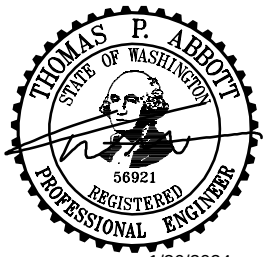
# *Taylor Lane*

***Preliminary Drainage Report***

***Presented to: City of Marysville***




1/26/2024

# Taylor Lane

***Drainage Report***

Prepared for

***Cornerstone Homes***

*Contact: Joe Long*

*13805 Smokey Point Blvd #102*

*Marysville, WA 98271*

Prepared by

Cooper Danby

Approved by

*Tom Abbott, PE*

***January 2024*** ***Job No: 23-0009***

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**Figures**

## SECTION 1: PROJECT OVERVIEW

The proposed Taylor Lane project is approximately a 4.66-acre site. The project is a single-family residential development on parcel #00590700013600 and addressed at 4820 83rd Ave NE Marysville 98270. The project proposes to construct 20 new single-family lots and retain the existing single-family home for a total of 21 lots. Emergency and standard access drives along with associated private and public utilities are proposed to serve project development from 49th St NE. Frontage improvements along 49th St NE and 83rd Ave NE consisting of sidewalk improvements to City standards are proposed. See the Vicinity Map in Appendix 1 for visual representation of the subject property.

### Existing Site

The parcel #00590700013600 is currently occupied by one single family home with associated outbuildings taking access from 83rd Ave NE. The northeast corner of the site containing the existing home consists of lawn coverage and gravel driveways, while the rest of the site contains dense forest and vegetative coverage. Existing topography generally descends to the south, with some areas of steep slopes, towards a wetland located in the lower-middle region. The project parcel is currently zoned R-6.5 in the City of Marysville.

The proposed development will exist within the bounds of a single stormwater threshold discharge basin as all site runoff from developed surfaces meets within ¼ mile from the project site downstream. Wetland Resources Inc has prepared a Critical Areas Report dated January 2024 on the site. The findings indicate that in the southerly portion of the site, there is a Category II wetland with a 100' buffer. Impacts are planned within portions of these buffer areas, requiring averaging and mitigation. Additionally, stormwater is proposed to be discharged to the wetland area on the parcel via a dispersion trench.

A preliminary Geotechnical Engineering Design Study has been prepared by Earth Solutions NW in January 2024 on the site. Please reference the geotechnical report for detailed soils information. There are a number of steep slopes on the site, as the parcel generally slopes from north to south. Per the Geotechnical Engineer's recommendations, the steep slopes are proposed to be graded and walls constructed to support construction and development activities on the project site. Please see the submitted geotechnical report for addition discussion of the onsite soils and project grading proposal.

### Proposed Development

The proposed project will construct 20 new single-family lots and retain the existing home onsite. Emergency and standard access drives will serve the site from 49th St NE, along with associated private and public utilities are proposed to serve project development. Frontage improvements along 49th St NE and 83rd Ave NE consisting of sidewalk improvements to City standards are proposed. Retaining walls will be required along the southern side of most lots bordering the wetland buffer area.

### Proposed Drainage System

This project is designed to comply with the 2019 Department of Ecology Stormwater Manual for Western Washington (2019 DOE SWMMWW). Stormwater will be mitigated via a detention vault that is proposed in the southwestern portion of the site. Prior to discharge, a perkfilter cartridge filtration unit will be used to treat stormwater runoff to meet basic water quality treatment requirements. The proposed detention vault and water quality treatment system will discharge to the existing onsite wetland area which continues offsite to the south until joining King Creek.

Onsite development will create 2.19 AC of new impervious surfaces which will be collected by the detention vault for mitigation and stormwater quality treatment. This area is considered to be within the Onsite Basin for stormwater modeling. Frontage improvements consisting of new sidewalk and planter along 49th St NE and 83rd Ave NE, referred to as the Frontage Basin, will also be collected and routed to the detention vault to the maximum extent feasible. The runoff from these surfaces unable to be collected due to vertical constraints, approximately 0.02 AC, will be considered to bypass detention and be within the Frontage Bypass Basin.

### Erosion/Sedimentation Control

Erosion control measures that will be utilized during construction will include a combination of silt fence, storm drain inlet protection, interceptor swales, and sediment ponds. See Section 2.0 for discussion of how SWPPP Elements are addressed.

**Minimum Requirements**
Per the 2019 DOE Manual, Minimum Requirements 1-9 apply to the proposed development.

*Minimum Requirement #1: Preparation of Stormwater Site Plans*
This report along with the preliminary plans satisfies the minimum requirement.

*Minimum Requirement #2: Construction Stormwater Pollution Prevention*
See Section 2 of this Report for the SWPPP BMP Elements, and the SWPPP (submitted as a separate document) for a complete discussion of erosion control BMP's and their use specific to the site.

