

PRELIMINARY TECHNICAL INFORMATION REPORT

Hidden Ridge Estates

City of Camas, Washington

Prepared for:

CAMVEST gm LLC
7905 NE 173RD AVE
VANCOUVER WA, 98682

Prepared by:

ENGINEERING NORTHWEST PLLC

Paul Williams P.E.
7504 NW 10th Avenue
Vancouver, WA 98665
(360) 931-3122
paulwilliamspe@gmail.com

ENGINEERING NORTHWEST

CERTIFICATION OF ENGINEERING

The technical information and data contained in this report was prepared under the direction and supervision of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below. This TIR meets the minimum requirements of the City of Camas stormwater ordinances and 2019 Stormwater Management Manual for Western Washington.



Contents

Section A – Project Overview.....	4
Section A.1 Site Information.....	4
Section B – Minimum Requirements	5
Section B.1 – Determination of Minimum Requirements	5
Table A.1: Threshold Discharge Area ID	5
Appendix A: Maps.....	10
Appendix B: Flow charts	18
Appendix C: Natural Drainage Flow Pattern	21
Appendix D: WWHM SCREEN SHOT	23
Appendix e: DESIGN FOR PERKFILTER.....	25
Appendix F: WWHM	27
Appendix H: ISO MAPS.....	28
Appendix I: Basin map	29

SECTION A – PROJECT OVERVIEW

Section A.1 Site Information

The proposed Hidden Ridge Estates subdivision will be located east side Ingles Road in the City of Camas, Washington (See Vicinity Map). The proposed project will construct 14 single-family homes, a private road, a stormwater facility and landscaping. The remainder of the existing site will not be altered; this includes the open area located north portion of the site.

The proposed storm design will meet the requirements of the City of Camas and 2019 Stormwater Management Manual for Western Washington.

Topography

The project site is approximately 7.61 acres in size. The site has modest to steep slopes with a ditch located along the NE Ingles Road. The highest elevation of 340 feet is located in the southeast portion of the parcel. The lowest elevation of 280 feet is located along the southwest corner of the property. Site slopes are approximately 15% towards the west property line.

Hydrology

Stormwater runoff sheet flows from approx. at the high point which is 340-feet west of the east property line. From the high point the stormwater runoff sheet flows west to NE Ingles Road. The stormwater that sheet flows to the NE Ingles road ditch. Conveyance system “ditch” runs along west property line. This ditch collects public road runoff, and runoff from the property to the east.

Basin Areas

Impervious and pervious surface areas for the pre-developed, existing and post-developed conditions site are shown in Table A-1. The impervious area includes roofs, access drives,

sidewalks, and private road while previous area includes landscaping. Pre-Developed conditions are defined as forested.

Due to soil properties in this area, it is unlikely stormwater management by infiltration BMPs will not be applicable.

Section B – Minimum Requirements

Section B.1 – Determination of Minimum Requirements

Proposed land disturbance will consist of 14 single family homes with a private street. Since the amount of proposed hard surfaces is more than 5,000 square feet, this project is required to meet Minimum Requirements 1-9

TABLE A.1: THRESHOLD DISCHARGE AREA ID Basin 1	Square Feet
Existing hard Surface	12,500
New hard surfaces	74,801
Replaced hard surfaces	0
Native vegetation converted to lawn/landscape	25,000
Native vegetation converted to pasture	0
Total land disturbing activity	93,501
New and replaced pollution generating hard surfaces (PGHS)	32,801
Non-pollution generating surface	42,000

The developed basin's effective hard surfaces and their applicability to meeting the Minimum Requirements 6-8 are summarized in Table A.2 below.

TABLE A.2 EFFECTIVE HARD SURFACES			
Hard Surface Area	MR #6 Required (Y/N)	MR#7 Required (Y/N)	MR#8 Required (Y/N)
32,801	Y	Y	N

City of City of Camas stormwater ordinances requires that the project discharge less than the pre-development rate. The pre-development site was model in WWHM2012 as forested condition for the proposed project disturbed area.

Section C -Soils Evaluation

The "Soil Survey of Clark County. Washington" indicates the soil at this site consist of the following:

(OmE) Olympic Clay loam, 5 to 45 percent slopes

Clark County GIS indicates that the site soils are designed as Soil Group 3 – Moderately Drained Soils for use with the Western Washington Hydrology Model (WWHM2012).

Onsite native soil is not suitable for infiltration, thus infiltration testing was not performed onsite.

Section D – Source Control

There are not any prohibited discharges planned for this site. A stormwater pollution plan (SWPPP) will be prepared for the final technical report for the project. The SWPPP will identify and list BMPs for Source Control and will include BMPs to prohibit sediment-laden runoff from leaving the site and impacting any local or State water. In addition, BMPs will be

implemented as necessary to prevent pollutants from coming in contact with the stormwater system.

The proposed site is being developed with activities that are pollution generating. The following BMP categories have some degree of applicability, in particular, BMPs for Landscaping and Lawn/Vegetation Management and Maintenance of Stormwater Drainage and Treatment System.

All source control BMPs in the private street will be the responsibility of the HOA per their established maintenance procedures. The stormwater facilities will be privately owned and maintained in a manner consistent with the Stormwater Facility Maintenance Manual and BMPs for landscaping and Lawn/Vegetation Management.

Individual lot owners will be responsible for source control BMPs related to installing and maintaining landscaping and roof downspout systems on their respective lots. This responsibility includes the prevention of introduction of pollutants into their system(s). The application of appropriate maintenance measures will also provide source control.

Additional Reference: SMMWW, Volume IV, Chapter 2 - Selection of Operational and Structural Source Control BMPs; 2.2 Pollutant Source-Specific BMPs

BMPs for Dust Control at Disturbed Land Areas and Unpaved Roadways and Parking Lots

BMPs for Landscaping and Lawn/ Vegetation Management

BMPs for Maintenance of Stormwater Drainage and Treatment Systems BMPs for Urban Streets

Section E - Onsite Stormwater Management BMPs

An Erosion Control Plan will be developed for the implementation of BMPs to manage stormwater during grading activities. These BMPs will be shown on the erosion control plan.

Individual lot owners will be responsible for installing and maintaining roof downspout systems on their respective lots consistent with Volume III, Chapter 3.1.1 of the SMMWW.

Section F - Runoff Treatment and Design

- 1) Basic stormwater treatment is required for the private streets in this project.
- 2) Phosphorous removal is also required.

The runoff from areas requiring treatment will be routed to specific Old Castle PerkFilter Systems (or Contech Stormfilter Systems). The systems will be off-line in nature and be sized to treat the off-line flow rate determined from a WWHM2012 analysis.

The management of flows above the WQ flow rates will be directed to the particular storm line system. The existing site release to a proposed stormwater pipe in NE Ingles Road.

Initial installation cost and the expenses associated with long-term maintenance are expected to be typical of projects with similar street sections and with runoff from interior lots. The lots along the west side will have pervious surfaces that will run onto pollution-generating impervious surfaces (PGIS). The amount of pollution-generating surfaces is:

Private Street Easement = 0.34 acres impervious portion

From Lots = 0.361 ac. previous + 0.374 ac. roofs/drives Total = 1.031 acres

Section G - Flow Control Analysis and Design

The project proposes a large pipe to store clean stormwater runoff. A control manhole will meter the stormwater from the storage pipe and slowly release runoff to the proposed stormwater pipe in NE Ingles Road. The WWHM model for the project show flow duration has passed

Section I - "Wetlands Protection"

No wetland in the area.

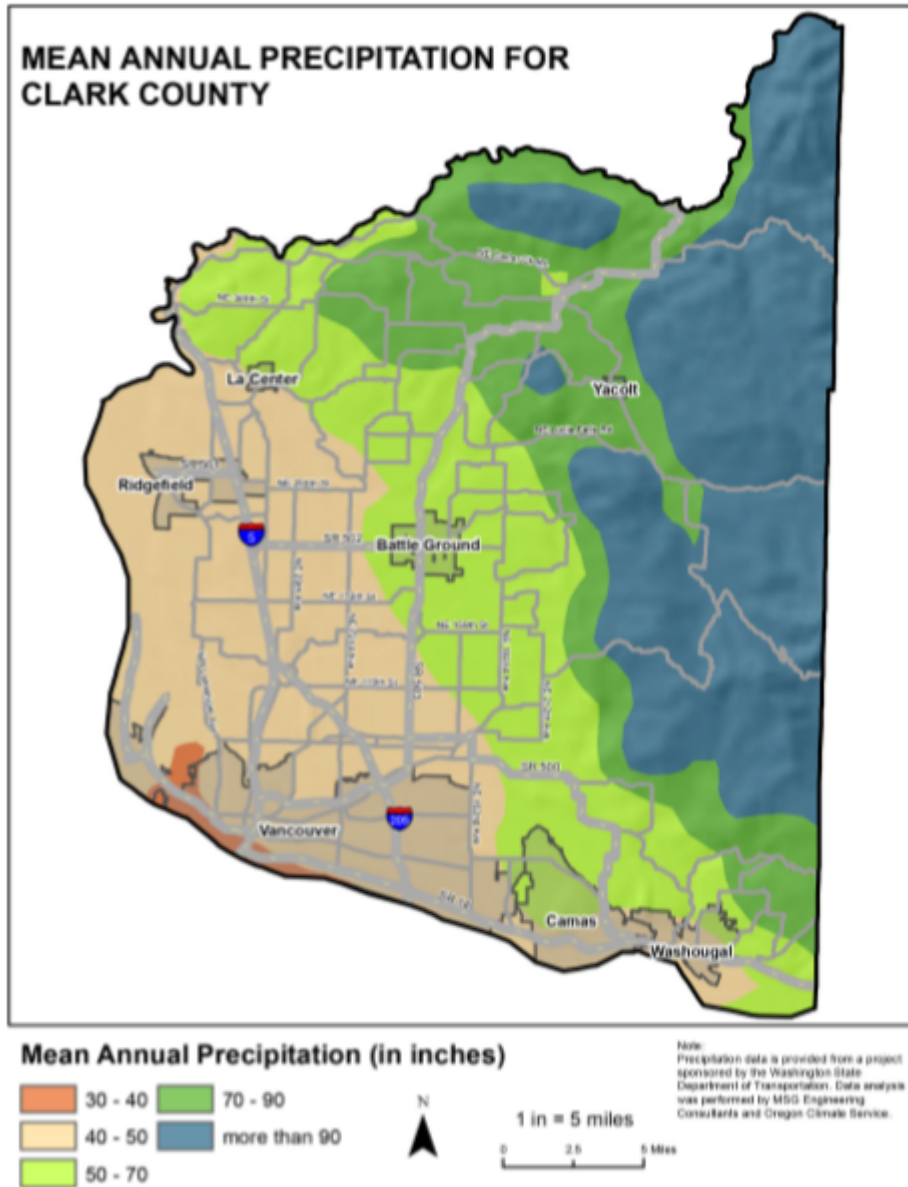


Figure 15: Mean Annual Precipitation in Clark County



APPENDIX A: MAPS



AERIAL



Legend

- Taxlots
- Cities Boundaries
- Urban Growth Boundaries



1: 2,424

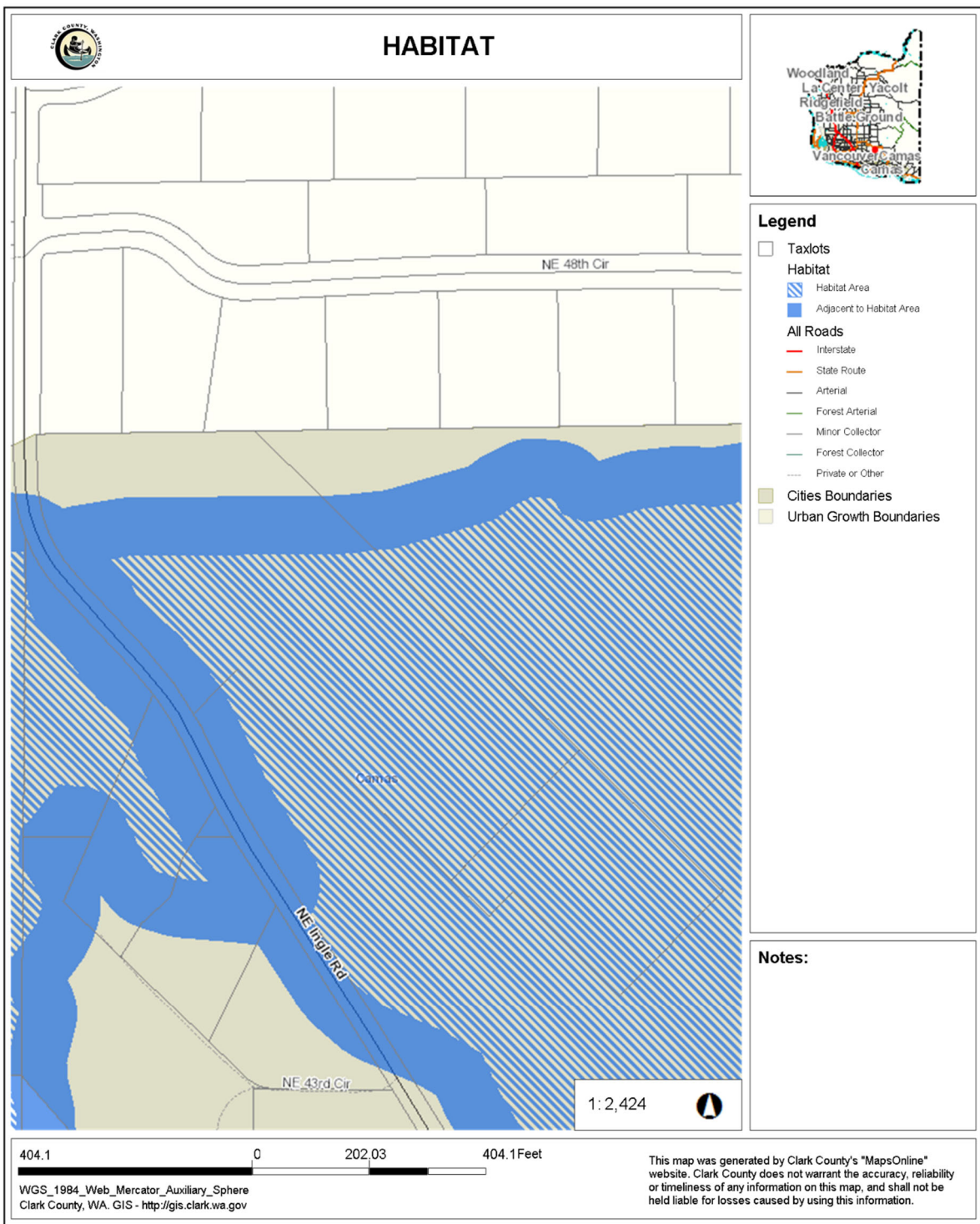


Notes:

