2,475.000	0.000	0.000	0.000	0.000	0.000
2,500.000	0.000	0.000	0.000	0.000	0.000
2,525.000	0.000	0.000	0.000	0.000	0.000
2,550.000	0.000	0.000	0.000	0.000	0.000
2,575.000	0.000	0.000	0.000	0.000	0.000
2,600.000	0.000	0.000	0.000	0.000	0.000
2,625.000	0.000	0.000	0.000	0.000	0.000
2,650.000	0.000	0.000	0.000	0.000	0.000
2,675.000	0.000	0.000	0.000	0.000	0.000
2,700.000	0.000	0.000	0.000	0.000	0.000
2,725.000	0.000	0.000	0.000	0.000	0.000
2,750.000	0.000	0.000	0.000	0.000	0.000
2,775.000	0.000	0.000	0.000	0.000	0.000
2,800.000	0.000	0.000	0.000	0.000	0.000
2,825.000	0.000	0.000	0.000	0.000	0.000
2,850.000	0.000	0.000	0.000	0.000	0.000
2,875.000	0.000	0.000	0.000	0.000	0.000
2,900.000	0.000	0.000	0.000	0.000	0.000
2,925.000	0.000	0.000	0.000	0.000	0.000
2,950.000	0.000	0.000	0.000	0.000	0.000
2,975.000	0.000	0.000	0.000	0.000	0.000
3,000.000	0.000	0.000	0.000	0.000	0.000
3,025.000	0.000	0.000	0.000	0.000	0.000
3,050.000	0.000	0.000	0.000	0.000	0.000

Drawdown-Basin

Subsection: Time vs. Volume
Label: 1

Return Event: 0 years
Storm Event:

Time vs. Volume (ac-ft)

Output Time increment = 5.000 min
Time on left represents time for first value in each row.

Time (min)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
3,075.000	0.000	0.000	0.000	0.000	0.000
3,100.000	0.000	0.000	0.000	0.000	0.000
3,125.000	0.000	0.000	0.000	0.000	0.000
3,150.000	0.000	0.000	0.000	0.000	0.000
3,175.000	0.000	0.000	0.000	0.000	0.000
3,200.000	0.000	0.000	0.000	0.000	0.000
3,225.000	0.000	0.000	0.000	0.000	0.000
3,250.000	0.000	0.000	0.000	0.000	0.000
3,275.000	0.000	0.000	0.000	0.000	0.000
3,300.000	0.000	0.000	0.000	0.000	0.000
3,325.000	0.000	0.000	0.000	0.000	0.000
3,350.000	0.000	0.000	0.000	0.000	0.000
3,375.000	0.000	0.000	0.000	0.000	0.000
3,400.000	0.000	0.000	0.000	0.000	0.000
3,425.000	0.000	0.000	0.000	0.000	0.000
3,450.000	0.000	0.000	0.000	0.000	0.000
3,475.000	0.000	0.000	0.000	0.000	0.000
3,500.000	0.000	0.000	0.000	0.000	0.000
3,525.000	0.000	0.000	0.000	0.000	0.000
3,550.000	0.000	0.000	0.000	0.000	0.000
3,575.000	0.000	0.000	0.000	0.000	0.000
3,600.000	0.000	0.000	0.000	0.000	0.000
3,625.000	0.000	0.000	0.000	0.000	0.000
3,650.000	0.000	0.000	0.000	0.000	0.000
3,675.000	0.000	0.000	0.000	0.000	0.000
3,700.000	0.000	0.000	0.000	0.000	0.000
3,725.000	0.000	0.000	0.000	0.000	0.000
3,750.000	0.000	0.000	0.000	0.000	0.000
3,775.000	0.000	0.000	0.000	0.000	0.000
3,800.000	0.000	0.000	0.000	0.000	0.000
3,825.000	0.000	0.000	0.000	0.000	0.000
3,850.000	0.000	0.000	0.000	0.000	0.000
3,875.000	0.000	0.000	0.000	0.000	0.000
3,900.000	0.000	0.000	0.000	0.000	0.000
3,925.000	0.000	0.000	0.000	0.000	0.000
3,950.000	0.000	0.000	0.000	0.000	0.000
3,975.000	0.000	0.000	0.000	0.000	0.000
4,000.000	0.000	0.000	0.000	0.000	0.000
4,025.000	0.000	0.000	0.000	0.000	0.000
4,050.000	0.000	0.000	0.000	0.000	0.000
4,075.000	0.000	0.000	0.000	0.000	0.000

Drawdown-Basin

Subsection: Time vs. Volume
Label: 1

Return Event: 0 years
Storm Event:

Time vs. Volume (ac-ft)

Output Time increment = 5.000 min
Time on left represents time for first value in each row.