404.1 0 202.03 404.1 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - <http://gis.clark.wa.gov>

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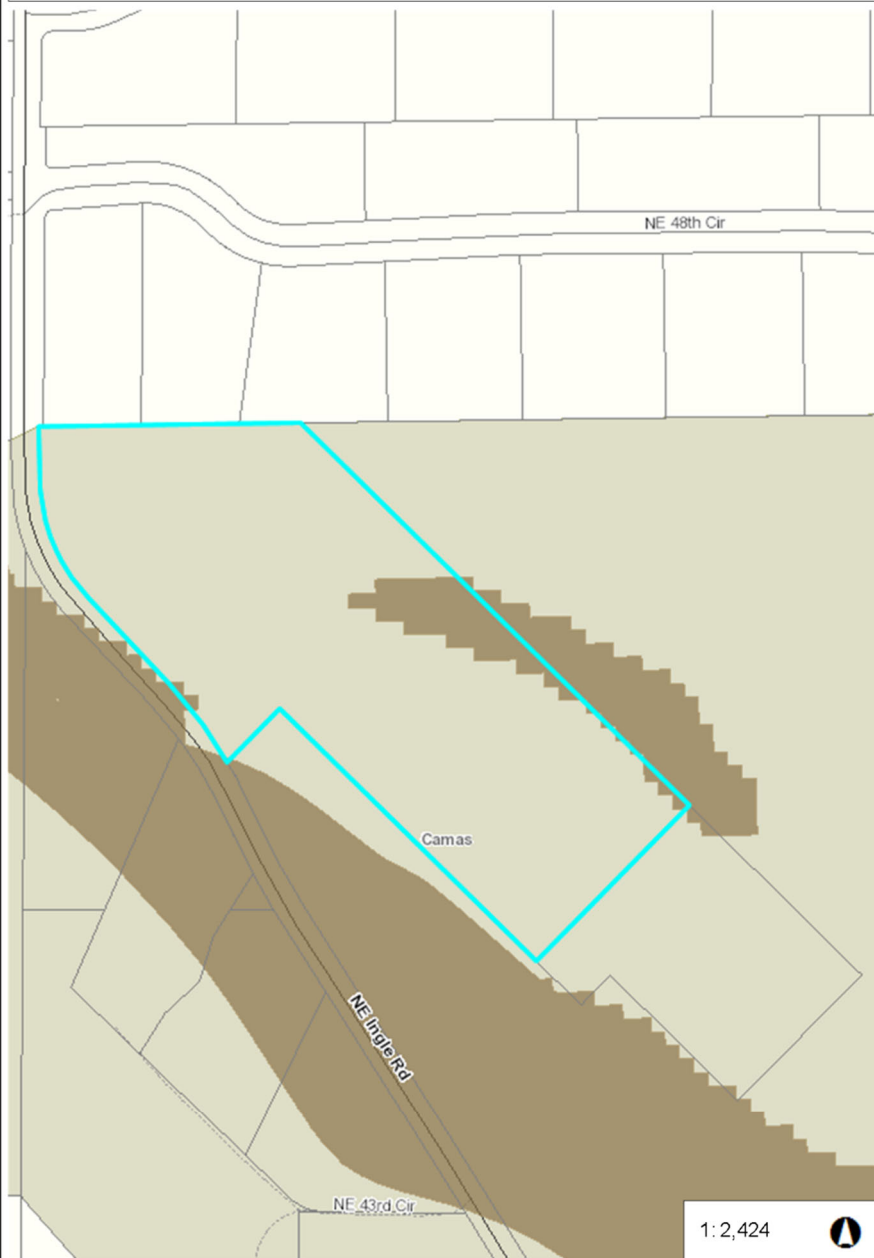


Severe Erosion Hazard



Legend

- Taxlots
- Severe Erosion Hazard
- All Roads**
 - Interstate
 - State Route
 - Arterial
 - Forest Arterial
 - Minor Collector
 - Forest Collector
 - Private or Other
- Cities Boundaries
- Urban Growth Boundaries



Notes:

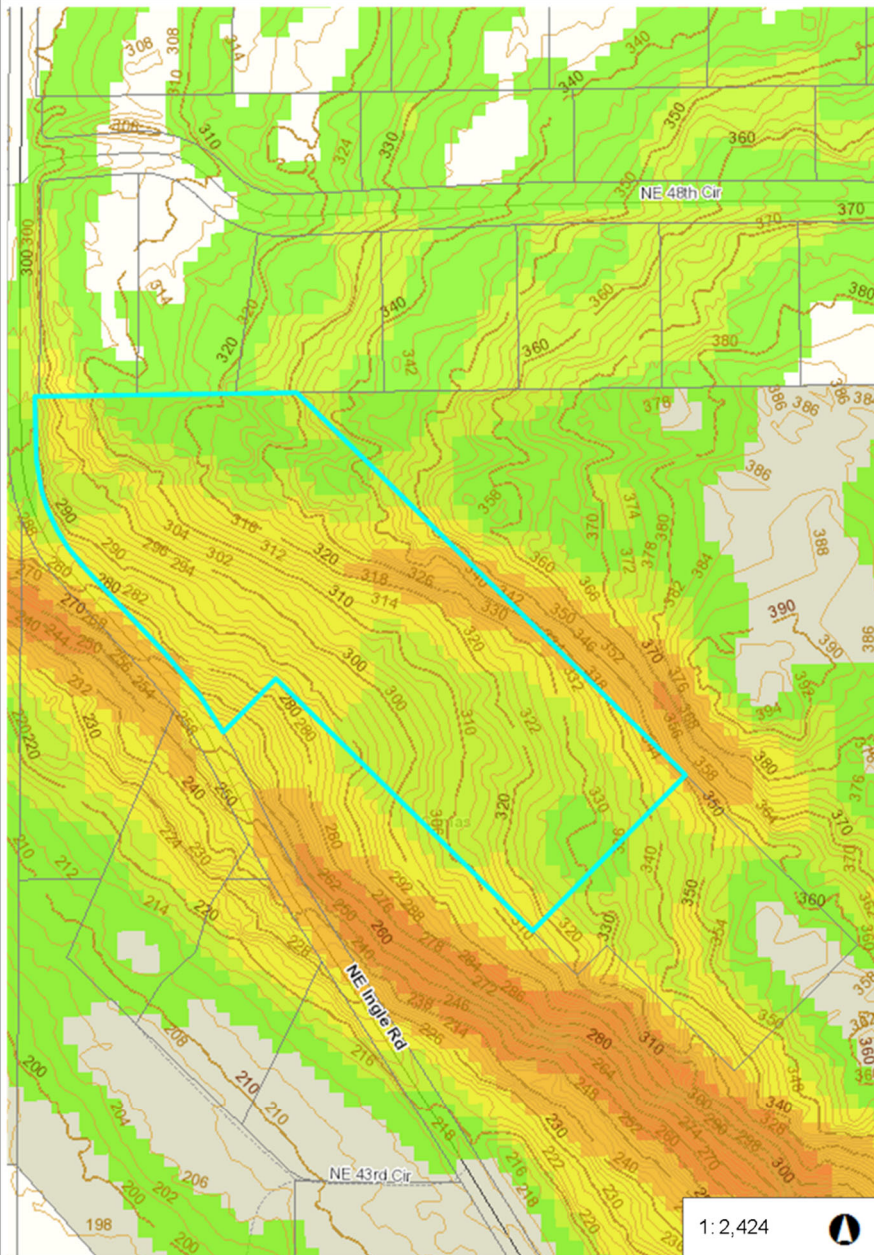
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Clark County, WA. GIS - <http://gis.clark.wa.gov>

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CONTOUR AND SLOPES



Legend

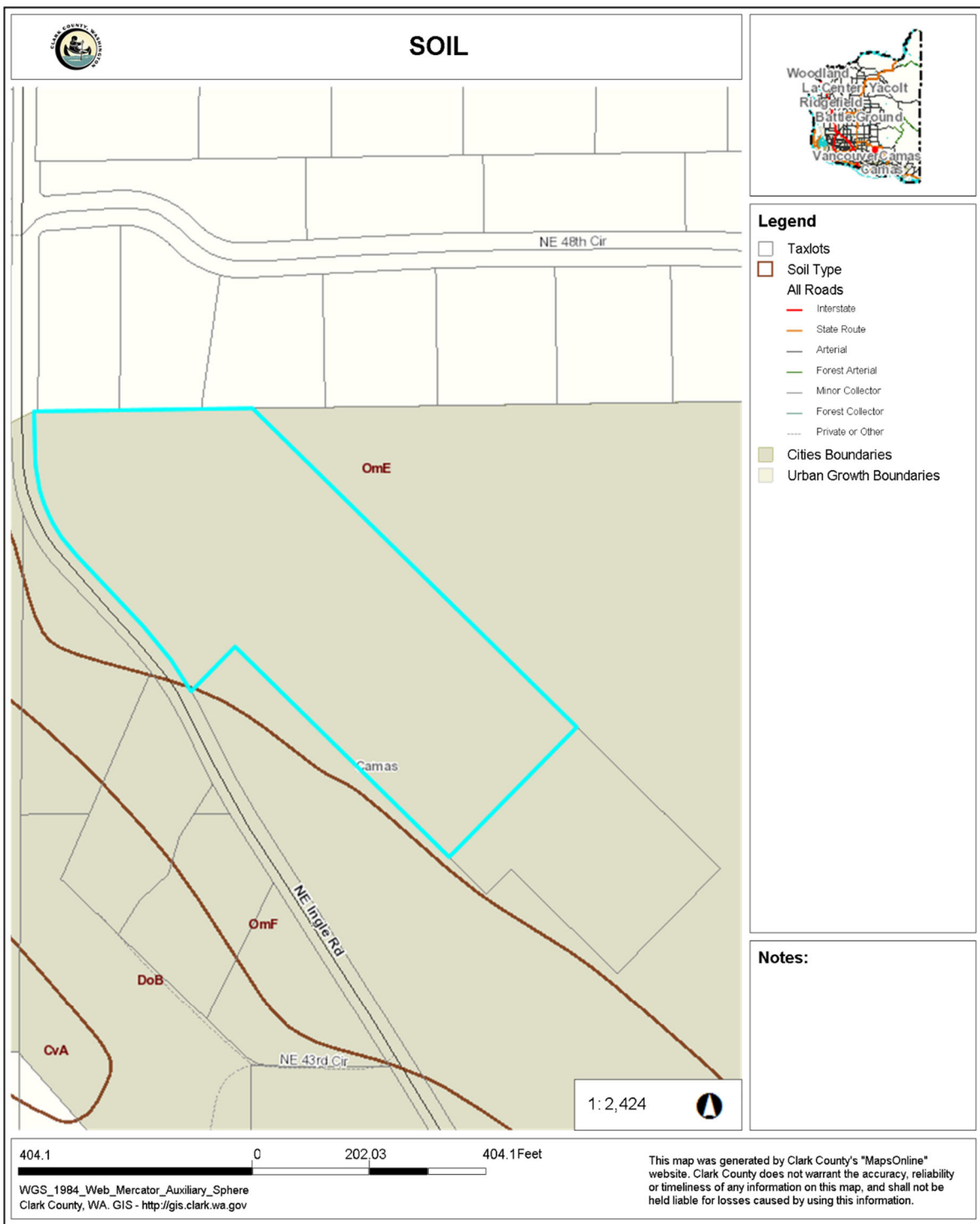
- Taxlots
- Contour Lines - 2 ft
- Contour Lines - 10 ft
- Slopes
 - less than 5 Percent
 - 5-10 Percent
 - 10-15 Percent
 - 15-25 Percent
 - 25-40 Percent
 - 40 - 100 Percent
- All Roads
 - Interstate
 - State Route
 - Arterial
 - Forest Arterial
 - Minor Collector
 - Forest Collector
 - Private or Other
- Cities Boundaries
- Urban Growth Boundaries

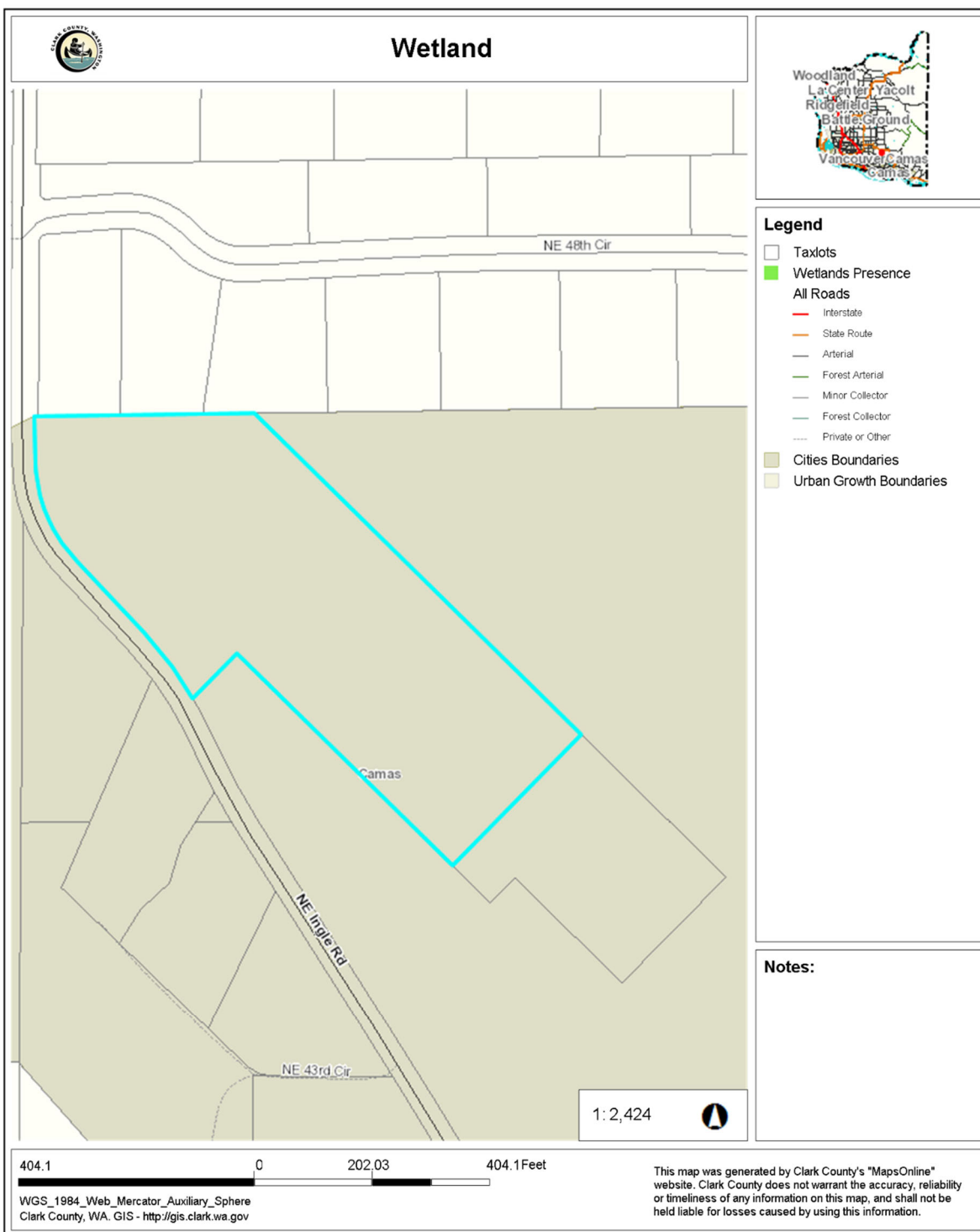
Notes:

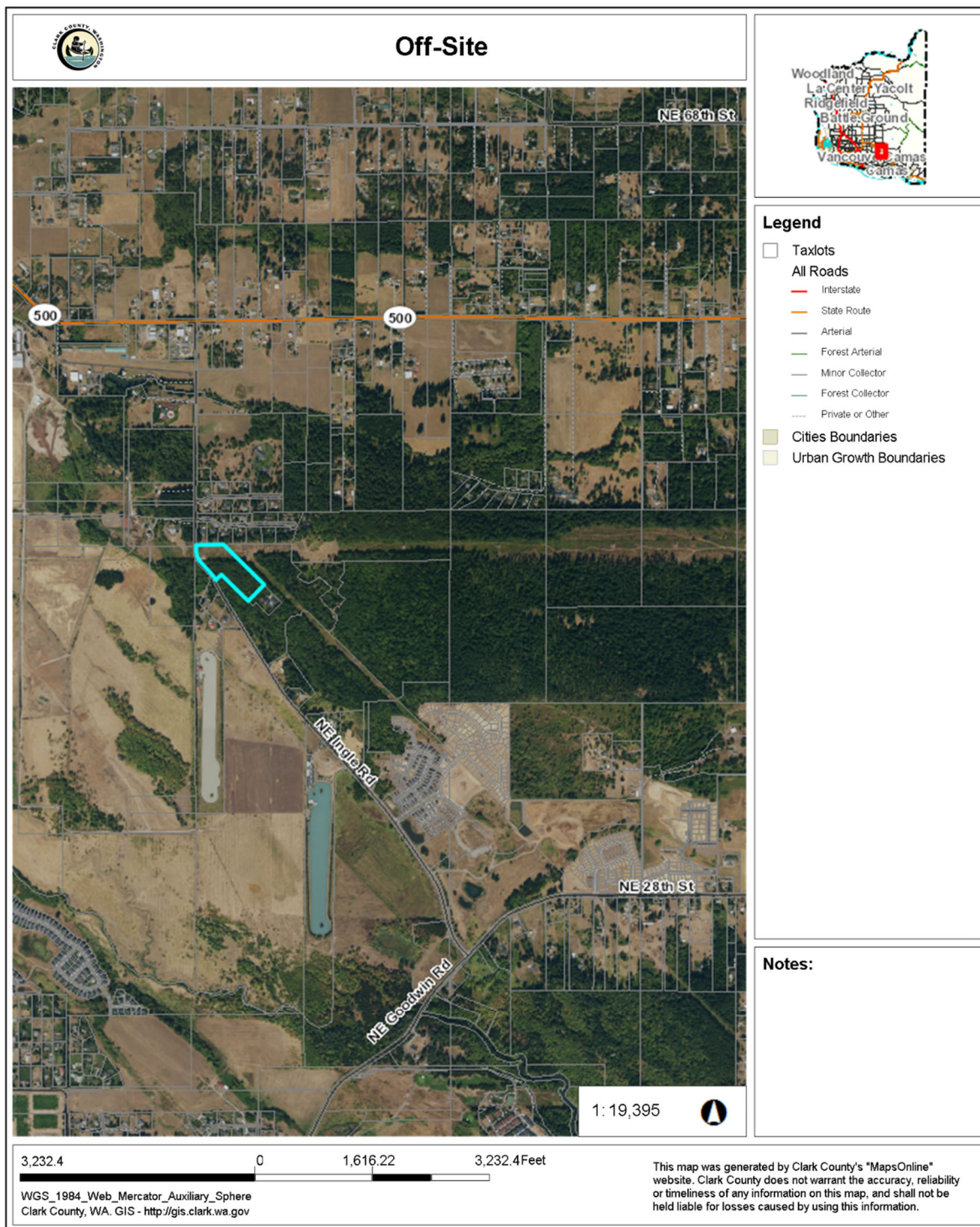
404.1 0 202.03 404.1 Feet

WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - <http://gis.clark.wa.gov>

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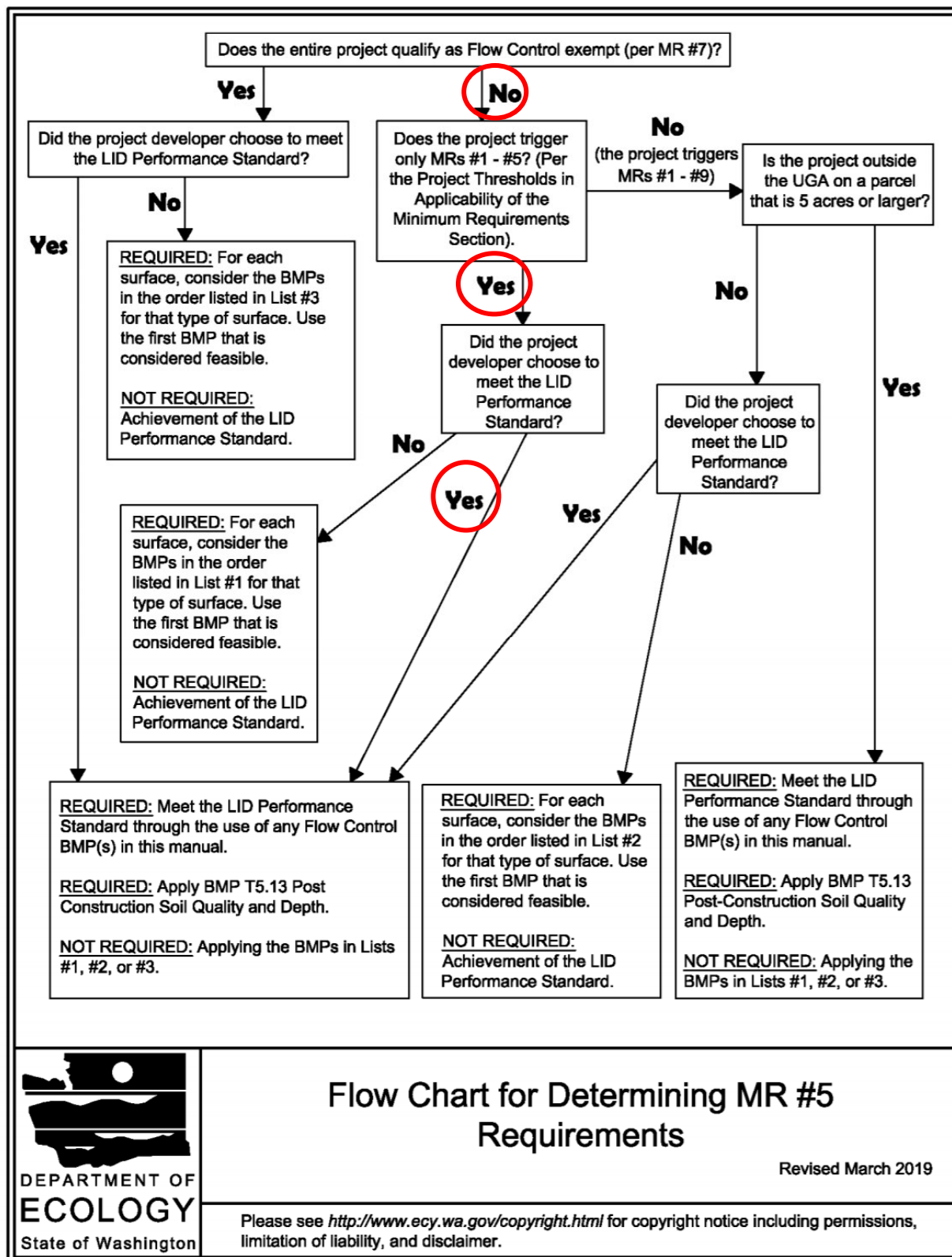


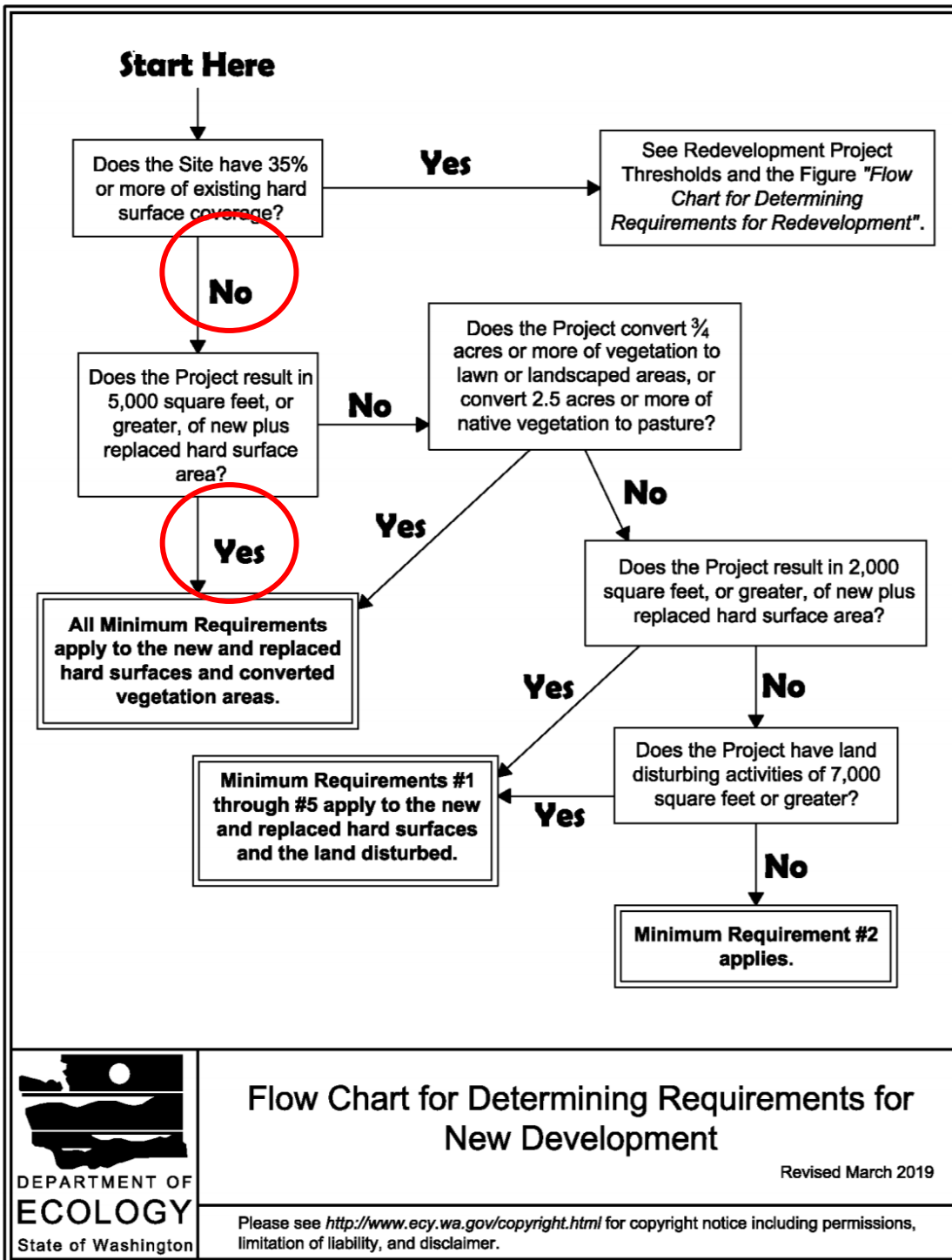


Off-site Map



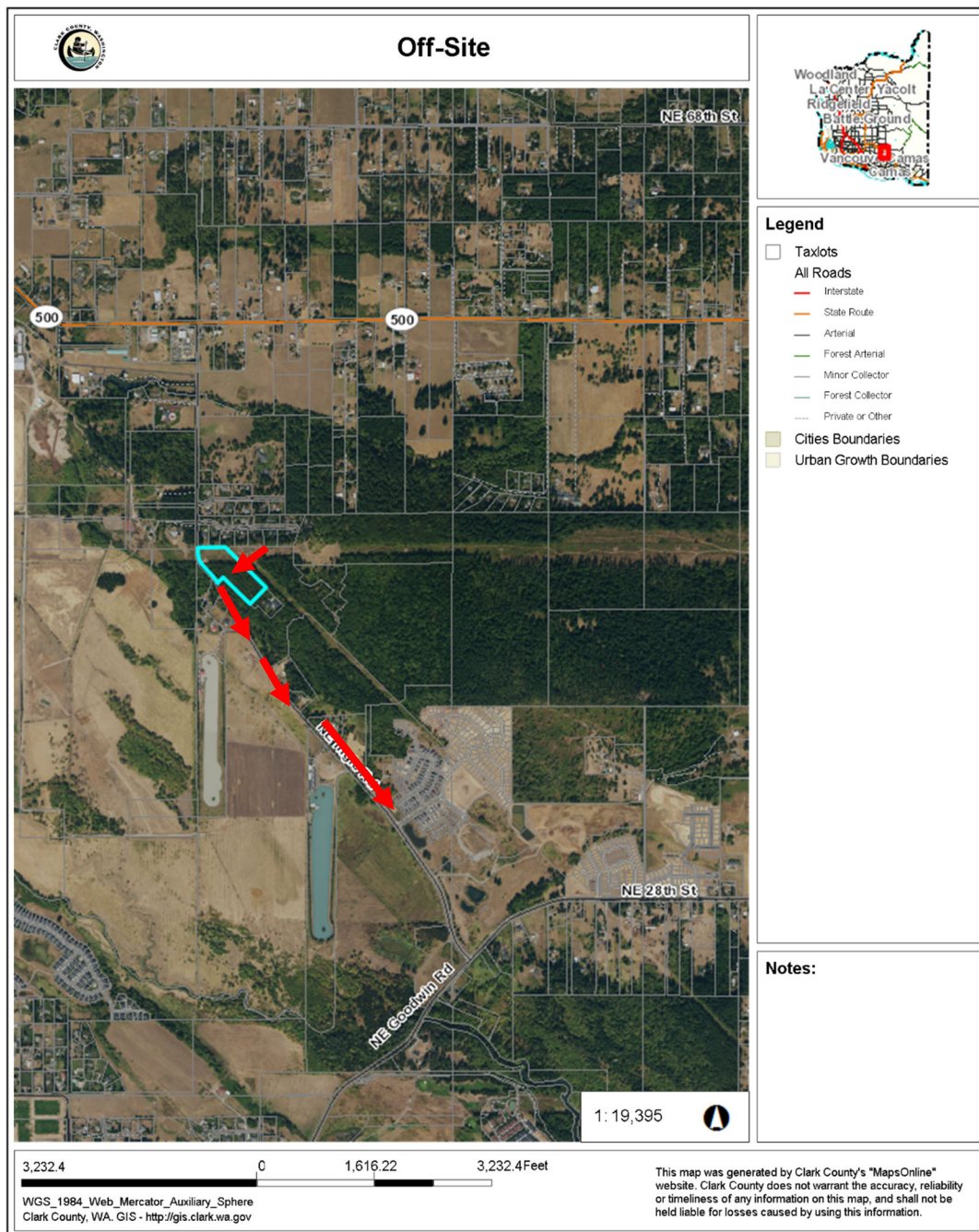
APPENDIX B: FLOW CHARTS





Minimum Requirement #8 Flow Chart

APPENDIX C: NATURAL DRAINAGE FLOW PATTERN



→ **DRAINAGE FLOW PATH**

Natural Drainage Flow



APPENDIX D: WWHM SCREEN SHOT

(WATER QUALITY SYSTEM DESIGN)

Mitigated Report Summary

Mitigated Scenario Report Options

Water Quality Results

Tank 1 [POC Number 1]

Water Quality BMP Flow and Volume Calculations

On-line facility volume (ac-ft):	0.2877
On-line facility target flow (cfs):	0.1558
Adjusted for 15 min (cfs):	0.1558
Off-line facility target flow (cfs):	0.0861
Adjusted for 15 min (cfs):	0.0861

Model Default Modifications Water Quality General Model Information

Landuse Basin Data Routing Elements POC Data

Analysis

Run Analysis

Water Quality

On-Line BMP		Off-Line BMP	
24 hour Volume (ac-ft)	0.2877		
Standard Flow Rate (cfs)	0.1558	Standard Flow Rate (cfs)	0.0861

Stream Protection Duration LID Duration Flow Frequency Water Quality Hydrograph

Wetland Input Volumes LID Report Recharge Duration Recharge Predeveloped Recharge Mitigated

Analyze datasets Compact WDM Delete Selected ☐ Monthly FF [v]

501 POC 1 Predeveloped flow
801 POC 1 Mitigated flow

All Datasets Flow Stage Precip Evap POC 1

Flood Frequency Method

- ☒ Log Pearson Type III 17B
- ☐ Weibull
- ☐ Cunnane
- ☐ Gringorten



APPENDIX E: DESIGN FOR PERKFILTER

Kristar/Oldcastle Precast, Inc. FloGard Perk Filter™ (using ZPC Filter Media)

Ecology's Decision:

Based on Kristar/Oldcastle's application submissions, including the Draft Technical Evaluation Report, dated April 2010, Ecology hereby issues the following use level designations:

- 1. General use level designation (GULD) for the Perk Filter™ for basic treatment:**
 - Using a zeolite-perlite-carbon (ZPC) filter media as specified by Kristar/Oldcastle.
 - Sized at hydraulic loading rate of no more than 1.5 gpm/ft² of media surface area, per Table 1.

Table 1. Design Flowrate per Cartridge

Effective Cartridge Height (inches)	12	18
Cartridge Flowrate (gpm/cartridge)	6.8	10.2

- 2. General use level designation (GULD) for the Perk Filter™ for phosphorus treatment:**
 - Using a zeolite-perlite-carbon (ZPC) filter media as specified by Kristar/Oldcastle.
 - Sized at hydraulic loading rate of no more than 1.5 gpm/ft² of media surface area, per Table 1.
- 3. Ecology approves Perk Filter™ units for treatment at the hydraulic loading rates shown in Table 1, and sized based on the water quality design flow rate for an off-line system. The internal weir in the inlet chamber functions as a bypass to route flow in excess of the water quality design flow rate around the treatment chamber. Calculate the water quality design flow rate using the following procedures:**

6.8 gpm (12" cartridge) = 0.0152 cfs and 0.0861/0.0152 = 5.66 cartridges thus 6 cartridges



APPENDIX F: WWHM

WWHM2012
PROJECT REPORT

General Model Information

Project Name: Hidden Ridge Estates 3
Site Name: Hidden Ridge Estates
Site Address:
City: Camas
Report Date: 10/23/2019
Gage: Lacamas
Data Start: 1948/10/01
Data End: 2008/09/30
Timestep: 15 Minute
Precip Scale: 1.300
Version Date: 2018/10/10
Version: 4.2.16

POC Thresholds

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

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass: No

GroundWater: No

Pervious Land Use acre

SG3, Forest, Mod 2.15

SG3, Forest, Steep 5.46

Pervious Total 7.61

Impervious Land Use acre

Impervious Total 0

Basin Total 7.61

Element Flows To:

Surface

Interflow

Groundwater

Mitigated Land Use

Basin 1

Bypass:	Yes
GroundWater:	No
Pervious Land Use	acre
SG3, Forest, Steep	0.75
SG3, Forest, Mod	4.794
Pervious Total	5.544
Impervious Land Use	acre
Impervious Total	0
Basin Total	5.544

Element Flows To:		
Surface	Interflow	Groundwater

Private Street

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
SG3, Lawn, Mod	0.163
Pervious Total	0.163
Impervious Land Use	acre
ROADS MOD	0.57
DRIVEWAYS MOD	0.19
SIDEWALKS MOD	0.183
Impervious Total	0.943
Basin Total	1.106

Element Flows To:		
Surface	Interflow	Groundwater
Tank 1	Tank 1	

Lot 1 - 14 Roofs

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
ROOF TOPS FLAT	0.96
Impervious Total	0.96
Basin Total	0.96

Element Flows To:		
Surface	Interflow	Groundwater
Tank 2	Tank 2	

Routing Elements

Predeveloped Routing

Mitigated Routing

Tank 1

Dimensions
Depth: 5 ft.
Tank Type: Circular
Diameter: 5 ft.
Length: 520 ft.
Discharge Structure
Riser Height: 4.5 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 0.125 in. Elevation: 0 ft.
Element Flows To:
Outlet 1 Outlet 2

Tank Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.000	0.000	0.000	0.000
0.0556	240.6	8.932	0.000	0.000
0.1111	338.4	25.18	0.000	0.000
0.1667	412.0	46.10	0.000	0.000
0.2222	473.1	70.73	0.000	0.000
0.2778	525.8	98.51	0.000	0.000
0.3333	572.6	129.0	0.000	0.000
0.3889	614.8	162.0	0.000	0.000
0.4444	653.3	197.3	0.000	0.000
0.5000	688.7	234.5	0.000	0.000
0.5556	721.4	273.7	0.000	0.000
0.6111	751.9	314.7	0.000	0.000
0.6667	780.3	357.2	0.000	0.000
0.7222	807.0	401.3	0.000	0.000
0.7778	832.0	446.9	0.000	0.000
0.8333	855.5	493.8	0.000	0.000
0.8889	877.7	541.9	0.000	0.000
0.9444	898.5	591.3	0.000	0.000
1.0000	918.2	641.7	0.000	0.000
1.0556	936.8	693.3	0.000	0.000
1.1111	954.4	745.8	0.000	0.000
1.1667	970.9	799.3	0.000	0.000
1.2222	986.5	853.7	0.000	0.000
1.2778	1001.	908.9	0.000	0.000
1.3333	1015.	964.9	0.000	0.000
1.3889	1028.	1021.	0.000	0.000
1.4444	1040.	1079.	0.000	0.000
1.5000	1052.	1137.	0.000	0.000
1.5556	1062.	1196.	0.000	0.000
1.6111	1072.	1255.	0.000	0.000
1.6667	1082.	1315.	0.000	0.000
1.7222	1090.	1375.	0.000	0.000
1.7778	1098.	1436.	0.000	0.000
1.8333	1106.	1497.	0.000	0.000
1.8889	1113.	1559.	0.000	0.000
1.9444	1119.	1621.	0.000	0.000
2.0000	1124.	1683.	0.000	0.000
2.0556	1129.	1746.	0.000	0.000

2.1111	1133.	1809.	0.000	0.000
2.1667	1137.	1872.	0.000	0.000
2.2222	1140.	1935.	0.000	0.000
2.2778	1143.	1999.	0.000	0.000
2.3333	1145.	2062.	0.000	0.000
2.3889	1146.	2126.	0.000	0.000
2.4444	1147.	2190.	0.000	0.000
2.5000	1147.	2253.	0.000	0.000
2.5556	1147.	2317.	0.000	0.000
2.6111	1146.	2381.	0.000	0.000
2.6667	1145.	2444.	0.000	0.000
2.7222	1143.	2508.	0.000	0.000
2.7778	1140.	2571.	0.000	0.000
2.8333	1137.	2635.	0.000	0.000
2.8889	1133.	2698.	0.000	0.000
2.9444	1129.	2761.	0.000	0.000
3.0000	1124.	2823.	0.000	0.000
3.0556	1119.	2886.	0.000	0.000
3.1111	1113.	2948.	0.000	0.000
3.1667	1106.	3009.	0.000	0.000
3.2222	1098.	3071.	0.000	0.000
3.2778	1090.	3131.	0.000	0.000
3.3333	1082.	3192.	0.000	0.000
3.3889	1072.	3252.	0.000	0.000
3.4444	1062.	3311.	0.000	0.000
3.5000	1052.	3370.	0.000	0.000
3.5556	1040.	3428.	0.000	0.000
3.6111	1028.	3485.	0.000	0.000
3.6667	1015.	3542.	0.000	0.000
3.7222	1001.	3598.	0.000	0.000
3.7778	986.5	3653.	0.000	0.000
3.8333	970.9	3708.	0.000	0.000
3.8889	954.4	3761.	0.000	0.000
3.9444	936.8	3814.	0.000	0.000
4.0000	918.2	3865.	0.000	0.000
4.0556	898.5	3916.	0.000	0.000
4.1111	877.7	3965.	0.000	0.000
4.1667	855.5	4013.	0.000	0.000
4.2222	832.0	4060.	0.000	0.000
4.2778	807.0	4106.	0.000	0.000
4.3333	780.3	4150.	0.000	0.000
4.3889	751.9	4192.	0.000	0.000
4.4444	721.4	4233.	0.000	0.000
4.5000	688.7	4272.	0.000	0.000
4.5556	653.3	4310.	0.139	0.000
4.6111	614.8	4345.	0.390	0.000
4.6667	572.6	4378.	0.704	0.000
4.7222	525.8	4409.	1.047	0.000
4.7778	473.1	4436.	1.384	0.000
4.8333	412.0	4461.	1.684	0.000
4.8889	338.4	4482.	1.922	0.000
4.9444	240.6	4498.	2.089	0.000
5.0000	0.000	4507.	2.204	0.000
5.0556	0.000	0.000	2.348	0.000

Tank 2

Dimensions
 Depth: 3.5 ft.
 Tank Type: Circular
 Diameter: 3.5 ft.
 Length: 1125 ft.
 Discharge Structure
 Riser Height: 3 ft.
 Riser Diameter: 12 in.
 Orifice 1 Diameter: 0.25 in. Elevation: 0 ft.
 Element Flows To:
 Outlet 1 Outlet 2

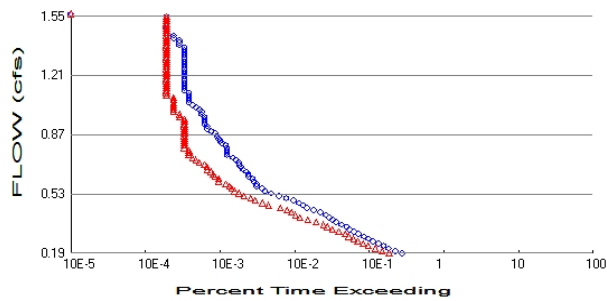
Tank Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.000	0.000	0.000	0.000
0.0389	1.895	0.049	0.000	0.000
0.0778	2.664	0.138	0.000	0.000
0.1167	3.245	0.254	0.000	0.000
0.1556	3.725	0.389	0.000	0.000
0.1944	4.141	0.543	0.000	0.000
0.2333	4.509	0.711	0.000	0.000
0.2722	4.841	0.893	0.000	0.000
0.3111	5.144	1.087	0.000	0.000
0.3500	5.423	1.293	0.001	0.000
0.3889	5.681	1.509	0.001	0.000
0.4278	5.921	1.734	0.001	0.000
0.4667	6.145	1.969	0.001	0.000
0.5056	6.355	2.212	0.001	0.000
0.5444	6.552	2.463	0.001	0.000
0.5833	6.737	2.722	0.001	0.000
0.6222	6.911	2.987	0.001	0.000
0.6611	7.076	3.259	0.001	0.000
0.7000	7.231	3.537	0.001	0.000
0.7389	7.377	3.821	0.001	0.000
0.7778	7.516	4.111	0.001	0.000
0.8167	7.646	4.406	0.001	0.000
0.8556	7.769	4.706	0.001	0.000
0.8944	7.885	5.010	0.001	0.000
0.9333	7.994	5.319	0.001	0.000
0.9722	8.097	5.632	0.001	0.000
1.0111	8.194	5.949	0.001	0.000
1.0500	8.284	6.269	0.001	0.000
1.0889	8.369	6.593	0.001	0.000
1.1278	8.448	6.920	0.001	0.000
1.1667	8.522	7.250	0.001	0.000
1.2056	8.590	7.583	0.001	0.000
1.2444	8.653	7.918	0.001	0.000
1.2833	8.711	8.256	0.001	0.000
1.3222	8.765	8.596	0.002	0.000
1.3611	8.813	8.937	0.002	0.000
1.4000	8.856	9.281	0.002	0.000
1.4389	8.895	9.626	0.002	0.000
1.4778	8.929	9.973	0.002	0.000
1.5167	8.958	10.32	0.002	0.000