Time (min)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
4,100.000	0.000	0.000	0.000	0.000	0.000
4,125.000	0.000	0.000	0.000	0.000	0.000
4,150.000	0.000	0.000	0.000	0.000	0.000
4,175.000	0.000	0.000	0.000	0.000	0.000
4,200.000	0.000	0.000	0.000	0.000	0.000
4,225.000	0.000	0.000	0.000	0.000	0.000
4,250.000	0.000	0.000	0.000	0.000	0.000
4,275.000	0.000	0.000	0.000	0.000	0.000
4,300.000	0.000	0.000	0.000	0.000	0.000
4,325.000	0.000	0.000	0.000	0.000	0.000
4,350.000	0.000	0.000	0.000	0.000	0.000
4,375.000	0.000	0.000	0.000	0.000	0.000
4,400.000	0.000	0.000	0.000	0.000	0.000
4,425.000	0.000	0.000	0.000	0.000	0.000
4,450.000	0.000	0.000	0.000	0.000	0.000
4,475.000	0.000	0.000	0.000	0.000	0.000
4,500.000	0.000	0.000	0.000	0.000	0.000
4,525.000	0.000	0.000	0.000	0.000	0.000
4,550.000	0.000	0.000	0.000	0.000	0.000
4,575.000	0.000	0.000	0.000	0.000	0.000
4,600.000	0.000	0.000	0.000	0.000	0.000
4,625.000	0.000	0.000	0.000	0.000	0.000
4,650.000	0.000	0.000	0.000	0.000	0.000
4,675.000	0.000	0.000	0.000	0.000	0.000
4,700.000	0.000	0.000	0.000	0.000	0.000
4,725.000	0.000	0.000	0.000	0.000	0.000
4,750.000	0.000	0.000	0.000	0.000	0.000
4,775.000	0.000	0.000	0.000	0.000	0.000
4,800.000	0.000	0.000	0.000	0.000	0.000
4,825.000	0.000	0.000	0.000	0.000	0.000
4,850.000	0.000	0.000	0.000	0.000	0.000
4,875.000	0.000	0.000	0.000	0.000	0.000
4,900.000	0.000	0.000	0.000	0.000	0.000
4,925.000	0.000	0.000	0.000	0.000	0.000
4,950.000	0.000	0.000	0.000	0.000	0.000
4,975.000	0.000	0.000	0.000	0.000	0.000
5,000.000	0.000	0.000	0.000	0.000	0.000
5,025.000	0.000	0.000	0.000	0.000	0.000
5,050.000	0.000	0.000	0.000	0.000	0.000
5,075.000	0.000	0.000	0.000	0.000	0.000
5,100.000	0.000	0.000	0.000	0.000	0.000

Drawdown-Basin

Subsection: Time vs. Volume
Label: 1

Return Event: 0 years
Storm Event:

Time vs. Volume (ac-ft)

Output Time increment = 5.000 min
Time on left represents time for first value in each row.

Time (min)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)	Volume (ac-ft)
5,125.000	0.000	0.000	0.000	0.000	0.000
5,150.000	0.000	0.000	0.000	0.000	0.000
5,175.000	0.000	0.000	0.000	0.000	0.000
5,200.000	0.000	0.000	0.000	0.000	0.000
5,225.000	0.000	0.000	0.000	0.000	0.000
5,250.000	0.000	0.000	0.000	0.000	0.000
5,275.000	0.000	0.000	0.000	0.000	0.000
5,300.000	0.000	0.000	0.000	0.000	0.000
5,325.000	0.000	0.000	0.000	0.000	0.000
5,350.000	0.000	0.000	0.000	0.000	0.000
5,375.000	0.000	0.000	0.000	0.000	0.000
5,400.000	0.000	0.000	0.000	0.000	0.000
5,425.000	0.000	0.000	0.000	0.000	0.000
5,450.000	0.000	0.000	0.000	0.000	0.000
5,475.000	0.000	0.000	0.000	0.000	0.000
5,500.000	0.000	0.000	0.000	0.000	0.000
5,525.000	0.000	0.000	0.000	0.000	0.000
5,550.000	0.000	0.000	0.000	0.000	0.000
5,575.000	0.000	0.000	0.000	0.000	0.000
5,600.000	0.000	0.000	0.000	0.000	0.000
5,625.000	0.000	0.000	0.000	0.000	0.000
5,650.000	0.000	0.000	0.000	0.000	0.000
5,675.000	0.000	0.000	0.000	0.000	0.000
5,700.000	0.000	0.000	0.000	0.000	0.000
5,725.000	0.000	0.000	0.000	0.000	0.000
5,750.000	0.000	0.000	0.000	0.000	0.000
5,775.000	0.000	0.000	0.000	0.000	0.000
5,800.000	0.000	0.000	0.000	0.000	0.000
5,825.000	0.000	0.000	0.000	0.000	0.000
5,850.000	0.000	0.000	0.000	0.000	0.000
5,875.000	0.000	0.000	0.000	0.000	0.000
5,900.000	0.000	0.000	0.000	0.000	0.000
5,925.000	0.000	0.000	0.000	0.000	0.000
5,950.000	0.000	0.000	0.000	0.000	0.000
5,975.000	0.000	0.000	0.000	0.000	0.000
6,000.000	0.000	(N/A)	(N/A)	(N/A)	(N/A)