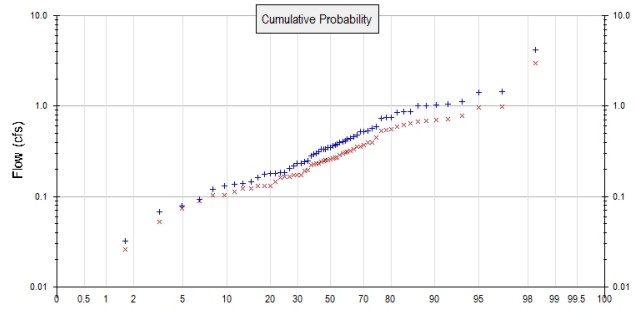
1.5556	8.983	10.67	0.002	0.000
1.5944	9.003	11.02	0.002	0.000
1.6333	9.019	11.37	0.002	0.000
1.6722	9.030	11.72	0.002	0.000
1.7111	9.037	12.07	0.002	0.000
1.7500	9.039	12.42	0.002	0.000
1.7889	9.037	12.77	0.002	0.000
1.8278	9.030	13.12	0.002	0.000
1.8667	9.019	13.47	0.002	0.000
1.9056	9.003	13.82	0.002	0.000
1.9444	8.983	14.17	0.002	0.000
1.9833	8.958	14.52	0.002	0.000
2.0222	8.929	14.87	0.002	0.000
2.0611	8.895	15.22	0.002	0.000
2.1000	8.856	15.56	0.002	0.000
2.1389	8.813	15.91	0.002	0.000
2.1778	8.765	16.25	0.002	0.000
2.2167	8.711	16.59	0.002	0.000
2.2556	8.653	16.92	0.002	0.000
2.2944	8.590	17.26	0.002	0.000
2.3333	8.522	17.59	0.002	0.000
2.3722	8.448	17.92	0.002	0.000
2.4111	8.369	18.25	0.002	0.000
2.4500	8.284	18.57	0.002	0.000
2.4889	8.194	18.89	0.002	0.000
2.5278	8.097	19.21	0.002	0.000
2.5667	7.994	19.52	0.002	0.000
2.6056	7.885	19.83	0.002	0.000
2.6444	7.769	20.14	0.002	0.000
2.6833	7.646	20.44	0.002	0.000
2.7222	7.516	20.73	0.002	0.000
2.7611	7.377	21.02	0.002	0.000
2.8000	7.231	21.31	0.002	0.000
2.8389	7.076	21.58	0.002	0.000
2.8778	6.911	21.86	0.002	0.000
2.9167	6.737	22.12	0.002	0.000
2.9556	6.552	22.38	0.002	0.000
2.9944	6.355	22.63	0.002	0.000
3.0333	6.145	22.87	0.067	0.000
3.0722	5.921	23.11	0.208	0.000
3.1111	5.681	23.33	0.392	0.000
3.1500	5.423	23.55	0.607	0.000
3.1889	5.144	23.76	0.841	0.000
3.2278	4.841	23.95	1.083	0.000
3.2667	4.509	24.13	1.321	0.000
3.3056	4.141	24.30	1.543	0.000
3.3444	3.725	24.45	1.739	0.000
3.3833	3.245	24.59	1.903	0.000
3.4222	2.664	24.70	2.032	0.000
3.4611	1.895	24.79	2.129	0.000
3.5000	0.000	24.84	2.206	0.000
3.5389	0.000	0.000	2.315	0.000

Analysis Results

POC 1



+ Predeveloped x Mitigated



Predeveloped Landuse Totals for POC #1

Total Pervious Area: 7.61
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1

Total Pervious Area: 5.707
Total Impervious Area: 1.903

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.382204
5 year	0.773841
10 year	1.036809
25 year	1.344392
50 year	1.548746
100 year	1.730609

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.27978
5 year	0.55157
10 year	0.74374
25 year	0.983411
50 year	1.154045
100 year	1.315455

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.332	0.243
1950	0.315	0.230
1951	0.878	0.591
1952	0.234	0.163
1953	0.436	0.303
1954	1.000	0.670
1955	0.371	0.254
1956	1.014	0.704
1957	0.592	0.399
1958	0.349	0.233

1959	0.241	0.171
1960	0.182	0.131
1961	0.476	0.334
1962	0.184	0.130
1963	0.246	0.173
1964	0.332	0.268
1965	0.524	0.359
1966	0.413	0.310
1967	0.365	0.264
1968	0.404	0.322
1969	0.528	0.373
1970	4.197	2.993
1971	0.185	0.165
1972	0.398	0.311
1973	0.132	0.122
1974	0.743	0.562
1975	0.282	0.250
1976	0.742	0.545
1977	0.006	0.008
1978	1.121	0.782
1979	0.093	0.090
1980	0.301	0.270
1981	0.865	0.640
1982	0.571	0.451
1983	1.447	0.991
1984	0.230	0.192
1985	0.203	0.195
1986	0.161	0.146
1987	0.856	0.624
1988	0.138	0.104
1989	0.121	0.104
1990	0.139	0.131
1991	0.332	0.221
1992	0.376	0.258
1993	0.180	0.123
1994	0.294	0.252
1995	0.177	0.166
1996	1.416	0.967
1997	1.050	0.723
1998	0.346	0.229
1999	0.462	0.352
2000	0.432	0.287
2001	0.032	0.026
2002	1.033	0.689
2003	0.727	0.538
2004	0.078	0.073
2005	0.067	0.052
2006	0.521	0.398
2007	0.216	0.173
2008	0.144	0.114

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	4.1966	2.9934
2	1.4468	0.9914
3	1.4155	0.9671
4	1.1209	0.7823

5	1.0503	0.7233
6	1.0328	0.7043
7	1.0140	0.6891
8	1.0001	0.6701
9	0.8784	0.6402
10	0.8655	0.6243
11	0.8559	0.5908
12	0.7433	0.5619
13	0.7422	0.5446
14	0.7272	0.5381
15	0.5921	0.4512
16	0.5711	0.3990
17	0.5282	0.3976
18	0.5238	0.3725
19	0.5208	0.3590
20	0.4760	0.3524
21	0.4623	0.3339
22	0.4361	0.3216
23	0.4317	0.3111
24	0.4127	0.3098
25	0.4040	0.3027
26	0.3984	0.2871
27	0.3760	0.2698
28	0.3713	0.2685
29	0.3647	0.2642
30	0.3492	0.2577
31	0.3457	0.2540
32	0.3323	0.2520
33	0.3322	0.2495
34	0.3316	0.2426
35	0.3154	0.2332
36	0.3009	0.2303
37	0.2944	0.2289
38	0.2821	0.2210
39	0.2461	0.1949
40	0.2407	0.1924
41	0.2343	0.1732
42	0.2302	0.1726
43	0.2158	0.1714
44	0.2026	0.1660
45	0.1854	0.1648
46	0.1842	0.1633
47	0.1816	0.1456
48	0.1800	0.1312
49	0.1771	0.1306
50	0.1607	0.1303
51	0.1441	0.1233
52	0.1387	0.1222
53	0.1378	0.1138
54	0.1320	0.1041
55	0.1207	0.1036
56	0.0926	0.0900
57	0.0783	0.0730
58	0.0675	0.0523
59	0.0318	0.0258
60	0.0061	0.0075

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1911	5729	3865	67	Pass
0.2048	4702	3112	66	Pass
0.2185	3842	2516	65	Pass
0.2322	3246	2038	62	Pass
0.2460	2771	1730	62	Pass
0.2597	2363	1473	62	Pass
0.2734	2033	1290	63	Pass
0.2871	1766	1117	63	Pass
0.3008	1515	991	65	Pass
0.3145	1306	816	62	Pass
0.3282	1141	670	58	Pass
0.3420	1040	580	55	Pass
0.3557	890	509	57	Pass
0.3694	757	407	53	Pass
0.3831	675	316	46	Pass
0.3968	613	247	40	Pass
0.4105	545	215	39	Pass
0.4242	459	190	41	Pass
0.4379	378	166	43	Pass
0.4517	305	134	43	Pass
0.4654	270	94	34	Pass
0.4791	240	78	32	Pass
0.4928	202	62	30	Pass
0.5065	161	54	33	Pass
0.5202	128	44	34	Pass
0.5339	102	38	37	Pass
0.5477	84	33	39	Pass
0.5614	76	30	39	Pass
0.5751	65	28	43	Pass
0.5888	64	25	39	Pass
0.6025	59	20	33	Pass
0.6162	57	20	35	Pass
0.6299	51	18	35	Pass
0.6437	50	17	34	Pass
0.6574	47	16	34	Pass
0.6711	43	14	32	Pass
0.6848	40	14	35	Pass
0.6985	38	13	34	Pass
0.7122	37	11	29	Pass
0.7259	34	10	29	Pass
0.7396	31	9	29	Pass
0.7534	26	8	30	Pass
0.7671	26	8	30	Pass
0.7808	26	8	30	Pass
0.7945	26	7	26	Pass
0.8082	25	7	28	Pass
0.8219	22	7	31	Pass
0.8356	21	7	33	Pass
0.8494	20	7	35	Pass
0.8631	19	7	36	Pass
0.8768	18	7	38	Pass
0.8905	16	7	43	Pass
0.9042	14	7	50	Pass

0.9179	14	7	50	Pass
0.9316	13	7	53	Pass
0.9453	13	7	53	Pass
0.9591	13	7	53	Pass
0.9728	13	6	46	Pass
0.9865	12	6	50	Pass
1.0002	12	5	41	Pass
1.0139	11	5	45	Pass
1.0276	10	5	50	Pass
1.0413	9	5	55	Pass
1.0551	8	5	62	Pass
1.0688	8	5	62	Pass
1.0825	8	5	62	Pass
1.0962	8	4	50	Pass
1.1099	8	4	50	Pass
1.1236	7	4	57	Pass
1.1373	7	4	57	Pass
1.1511	7	4	57	Pass
1.1648	7	4	57	Pass
1.1785	7	4	57	Pass
1.1922	7	4	57	Pass
1.2059	7	4	57	Pass
1.2196	7	4	57	Pass
1.2333	7	4	57	Pass
1.2470	7	4	57	Pass
1.2608	7	4	57	Pass
1.2745	7	4	57	Pass
1.2882	7	4	57	Pass
1.3019	7	4	57	Pass
1.3156	7	4	57	Pass
1.3293	7	4	57	Pass
1.3430	7	4	57	Pass
1.3568	7	4	57	Pass
1.3705	7	4	57	Pass
1.3842	6	4	66	Pass
1.3979	6	4	66	Pass
1.4116	6	4	66	Pass
1.4253	5	4	80	Pass
1.4390	5	4	80	Pass
1.4528	4	4	100	Pass
1.4665	4	4	100	Pass
1.4802	4	4	100	Pass
1.4939	4	4	100	Pass
1.5076	4	4	100	Pass
1.5213	4	4	100	Pass
1.5350	4	4	100	Pass
1.5487	4	4	100	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

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

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Tank 1 POC	☐	8.28			☐	0.00			
Tank 2 POC	☐	151.98			☐	0.00			
Total Volume Infiltrated		160.26	0.00	0.00		0.00	0.00	0%	No Treat Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

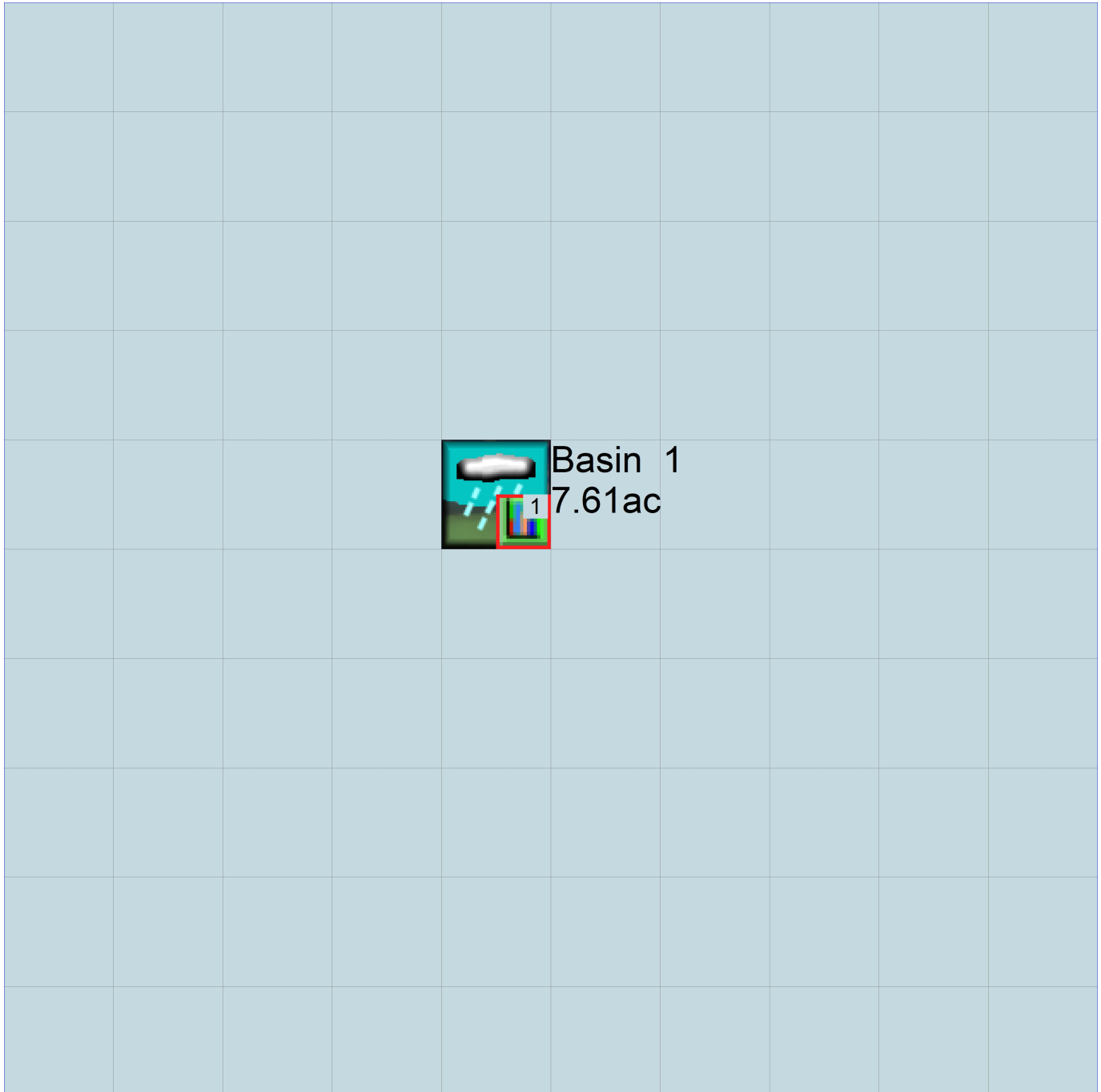
No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix

Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

RUN

GLOBAL

```
WWM4 model simulation
START      1948 10 01      END      2008 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      Hidden Ridge Estates 3.wdm
MESSU    25      PreHidden Ridge Estates 3.MES
          27      PreHidden Ridge Estates 3.L61
          28      PreHidden Ridge Estates 3.L62
          30      POCHidden Ridge Estates 31.dat
```

END FILES

OPN SEQUENCE

INGRP INDELT 00:15

PERLND 20

PERLND 21

COPY 501

DISPLY 1

END INGRP

END OPN SEQUENCE

DISPLY

DISPLY-INF01

```
# - #<-----Title----->***TRAN PIVL DIG1 FIL1 PYR DIG2 FIL2 YRND
1 Basin 1 MAX 1 2 30 9
```

END DISPLY-INF01

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 Engr Metr ***
```

```
20 SG3, Forest, Mod 1 1 1 1 27 0
```

```
21 SG3, Forest, Steep 1 1 1 1 27 0
```

END GEN-INFO

*** Section PWATER***

ACTIVITY

```
<PLS > ***** Active Sections *****
```

```
# - # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC ***
```

```
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 *****
```

```

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 ***
20      0      0      0      0      0      0      0      0      0      0      0
21      0      0      0      0      0      0      0      0      0      0      0
END PWAT-PARM1

PWAT-PARM2
<PLS > PWATER input info: Part 2 ***
# - # ***FOREST LZSN INFILT LSUR SLSUR KVARY AGWRC
20      0      9      0.08      400      0.1      0      0.96
21      0      9      0.08      400      0.15      0      0.96
END PWAT-PARM2

PWAT-PARM3
<PLS > PWATER input info: Part 3 ***
# - # ***PETMAX PETMIN INFEXP INFILD DEEPFR BASETP AGWETP
20      0      0      2.5      2      0      0      0
21      0      0      2.5      2      0      0      0
END PWAT-PARM3

PWAT-PARM4
<PLS > PWATER input info: Part 4 ***
# - # CEPSC UZSN NSUR INTFW IRC LZETP ***
20      0.2      1      0.35      4      0.4      0.7
21      0.2      1      0.35      4      0.4      0.7
END PWAT-PARM4

PWAT-STATE1
<PLS > *** Initial conditions at start of simulation
ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
# - # *** CEPS SURS UZS IFWS LZS AGWS GWVS
20      0      0      0      0      3      1      0
21      0      0      0      0      3      1      0
END PWAT-STATE1

END PERLND

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

END GEN-INFO
*** Section IWATER***

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

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

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

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

IWAT-PARM3

```


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 1.3	PERLND	1	999	EXTNL PREC	
WDM	2	PREC ENGL 1.3	IMPLND	1	999	EXTNL PREC	
WDM	1	EVAP ENGL 0.8	PERLND	1	999	EXTNL PETINP	
WDM	1	EVAP ENGL 0.8	IMPLND	1	999	EXTNL PETINP	

END EXT SOURCES

EXT TARGETS

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

END EXT TARGETS

MASS-LINK

<Volume>	<-Grp>	<-Member-><-Mult-->	<Target>	<-Grp>	<-Member->***
<Name>	#	<Name> # #<-factor->	<Name>	#	<Name> # #***
MASS-LINK	12				
PERLND	PWATER	SURO 0.083333	COPY	INPUT	MEAN
END MASS-LINK	12				
MASS-LINK	13				
PERLND	PWATER	IFWO 0.083333	COPY	INPUT	MEAN
END MASS-LINK	13				

END MASS-LINK

END RUN

Mitigated UCI File

RUN

GLOBAL

WWM4 model simulation
START 1948 10 01 END 2008 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 Hidden Ridge Estates 3.wdm
MESSU 25 MitHidden Ridge Estates 3.MES
27 MitHidden Ridge Estates 3.L61
28 MitHidden Ridge Estates 3.L62
30 POCHidden Ridge Estates 31.dat

END FILES

OPN SEQUENCE

INGRP INDELT 00:15

PERLND 21
PERLND 20
PERLND 26
IMPLND 2
IMPLND 6
IMPLND 9
IMPLND 4
RCHRES 1
RCHRES 2
COPY 1
COPY 501
COPY 601
DISPLY 1

END INGRP

END OPN SEQUENCE

DISPLY

DISPLY-INF01

- #<-----Title----->***TRAN PIVL DIG1 FIL1 PYR DIG2 FIL2 YRND
1 Tank 1 MAX 1 2 30 9

END DISPLY-INF01

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 ***

21	SG3, Forest, Steep	1	1	1	1	27	0
20	SG3, Forest, Mod	1	1	1	1	27	0
26	SG3, Lawn, Mod	1	1	1	1	27	0

END GEN-INFO

*** Section PWATER***

```

ACTIVITY
<PLS > ***** Active Sections *****
# - # ATMP SNOW PWAT SED PST PWG PQAL MSTL PEST NITR PHOS TRAC ***
21      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
26      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 *****
21      0      0      4      0      0      0      0      0      0      0      0      1      9
20      0      0      4      0      0      0      0      0      0      0      0      1      9
26      0      0      4      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 ***
21      0      0      0      0      0      0      0      0      0      0      0
20      0      0      0      0      0      0      0      0      0      0      0
26      0      0      0      0      0      0      0      0      0      0      0
END PWAT-PARM1

PWAT-PARM2
<PLS > PWATER input info: Part 2 *****
# - # ***FOREST LZSN INFILT LSUR SLSUR KVAR Y AGWRC
21      0      9      0.08      400      0.15      0      0.96
20      0      9      0.08      400      0.1      0      0.96
26      0      9      0.05      400      0.1      0      0.96
END PWAT-PARM2

PWAT-PARM3
<PLS > PWATER input info: Part 3 *****
# - # ***PETMAX PETMIN INFEXP INFILD DEEPFR BASETP AGWETP
21      0      0      2.5      2      0      0      0
20      0      0      2.5      2      0      0      0
26      0      0      2.5      2      0      0      0
END PWAT-PARM3

PWAT-PARM4
<PLS > PWATER input info: Part 4 *****
# - # CEPSC UZSN NSUR INTFW IRC LZETP ***
21      0.2      1      0.35      4      0.4      0.7
20      0.2      1      0.35      4      0.4      0.7
26      0.1      0.8      0.25      4      0.4      0.25
END PWAT-PARM4

PWAT-STATE1
<PLS > *** Initial conditions at start of simulation
ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
# - # *** CEPS SURS UZS IFWS LZS AGWS GWVS
21      0      0      0      0      3      1      0
20      0      0      0      0      3      1      0
26      0      0      0      0      3      1      0
END PWAT-STATE1

END PERLND

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

```

ACTIVITY
 <PLS > ***** Active Sections *****
 # - # ATMP SNOW IWAT SLD IWG IQAL ***
 2 0 0 1 0 0 0
 6 0 0 1 0 0 0
 9 0 0 1 0 0 0
 4 0 0 1 0 0 0
 END ACTIVITY

PRINT-INFO
 <ILS > ***** Print-flags ***** PIVL PYR
 # - # ATMP SNOW IWAT SLD IWG IQAL *****
 2 0 0 4 0 0 0 1 9
 6 0 0 4 0 0 0 1 9
 9 0 0 4 0 0 0 1 9
 4 0 0 4 0 0 0 1 9
 END PRINT-INFO

IWAT-PARM1
 <PLS > IWATER variable monthly parameter value flags ***
 # - # CSNO RTOP VRS VNN RTLI ***
 2 0 0 0 0 0
 6 0 0 0 0 0
 9 0 0 0 0 0
 4 0 0 0 0 0
 END IWAT-PARM1

IWAT-PARM2
 <PLS > IWATER input info: Part 2 ***
 # - # *** LSUR SLSUR NSUR RETSC
 2 400 0.05 0.1 0.08
 6 400 0.05 0.1 0.08
 9 400 0.05 0.1 0.08
 4 400 0.01 0.1 0.1
 END IWAT-PARM2

IWAT-PARM3
 <PLS > IWATER input info: Part 3 ***
 # - # *** PETMAX PETMIN
 2 0 0
 6 0 0
 9 0 0
 4 0 0
 END IWAT-PARM3

IWAT-STATE1
 <PLS > *** Initial conditions at start of simulation
 # - # *** RETS SURS
 2 0 0
 6 0 0
 9 0 0
 4 0 0
 END IWAT-STATE1

END IMPLND

SCHEMATIC
 <-Source-> <-Area--> <-Target-> MBLK ***
 <Name> # <-factor-> <Name> # Tbl# ***
 Private Street***
 PERLND 26 0.163 RCHRES 1 2
 PERLND 26 0.163 RCHRES 1 3
 IMPLND 2 0.57 RCHRES 1 5
 IMPLND 6 0.19 RCHRES 1 5
 IMPLND 9 0.183 RCHRES 1 5
 Lot 1 - 14 Roofs***
 IMPLND 4 0.96 RCHRES 2 5
 Basin 1***
 PERLND 21 0.75 COPY 501 12

PERLND	21	0.75	COPY	601	12
PERLND	21	0.75	COPY	501	13
PERLND	21	0.75	COPY	601	13
PERLND	20	4.794	COPY	501	12
PERLND	20	4.794	COPY	601	12
PERLND	20	4.794	COPY	501	13
PERLND	20	4.794	COPY	601	13

*****Routing*****

PERLND	26	0.163	COPY	1	12
IMPLND	2	0.57	COPY	1	15
IMPLND	6	0.19	COPY	1	15
IMPLND	9	0.183	COPY	1	15
PERLND	26	0.163	COPY	1	13
IMPLND	4	0.96	COPY	1	15
RCHRES	1	1	COPY	501	16
RCHRES	2	1	COPY	501	16

END SCHEMATIC

NETWORK

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

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

END NETWORK

RCHRES

GEN-INFO

RCHRES	Name	Nexits	Unit	Systems	Printer	***
# - #	<----->	<---->	User	T-series	Engl Metr LKFG	***
				in out		***
1	Tank 1	1	1	1 1	28 0 1	
2	Tank 2	1	1	1 1	28 0 1	

END GEN-INFO

*** Section RCHRES***

ACTIVITY

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

END ACTIVITY

PRINT-INFO

<PLS >	*****	Print-flags	*****	PIVL	PYR	*****							
# - #	HYDR	ADCA	CONS	HEAT	SED	GQL	OXRX	NUTR	PLNK	PHCB	PIVL	PYR	*****
1	4	0	0	0	0	0	0	0	0	0	1	9	
2	4	0	0	0	0	0	0	0	0	0	1	9	

END PRINT-INFO

HYDR-PARM1

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

END HYDR-PARM1

HYDR-PARM2

# - #	FTABNO	LEN	DELTH	STCOR	KS	DB50	***
<----->	<----->	<----->	<----->	<----->	<----->	<----->	***
1	1	1893.94	0.0	0.0	0.5	0.0	
2	2	21.31	0.0	0.0	0.5	0.0	

END HYDR-PARM2

HYDR-INIT

```

RCHRES Initial conditions for each HYDR section ***
# - # *** VOL Initial value of COLIND Initial value of OUTDGT
*** ac-ft for each possible exit for each possible exit
<-----><-----> <---><---><---><---><---> *** <---><---><---><---><--->
1 0 4.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
2 0 4.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0
END HYDR-INIT
END RCHRES

```