Drawdown-Basin

Subsection: Elevation-Area Volume Curve
Label: 1

Return Event: 0 years
Storm Event:

Elevation (ft)	Planimeter (ft^2)	Area (ft^2)	A1+A2+sqr (A1*A2) (ft^2)	Volume (ac-ft)	Volume (Total) (ac-ft)
618.00	0.0	10.000	0.000	0.000	0.000
620.00	0.0	11,864.990	12,219.446	0.187	0.187
622.00	0.0	13,998.000	38,750.430	0.593	0.780
624.00	0.0	16,234.564	45,307.424	0.693	1.473
626.00	0.0	18,581.852	52,185.015	0.799	2.272

Drawdown-Basin

Subsection: Volume Equations
Label: 1

Return Event: 0 years
Storm Event:

Pond Volume Equations
* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2 - El1) * (Area1 + Area2 + sqr(Area1 * Area2))

where:	EL1, EL2	Lower and upper elevations of the increment
	Area1, Area2	Areas computed for EL1, EL2, respectively
	Volume	Incremental volume between EL1 and EL2

Drawdown-Basin

Subsection: Outlet Input Data
Label: Outlet#1

Return Event: 0 years
Storm Event:

Requested Pond Water Surface Elevations	
Minimum (Headwater)	618.00 ft
Increment (Headwater)	0.10 ft
Maximum (Headwater)	626.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	TW	618.00	626.00
Orifice-Circular	Orifice - 2	Forward	TW	622.00	626.00
Rectangular Weir	Weir - 1	Forward	TW	624.00	626.00
Tailwater Settings	Tailwater			(N/A)	(N/A)

Drawdown-Basin

Subsection: Outlet Input Data
Label: Outlet#1

Return Event: 0 years
Storm Event:

Structure ID: Orifice - 1 Structure Type: Orifice-Circular	
Number of Openings	1
Elevation	618.00 ft
Orifice Diameter	3.0 in
Orifice Coefficient	0.670

Structure ID: Orifice - 2 Structure Type: Orifice-Circular	
Number of Openings	2
Elevation	622.00 ft
Orifice Diameter	5.0 in
Orifice Coefficient	0.670

Structure ID: Weir - 1 Structure Type: Rectangular Weir	
Number of Openings	1
Elevation	624.00 ft
Weir Length	15.71 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: TW Structure Type: TW Setup, DS Channel	
Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft^3/s
Flow Tolerance (Maximum)	10.000 ft^3/s

Drawdown-Basin

Subsection: Composite Rating Curve
Label: Outlet#1

Return Event: 0 years
Storm Event:

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft^3/s)	Tailwater Elevation (ft)	Convergence Error (ft)
618.00	0.00	(N/A)	0.00
618.10	0.02	(N/A)	0.00
618.20	0.06	(N/A)	0.00
618.30	0.11	(N/A)	0.00
618.40	0.14	(N/A)	0.00
618.50	0.16	(N/A)	0.00
618.60	0.18	(N/A)	0.00
618.70	0.20	(N/A)	0.00
618.80	0.22	(N/A)	0.00
618.90	0.23	(N/A)	0.00
619.00	0.25	(N/A)	0.00
619.10	0.26	(N/A)	0.00
619.20	0.27	(N/A)	0.00
619.30	0.29	(N/A)	0.00
619.40	0.30	(N/A)	0.00
619.50	0.31	(N/A)	0.00
619.60	0.32	(N/A)	0.00
619.70	0.33	(N/A)	0.00
619.80	0.34	(N/A)	0.00
619.90	0.35	(N/A)	0.00
620.00	0.36	(N/A)	0.00
620.10	0.37	(N/A)	0.00
620.20	0.38	(N/A)	0.00
620.30	0.39	(N/A)	0.00
620.40	0.40	(N/A)	0.00
620.50	0.41	(N/A)	0.00
620.60	0.42	(N/A)	0.00
620.70	0.42	(N/A)	0.00
620.80	0.43	(N/A)	0.00
620.90	0.44	(N/A)	0.00
621.00	0.45	(N/A)	0.00
621.10	0.46	(N/A)	0.00
621.20	0.46	(N/A)	0.00
621.30	0.47	(N/A)	0.00
621.40	0.48	(N/A)	0.00
621.50	0.48	(N/A)	0.00
621.60	0.49	(N/A)	0.00
621.70	0.50	(N/A)	0.00
621.80	0.51	(N/A)	0.00
621.90	0.51	(N/A)	0.00
622.00	0.52	(N/A)	0.00
622.10	0.57	(N/A)	0.00
622.20	0.69	(N/A)	0.00

Drawdown-Basin

Subsection: Composite Rating Curve
Label: Outlet#1

Return Event: 0 years
Storm Event:

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
622.30	0.87	(N/A)	0.00
622.40	1.09	(N/A)	0.00
622.50	1.34	(N/A)	0.00
622.60	1.48	(N/A)	0.00
622.70	1.59	(N/A)	0.00
622.80	1.70	(N/A)	0.00
622.90	1.80	(N/A)	0.00
623.00	1.89	(N/A)	0.00
623.10	1.97	(N/A)	0.00
623.20	2.05	(N/A)	0.00
623.30	2.13	(N/A)	0.00
623.40	2.21	(N/A)	0.00
623.50	2.28	(N/A)	0.00
623.60	2.35	(N/A)	0.00
623.70	2.41	(N/A)	0.00
623.80	2.48	(N/A)	0.00
623.90	2.54	(N/A)	0.00
624.00	2.60	(N/A)	0.00
624.10	4.15	(N/A)	0.00
624.20	6.93	(N/A)	0.00
624.30	10.52	(N/A)	0.00
624.40	14.75	(N/A)	0.00
624.50	19.55	(N/A)	0.00
624.60	24.84	(N/A)	0.00
624.70	30.59	(N/A)	0.00
624.80	36.76	(N/A)	0.00
624.90	43.33	(N/A)	0.00
625.00	50.27	(N/A)	0.00
625.10	57.56	(N/A)	0.00
625.20	65.19	(N/A)	0.00
625.30	73.14	(N/A)	0.00
625.40	81.40	(N/A)	0.00
625.50	89.96	(N/A)	0.00
625.60	98.80	(N/A)	0.00
625.70	107.93	(N/A)	0.00
625.80	117.33	(N/A)	0.00
625.90	126.98	(N/A)	0.00
626.00	136.90	(N/A)	0.00

Contributing Structures
None Contributing
Orifice - 1
Orifice - 1

Drawdown-Basin

Subsection: Composite Rating Curve
Label: Outlet#1

Return Event: 0 years
Storm Event:

Composite Outflow Summary

Contributing Structures
Orifice - 1
Orifice - 1
Orifice - 1
Orifice - 1
Orifice - 1
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Orifice - 1
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Orifice - 1
Orifice - 1
Orifice - 1
Orifice - 1
Orifice - 1
Orifice - 1
Orifice - 1
Orifice - 1
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2

Drawdown-Basin

Subsection: Composite Rating Curve
Label: Outlet#1

Return Event: 0 years
Storm Event:

Composite Outflow Summary

Contributing Structures
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1
Orifice - 1 + Orifice - 2 + Weir - 1

Drawdown-Basin

Subsection: Elevation-Volume-Flow Table (Pond)
Label: 1

Return Event: 0 years
Storm Event:

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	622.20 ft
Volume (Initial)	0.845 ac-ft
Flow (Initial Outlet)	0.69 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.69 ft³/s
Time Increment	5.000 min

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (ft²)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
618.00	0.00	0.000	10.000	0.00	0.00	0.00
618.10	0.02	0.000	71.411	0.00	0.02	0.04
618.20	0.06	0.000	188.752	0.00	0.06	0.16
618.30	0.11	0.001	362.024	0.00	0.11	0.40
618.40	0.14	0.002	591.226	0.00	0.14	0.74
618.50	0.16	0.004	876.358	0.00	0.16	1.25
618.60	0.18	0.006	1,217.421	0.00	0.18	1.97
618.70	0.20	0.009	1,614.414	0.00	0.20	2.92
618.80	0.22	0.014	2,067.337	0.00	0.22	4.17
618.90	0.23	0.019	2,576.191	0.00	0.23	5.73
619.00	0.25	0.025	3,140.975	0.00	0.25	7.64
619.10	0.26	0.033	3,761.690	0.00	0.26	9.95
619.20	0.27	0.043	4,438.335	0.00	0.27	12.70
619.30	0.29	0.054	5,170.911	0.00	0.29	15.91
619.40	0.30	0.067	5,959.417	0.00	0.30	19.63
619.50	0.31	0.081	6,803.853	0.00	0.31	23.89
619.60	0.32	0.098	7,704.220	0.00	0.32	28.74
619.70	0.33	0.117	8,660.517	0.00	0.33	34.20
619.80	0.34	0.138	9,672.744	0.00	0.34	40.32
619.90	0.35	0.161	10,740.902	0.00	0.35	47.13
620.00	0.36	0.187	11,864.990	0.00	0.36	54.67
620.10	0.37	0.214	11,967.455	0.00	0.37	62.62
620.20	0.38	0.242	12,070.361	0.00	0.38	70.65
620.30	0.39	0.270	12,173.708	0.00	0.39	78.74
620.40	0.40	0.298	12,277.495	0.00	0.40	86.89
620.50	0.41	0.326	12,381.722	0.00	0.41	95.12
620.60	0.42	0.355	12,486.390	0.00	0.42	103.42
620.70	0.42	0.383	12,591.499	0.00	0.42	111.79
620.80	0.43	0.413	12,697.048	0.00	0.43	120.23