```

SPEC-ACTIONS
END SPEC-ACTIONS

```

FTABLES

FTABLE 1

91	4	Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.000000	0.000000	0.000000	0.000000	0.000000		
0.055556	240.6382	8.932523	0.000100				
0.111111	338.3966	25.17998	0.000141				
0.166667	412.0879	46.10178	0.000173				
0.222222	473.0955	70.73594	0.000200				
0.277778	525.8527	98.51632	0.000223				
0.333333	572.6442	129.0540	0.000245				
0.388889	614.8337	162.0585	0.000264				
0.444444	653.3134	197.3004	0.000283				
0.500000	688.7052	234.5918	0.000300				
0.555556	721.4639	273.7745	0.000316				
0.611111	751.9336	314.7121	0.000331				
0.666667	780.3825	357.2853	0.000346				
0.722222	807.0244	401.3878	0.000360				
0.777778	832.0328	446.9244	0.000374				
0.833333	855.5510	493.8083	0.000387				
0.888889	877.6987	541.9602	0.000400				
0.944444	898.5774	591.3069	0.000412				
1.000000	918.2736	641.7803	0.000424				
1.055556	936.8619	693.3168	0.000436				
1.111111	954.4070	745.8567	0.000447				
1.166667	970.9655	799.3437	0.000458				
1.222222	986.5871	853.7244	0.000469				
1.277778	1001.315	908.9481	0.000479				
1.333333	1015.190	964.9658	0.000490				
1.388889	1028.244	1021.732	0.000500				
1.444444	1040.510	1079.201	0.000510				
1.500000	1052.015	1137.330	0.000519				
1.555556	1062.783	1196.077	0.000529				
1.611111	1072.836	1255.404	0.000538				
1.666667	1082.196	1315.269	0.000547				
1.722222	1090.879	1375.635	0.000556				
1.777778	1098.901	1436.465	0.000565				
1.833333	1106.277	1497.723	0.000574				
1.888889	1113.020	1559.373	0.000583				
1.944444	1119.141	1621.381	0.000591				
2.000000	1124.651	1683.711	0.000600				
2.055556	1129.558	1746.331	0.000608				
2.111111	1133.870	1809.206	0.000616				
2.166667	1137.593	1872.305	0.000624				
2.222222	1140.735	1935.595	0.000632				
2.277778	1143.298	1999.043	0.000640				
2.333333	1145.288	2062.617	0.000648				
2.388889	1146.708	2126.287	0.000655				
2.444444	1147.559	2190.019	0.000663				
2.500000	1147.842	2253.783	0.000670				
2.555556	1147.559	2317.546	0.000678				
2.611111	1146.708	2381.279	0.000685				
2.666667	1145.288	2444.948	0.000692				
2.722222	1143.298	2508.522	0.000700				
2.777778	1140.735	2571.970	0.000707				
2.833333	1137.593	2635.260	0.000714				
2.888889	1133.870	2698.359	0.000721				
2.944444	1129.558	2761.235	0.000728				

3.000000	1124.651	2823.854	0.000734
3.055556	1119.141	2886.185	0.000741
3.111111	1113.020	2948.192	0.000748
3.166667	1106.277	3009.842	0.000755
3.222222	1098.901	3071.100	0.000761
3.277778	1090.879	3131.930	0.000768
3.333333	1082.196	3192.296	0.000774
3.388889	1072.836	3252.162	0.000781
3.444444	1062.783	3311.488	0.000787
3.500000	1052.015	3370.235	0.000793
3.555556	1040.510	3428.364	0.000800
3.611111	1028.244	3485.834	0.000806
3.666667	1015.190	3542.599	0.000812
3.722222	1001.315	3598.617	0.000818
3.777778	986.5871	3653.841	0.000824
3.833333	970.9655	3708.221	0.000830
3.888889	954.4070	3761.708	0.000836
3.944444	936.8619	3814.248	0.000842
4.000000	918.2736	3865.785	0.000848
4.055556	898.5774	3916.258	0.000854
4.111111	877.6987	3965.605	0.000860
4.166667	855.5510	4013.757	0.000866
4.222222	832.0328	4060.641	0.000871
4.277778	807.0244	4106.177	0.000877
4.333333	780.3825	4150.280	0.000883
4.388889	751.9336	4192.853	0.000888
4.444444	721.4639	4233.791	0.000894
4.500000	688.7052	4272.973	0.000899
4.555556	653.3134	4310.265	0.139634
4.611111	614.8337	4345.507	0.390749
4.666667	572.6442	4378.511	0.704348
4.722222	525.8527	4409.049	1.046951
4.777778	473.0955	4436.829	1.384478
4.833333	412.0879	4461.463	1.684400
4.888889	338.3966	4482.385	1.922043
4.944444	240.6382	4498.633	2.089176
5.000000	0.000101	4507.565	2.204283

END FTABLE 1

FTABLE 2

91 4

Depth (ft)	Area (acres)	Volume (acre-ft)	Outflow1 (cfs)	Velocity (ft/sec)	Travel Time*** (Minutes)***
0.000000	0.000000	0.000000	0.000000		
0.038889	1.895026	0.049241	0.000334		
0.077778	2.664873	0.138805	0.000473		
0.116667	3.245192	0.254136	0.000579		
0.155556	3.725627	0.389932	0.000669		
0.194444	4.141090	0.543071	0.000748		
0.233333	4.509573	0.711410	0.000819		
0.272222	4.841816	0.893348	0.000885		
0.311111	5.144843	1.087618	0.000946		
0.350000	5.423554	1.293187	0.001003		
0.388889	5.681528	1.509182	0.001058		
0.427778	5.921477	1.734851	0.001109		
0.466667	6.145512	1.969535	0.001159		
0.505556	6.355317	2.212650	0.001206		
0.544444	6.552258	2.463671	0.001251		
0.583333	6.737464	2.722118	0.001295		
0.622222	6.911878	2.987556	0.001338		
0.661111	7.076297	3.259579	0.001379		