Drawdown-Basin

Subsection: Elevation-Volume-Flow Table (Pond) Return Event: 0 years
Label: 1 Storm Event:

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (ft^2)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
620.90	0.44	0.442	12,803.038	0.00	0.44	128.73
621.00	0.45	0.471	12,909.468	0.00	0.45	137.31
621.10	0.46	0.501	13,016.339	0.00	0.46	145.96
621.20	0.46	0.531	13,123.650	0.00	0.46	154.68
621.30	0.47	0.561	13,231.402	0.00	0.47	163.48
621.40	0.48	0.592	13,339.594	0.00	0.48	172.34
621.50	0.48	0.623	13,448.227	0.00	0.48	181.28
621.60	0.49	0.654	13,557.300	0.00	0.49	190.29
621.70	0.50	0.685	13,666.814	0.00	0.50	199.37
621.80	0.51	0.716	13,776.769	0.00	0.51	208.52
621.90	0.51	0.748	13,887.164	0.00	0.51	217.75
622.00	0.52	0.780	13,998.000	0.00	0.52	227.05
622.10	0.57	0.812	14,105.893	0.00	0.57	236.47
622.20	0.69	0.845	14,214.200	0.00	0.69	246.03
622.30	0.87	0.878	14,322.922	0.00	0.87	255.72
622.40	1.09	0.911	14,432.058	0.00	1.09	265.53
622.50	1.34	0.944	14,541.608	0.00	1.34	275.44
622.60	1.48	0.977	14,651.572	0.00	1.48	285.30
622.70	1.59	1.011	14,761.950	0.00	1.59	295.22
622.80	1.70	1.045	14,872.743	0.00	1.70	305.21
622.90	1.80	1.079	14,983.950	0.00	1.80	315.26
623.00	1.89	1.114	15,095.571	0.00	1.89	325.37
623.10	1.97	1.149	15,207.606	0.00	1.97	335.56
623.20	2.05	1.184	15,320.056	0.00	2.05	345.82
623.30	2.13	1.219	15,432.920	0.00	2.13	356.15
623.40	2.21	1.255	15,546.198	0.00	2.21	366.55
623.50	2.28	1.290	15,659.890	0.00	2.28	377.02
623.60	2.35	1.327	15,773.996	0.00	2.35	387.57
623.70	2.41	1.363	15,888.517	0.00	2.41	398.19
623.80	2.48	1.399	16,003.452	0.00	2.48	408.88
623.90	2.54	1.436	16,118.801	0.00	2.54	419.66
624.00	2.60	1.473	16,234.564	0.00	2.60	430.50
624.10	4.15	1.511	16,348.165	0.00	4.15	442.91
624.20	6.93	1.549	16,462.163	0.00	6.93	456.63
624.30	10.52	1.586	16,576.557	0.00	10.52	471.23
624.40	14.75	1.625	16,691.347	0.00	14.75	486.55
624.50	19.55	1.663	16,806.533	0.00	19.55	502.51
624.60	24.84	1.702	16,922.115	0.00	24.84	519.05
624.70	30.59	1.741	17,038.093	0.00	30.59	536.12
624.80	36.76	1.780	17,154.467	0.00	36.76	553.69
624.90	43.33	1.820	17,271.237	0.00	43.33	571.73
625.00	50.27	1.859	17,388.404	0.00	50.27	590.22
625.10	57.56	1.899	17,505.966	0.00	57.56	609.15

Drawdown-Basin

Subsection: Elevation-Volume-Flow Table (Pond) Return Event: 0 years
Label: 1 Storm Event:

Elevation (ft)	Outflow (ft^3/s)	Storage (ac-ft)	Area (ft^2)	Infiltration (ft^3/s)	Flow (Total) (ft^3/s)	2S/t + O (ft^3/s)
625.20	65.19	1.940	17,623.925	0.00	65.19	628.49
625.30	73.14	1.980	17,742.279	0.00	73.14	648.22
625.40	81.40	2.021	17,861.030	0.00	81.40	668.35
625.50	89.96	2.062	17,980.177	0.00	89.96	688.86
625.60	98.80	2.104	18,099.720	0.00	98.80	709.73
625.70	107.93	2.145	18,219.658	0.00	107.93	730.96
625.80	117.33	2.187	18,339.993	0.00	117.33	752.54
625.90	126.98	2.230	18,460.725	0.00	126.98	774.47
626.00	136.90	2.272	18,581.852	0.00	136.90	796.73