0.700000	7.231405	3.537814	0.001419		
0.738889	7.377788	3.821909	0.001458		
0.777778	7.515955	4.111535	0.001496		
0.816667	7.646354	4.406382	0.001533		
0.855556	7.769373	4.706156	0.001569		
0.894444	7.885360	5.010576	0.001604		
0.933333	7.994619	5.319374	0.001639		
0.972222	8.097424	5.632297	0.001672		
1.011111	8.194017	5.949094	0.001705		
1.050000	8.284615	6.269531	0.001738		

1.088889	8.369414	6.593377	0.001770
1.127778	8.448587	6.920412	0.001801
1.166667	8.522292	7.250419	0.001832
1.205556	8.590670	7.583188	0.001862
1.244444	8.653846	7.918514	0.001892
1.283333	8.711934	8.256199	0.001921
1.322222	8.765035	8.596044	0.001950
1.361111	8.813239	8.937862	0.001979
1.400000	8.856626	9.281457	0.002007
1.438889	8.895267	9.626648	0.002034
1.477778	8.929223	9.973250	0.002062
1.516667	8.958547	10.32108	0.002089
1.555556	8.983285	10.66997	0.002115
1.594444	9.003475	11.01972	0.002142
1.633333	9.019147	11.37018	0.002168
1.672222	9.030324	11.72116	0.002193
1.711111	9.037024	12.07248	0.002219
1.750000	9.039256	12.42398	0.002244
1.788889	9.037024	12.77547	0.002268
1.827778	9.030324	13.12680	0.002293
1.866667	9.019147	13.47777	0.002317
1.905556	9.003475	13.82823	0.002341
1.944444	8.983285	14.17799	0.002365
1.983333	8.958547	14.52687	0.002389
2.022222	8.929223	14.87470	0.002412
2.061111	8.895267	15.22131	0.002435
2.100000	8.856626	15.56650	0.002458
2.138889	8.813239	15.91009	0.002480
2.177778	8.765035	16.25191	0.002503
2.216667	8.711934	16.59175	0.002525
2.255556	8.653846	16.92944	0.002547
2.294444	8.590670	17.26477	0.002569
2.333333	8.522292	17.59753	0.002591
2.372222	8.448587	17.92754	0.002612
2.411111	8.369414	18.25458	0.002634
2.450000	8.284615	18.57842	0.002655
2.488889	8.194017	18.89886	0.002676
2.527778	8.097424	19.21566	0.002697
2.566667	7.994619	19.52858	0.002717
2.605556	7.885360	19.83738	0.002738
2.644444	7.769373	20.14180	0.002758
2.683333	7.646354	20.44157	0.002778
2.722222	7.515955	20.73642	0.002798
2.761111	7.377788	21.02604	0.002818
2.800000	7.231405	21.31014	0.002838
2.838889	7.076297	21.58837	0.002858
2.877778	6.911878	21.86040	0.002877
2.916667	6.737464	22.12583	0.002897
2.955556	6.552258	22.38428	0.002916
2.994444	6.355317	22.63530	0.002935
3.033333	6.145512	22.87842	0.067494
3.072222	5.921477	23.11310	0.208364
3.111111	5.681528	23.33877	0.392830
3.150000	5.423554	23.55477	0.607796
3.188889	5.144843	23.76034	0.841910
3.227778	4.841816	23.95461	1.083623
3.266667	4.509573	24.13654	1.321145
3.305556	4.141090	24.30488	1.543112
3.344444	3.725627	24.45802	1.739640
3.383333	3.245192	24.59382	1.903671
3.422222	2.664873	24.70915	2.032526
3.461111	1.895026	24.79871	2.129647
3.500000	0.000001	24.84795	2.206508

END FTABLE 2

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	1.3	PERLND	1 999	EXTNL PREC

WDM	2	PREC	ENGL	1.3	IMPLND	1	999	EXTNL	PREC
WDM	1	EVAP	ENGL	0.8	PERLND	1	999	EXTNL	PETINP
WDM	1	EVAP	ENGL	0.8	IMPLND	1	999	EXTNL	PETINP

END EXT SOURCES

EXT TARGETS

<-Volume->	<-Grp>	<-Member->	<-Mult-->	Tran	<-Volume->	<Member>	Tsys	Tgap	Amd	***	
<Name>	#	<Name>	#	#<-factor->	strg	<Name>	#	<Name>	tem	strg	strg***
COPY	1	OUTPUT	MEAN	1	1	48.4	WDM	701	FLOW	ENGL	REPL
COPY	501	OUTPUT	MEAN	1	1	48.4	WDM	801	FLOW	ENGL	REPL
COPY	601	OUTPUT	MEAN	1	1	48.4	WDM	901	FLOW	ENGL	REPL
RCHRES	1	HYDR	RO	1	1	1	WDM	1000	FLOW	ENGL	REPL
RCHRES	1	HYDR	STAGE	1	1	1	WDM	1001	STAG	ENGL	REPL
RCHRES	2	HYDR	RO	1	1	1	WDM	1002	FLOW	ENGL	REPL
RCHRES	2	HYDR	STAGE	1	1	1	WDM	1003	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		16							
RCHRES	ROFLOW				COPY		INPUT	MEAN	
END MASS-LINK		16							

END MASS-LINK

END RUN

Disclaimer

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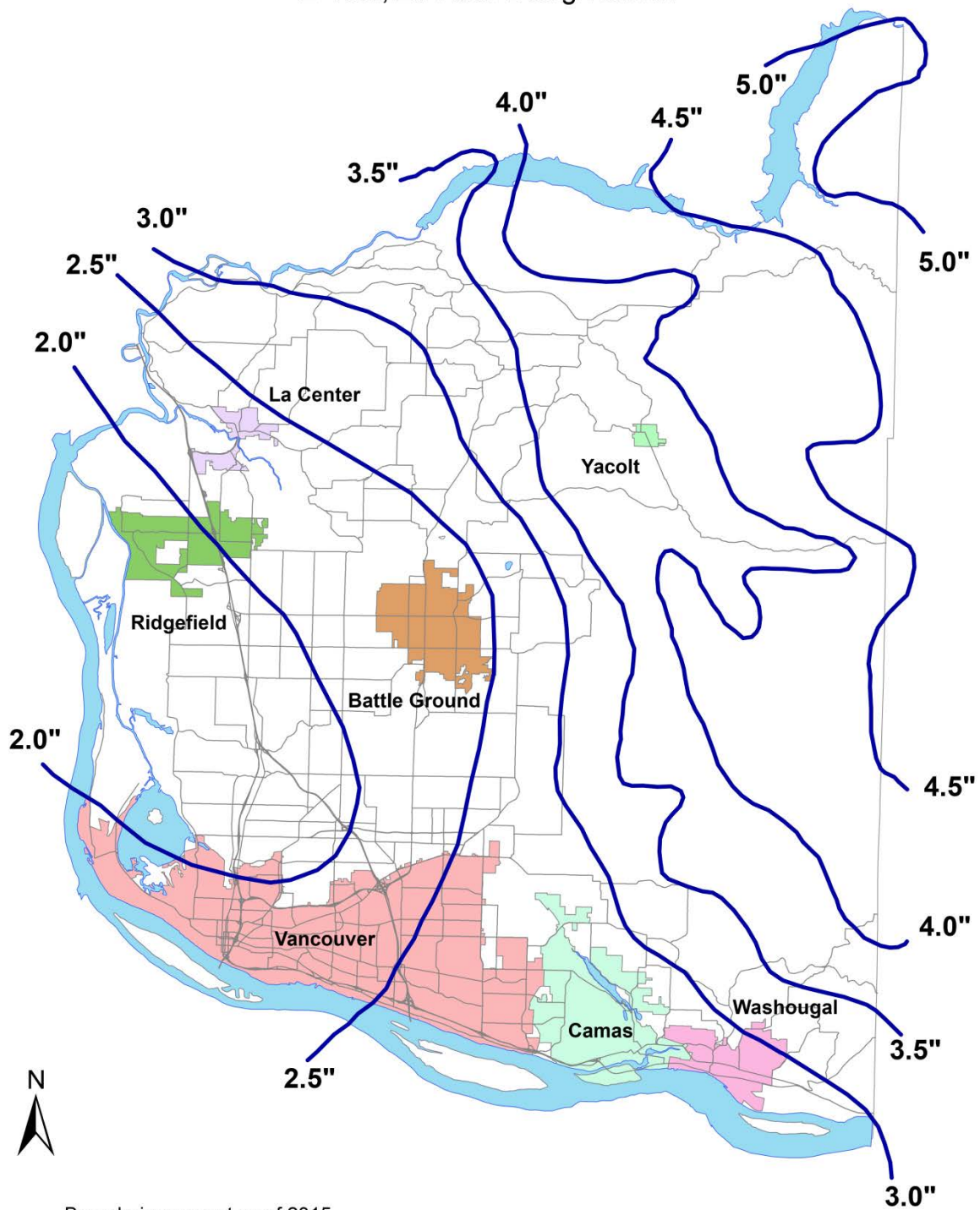
Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com



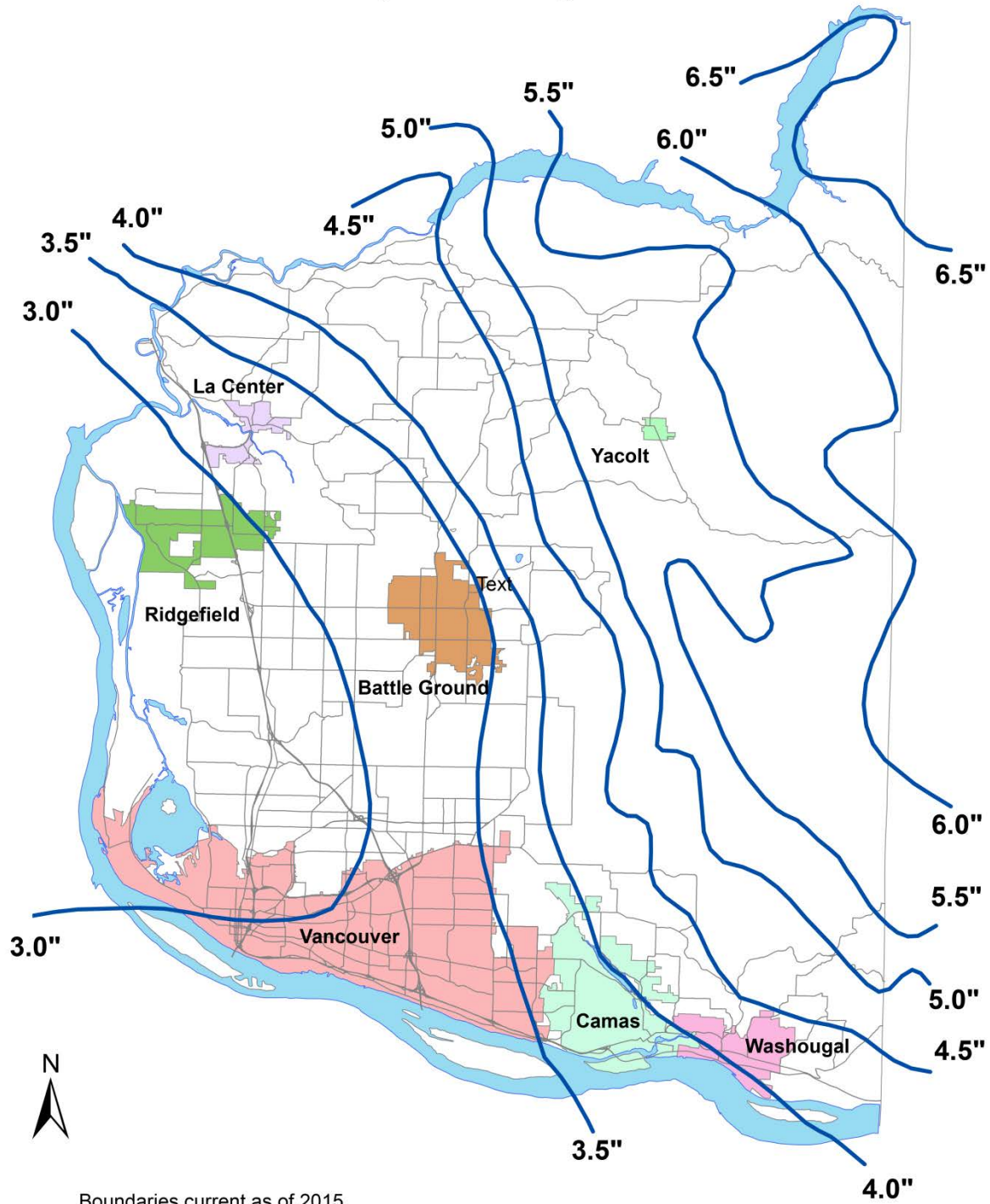
APPENDIX H: ISO MAPS

Isopluvial Map for Clark County 2-Year, 24-Hour Design Storm

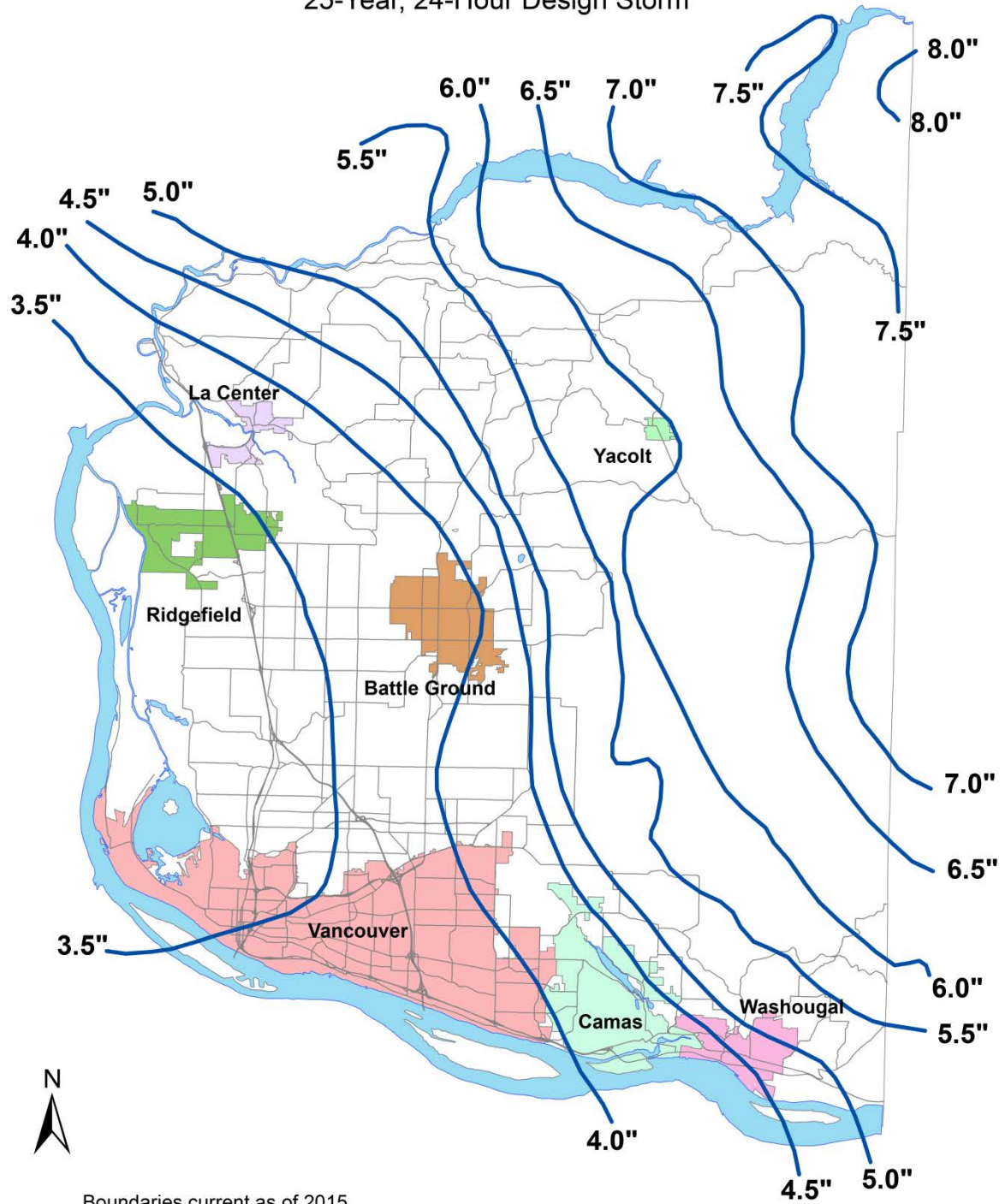


Boundaries current as of 2015

Isopluvial Map for Clark County
10-Year, 24-Hour Design Storm

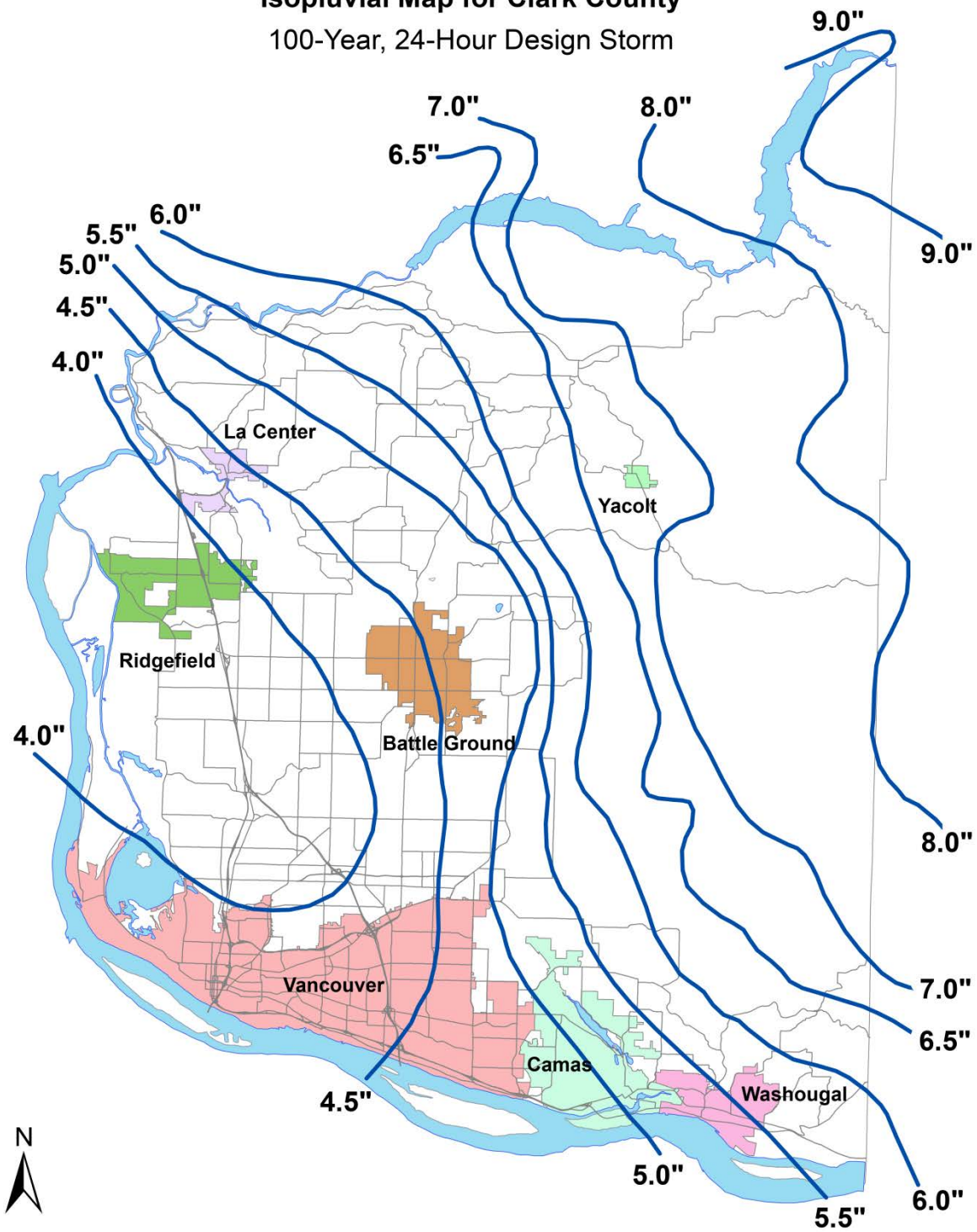


Isopluvial Map for Clark County 25-Year, 24-Hour Design Storm



Boundaries current as of 2015.

Isopluvial Map for Clark County
100-Year, 24-Hour Design Storm

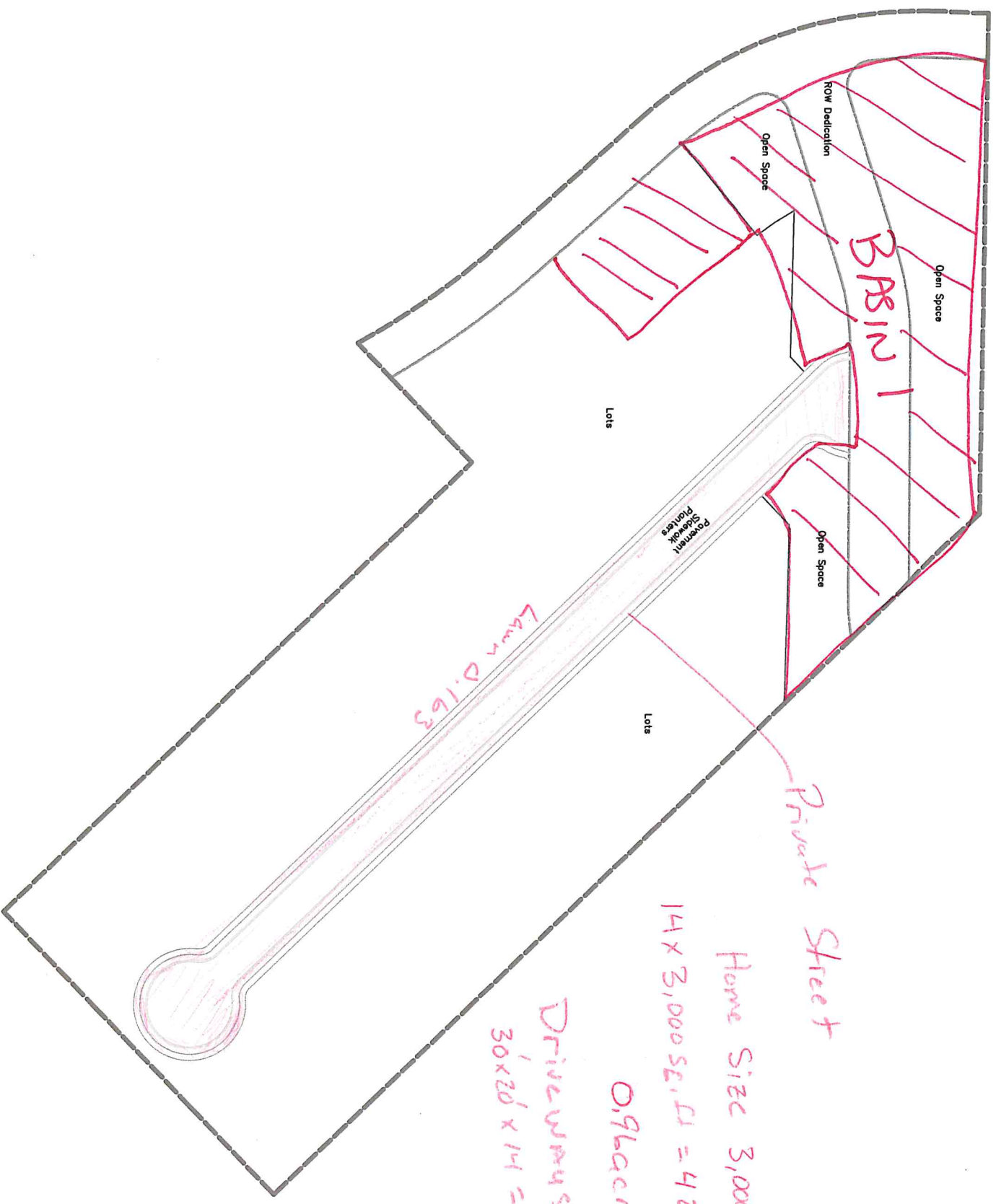


Boundaries current as of 2015.



APPENDIX I: BASIN MAP

Post Basin MAP



Home Size 3,000 sq. ft.
 $14 \times 3,000 \text{ sq. ft.} = 42,000 \text{ sq. ft.}$
 or
 0.96 acre
 Driveway
 $30 \times 20 \times 14 = 0.19 \text{ ac}$