Drawdown-Basin

Subsection: Level Pool Pond Routing Summary
Label: 1 (IN)

Return Event: 0 years
Storm Event:

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	622.20 ft
Volume (Initial)	0.845 ac-ft
Flow (Initial Outlet)	0.69 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.69 ft³/s
Time Increment	5.000 min

Inflow/Outflow Hydrograph Summary			
Flow (Peak In)	0.00 ft³/s	Time to Peak (Flow, In)	0.000 min
Flow (Peak Outlet)	0.69 ft³/s	Time to Peak (Flow, Outlet)	0.000 min

Elevation (Water Surface, Peak)	622.19 ft
Volume (Peak)	0.840 ac-ft

Mass Balance (ac-ft)	
Volume (Initial)	0.845 ac-ft
Volume (Total Inflow)	0.000 ac-ft
Volume (Total Infiltration)	0.000 ac-ft
Volume (Total Outlet Outflow)	0.845 ac-ft
Volume (Retained)	0.000 ac-ft
Volume (Unrouted)	0.000 ac-ft
Error (Mass Balance)	0.0 %

Drawdown-Basin

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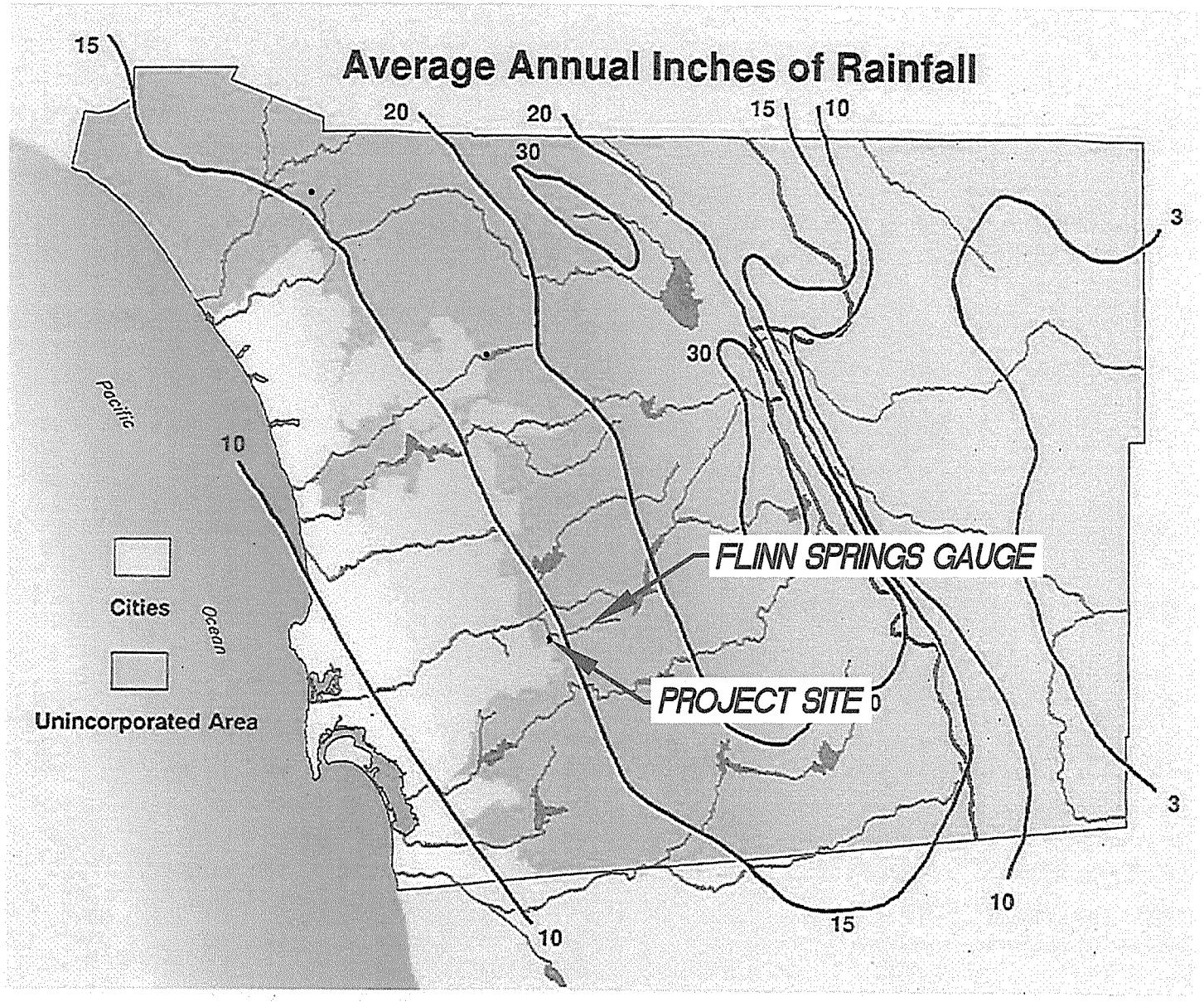
APPENDIX 3

Supplemental Information

Rain Gage Location Map

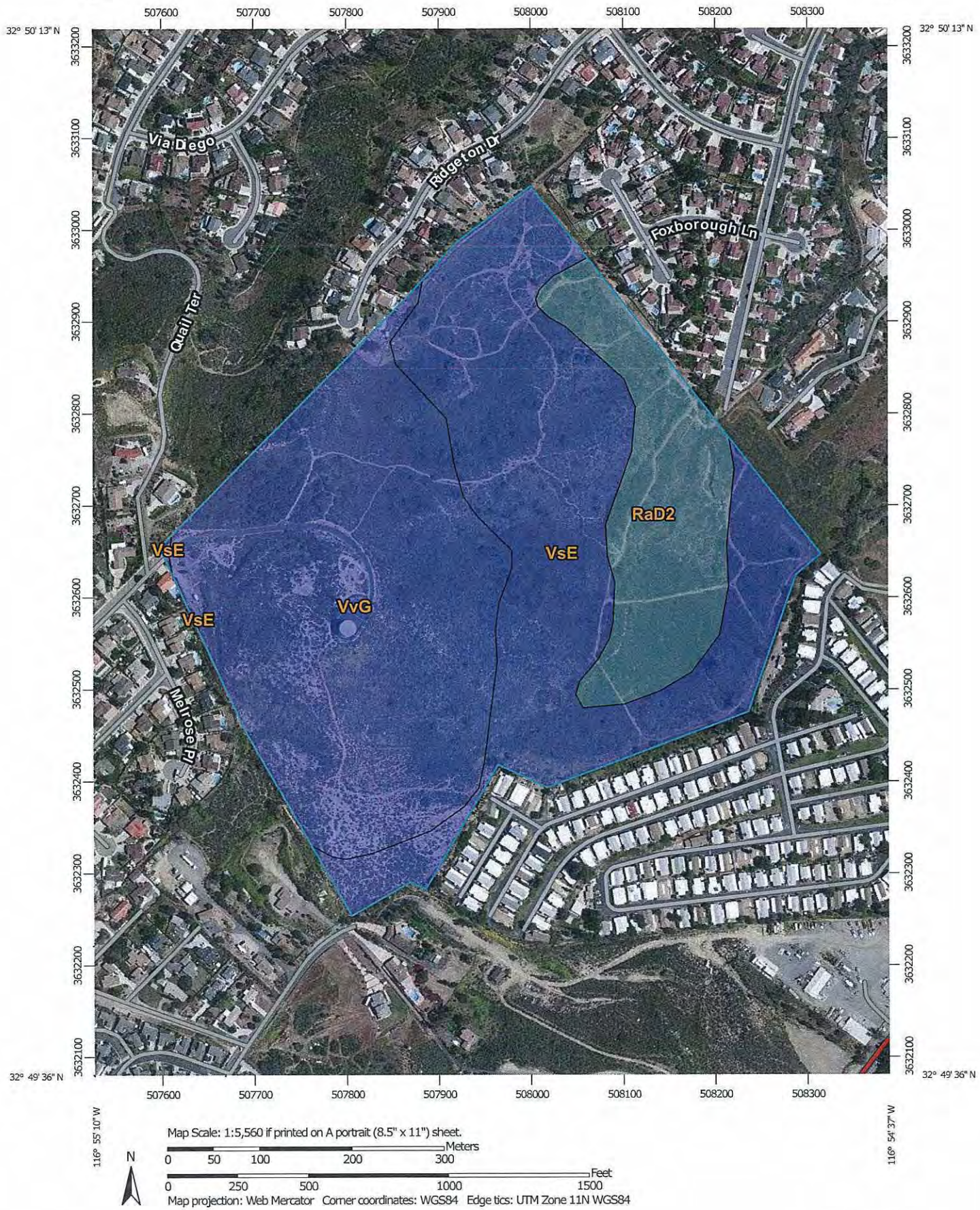


Average Annual Inches of Rainfall in San Diego
(not to be used for design calculations)

FIGURE
1-2

Hydrologic Soil Group Map

Hydrologic Soil Group—San Diego County Area, California
(Brightwater Ranch Project Site)



MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: San Diego County Area, California
Survey Area Data: Version 7, Nov 15, 2013

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

Date(s) aerial images were photographed: May 2, 2010—May 6, 2010

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — San Diego County Area, California (CA638)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
RaD2	Ramona sandy loam, 9 to 15 percent slopes, eroded	C	12.1	15.8%
VsE	Vista coarse sandy loam, 15 to 30 percent slopes	B	30.7	40.1%
VvG	Vista rocky coarse sandy loam, 30 to 65 percent slopes	B	33.7	44.1%
Totals for Area of Interest			**76.4**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

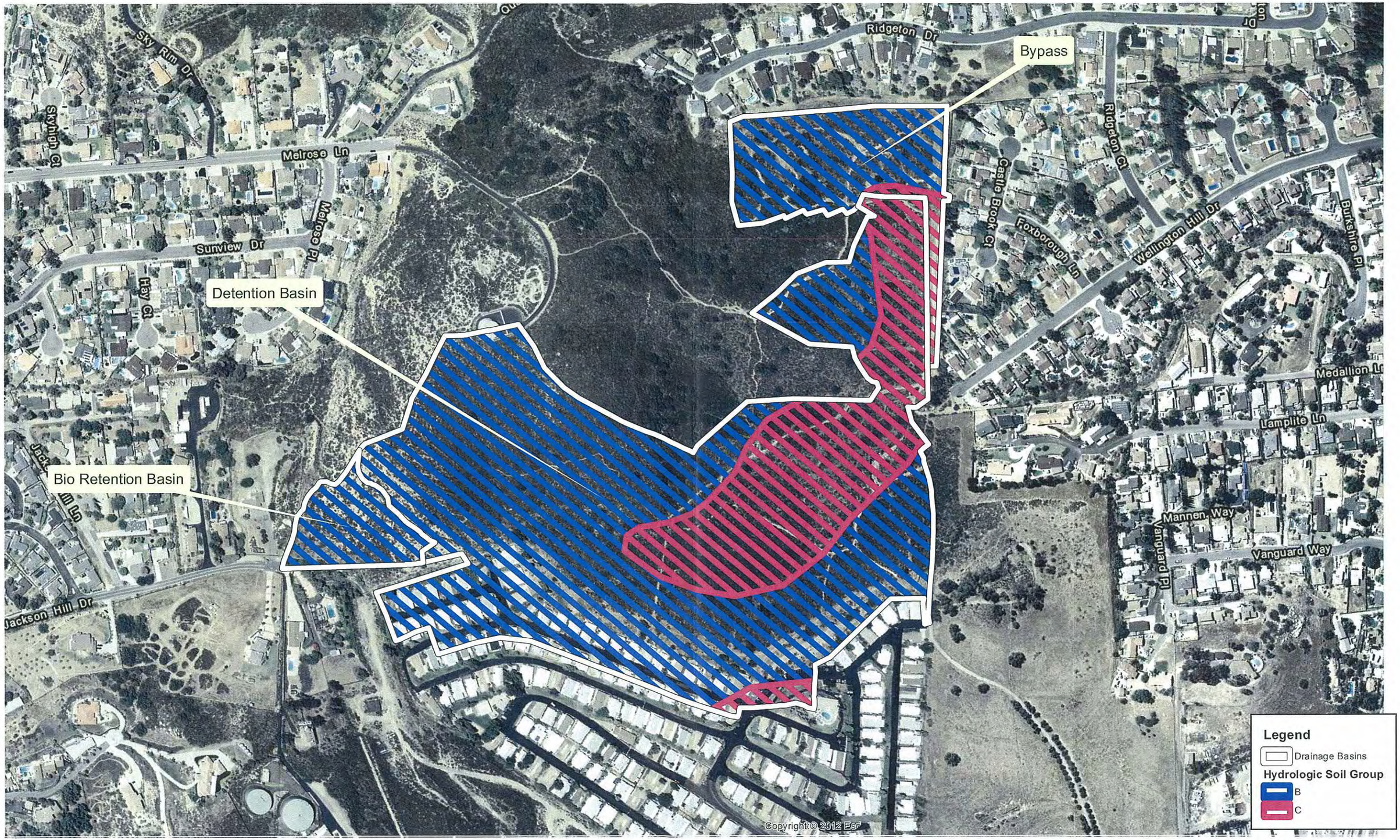
Tie-break Rule: Higher

APPENDIX 4

CD Containing SDHM Input and Output Files

APPENDIX 5

Exhibits



Soil Exhibit
For Hydromodification Analysis

Brightwater

Date: 1/28/2015
Name: 2862_02_Soils
Path: P:\2862.02\GIS\MXD\2862_02_Soils.mxd

GIS exhibits may be composed from various sources with different levels of accuracy. For details on accuracy of this exhibit please refer to Meta Data provided.

0 150 300 Feet

PROJECT DESIGN CONSULTANTS