*Minimum Requirement #3: Source of Pollution*
Permanent source control BMPs are not applicable for the subject site since the associated activities for the new residence do not fall within the types of facilities listed within Volume IV of the DOE Manual (Residential developments are not required to implement source control BMP's). BMPs for erosion and sedimentation control will be specified in the Construction Plans and the SWPPP.

*Minimum Requirement #4: Preservation of Natural Drainage Systems and Outfalls*
Flow from the site will preserve its natural drainage pattern south toward the onsite wetland. Runoff flows towards King Creek, a tributary to Ebey Slough, which then eventually discharges into The Puget Sound.

*Minimum Requirement #5: On-Site Stormwater Management*
The project proposes BMP T5.13 soils to be underlain within all pervious areas that are disturbed by development. Generally, all other infiltration-related BMPs are infeasible due to the site development area's adjacent location to steep slopes. Per the geotechnical report other dispersion-related BMPs are considered infeasible due to the proximity of the steep slopes to the developed impervious coverage of the site and the lack of available dispersion length. Please see Section 4.5 for additional discussion of Onsite Stormwater Management and Low Impact Development BMP feasibility.

*Minimum Requirement #6: Runoff Treatment*
Proposed new pollution generating impervious surfaces (PGIS) will exceed the 5,000 SF threshold and thus basic water quality treatment will be provided via a water quality treatment structure that treats stormwater runoff discharging from the stormwater detention vault. A Perkfilter cartridge filtration unit is proposed for this purpose. See Section 4.0 for additional discussion regarding proposed stormwater management and water quality treatment measures.

*Minimum Requirement #7: Flow Control*
The project will exceed the 10,000 SF new plus replaced impervious threshold and is required to provide flow control. A concrete detention vault will be installed in the southwestern portion of the project site, accessible via access easement serving Lot 1. This vault will discharge via dispersion trench at historic, mitigated rates towards the existing onsite wetland area. Please see Section 4.0 for additional flow control modeling and parameters for detention sizing.

*Minimum Requirement #8: Wetlands Protection*
Wetland Resources Inc has prepared a Critical Areas Report dated January, 2024 on the site. The findings indicate that in the southerly portion of the site, there is a Category II wetland with a 100' buffer. Development is anticipated to impact these buffer areas which will require mitigation and buffer averaging.

*Minimum Requirement #9: Operation and Maintenance*
See Operations and Maintenance in Section 6 of this report.

## SECTION 2: TEMPORARY EROSION AND SEDIMENT CONTROL DESIGN

**SWPPP Design Elements**
A Construction Stormwater Pollution Prevention Plan (SWPPP) will be provided prior to construction. The SWPPP report is modeled under the guidelines of I.3.4.2 MR2 of the DOE Manual. Construction SWPPP Elements #1 through #13 are addressed below. These elements will be delineated within future civil plans for the project.

*Element #1 – Mark Clearing Limits*
All clearing limits will be delineated with high visibility plastic fence and/or silt fence.

*Element #2 – Establish Construction Access*
Stabilized construction accesses will be installed as shown on the plans.

*Element #3 – Control Flow Rates*
Detention of construction period runoff will be provided by means of sediment ponds on the site.

*Element #4 – Install Sediment Controls*
Silt fence, catch basin protection, and the temporary sediment pond will be utilized to contain sediments within the project's clearing limits.

*Element #5 – Stabilize Soils*
Exposed soils will be stabilized as specified in the Grading and Erosion Control Notes with temporary and permanent seeding, mulching, and plastic covering.

*Element #6 – Protect Slopes*
Slopes shall be protected as specified under Element #5.

*Element #7 – Protect Drain Inlets*
Storm drain inlet protection will be utilized to contain sediments within the project's clearing limits.

*Element #8 – Stabilize Channels and Outlets*
Temporary channels, shall be stabilized with check dams.

*Element #9 – Control Pollutants*
Pollutants shall be controlled as specified in Volume IV of the 2019 DOE Manual—Source Control BMPs to address potential sources of pollution.

*Element #10 – Control De-Watering*
There will be no de-watering as a part of this project..

*Element #11 – Maintain BMPs*
Maintenance of the BMPs is specified within the Construction Sequence and Grading and Erosion Control Notes that will be included in the civil plans associated with the project.

*Element #12: Manage the Project*
The Grading and Erosion Control Notes specify seasonal work limitations. Maintenance of the BMPs is specified within the Construction Sequence and Grading and Erosion Control Notes.

*Element #13: Protect on-site stormwater management BMPs*
On-site stormwater management BMPs used for runoff from roofs and other hard surfaces are not feasible due to soil conditions and proposed project density.

## SECTION 3: DOWNSTREAM ANALYSIS

### Task 1. Study Area Definition and Maps

Snohomish County Bare Earth LiDAR, survey, and 2021 aerial photography were the best topographical references available for the area containing the site. The limits of the downstream analysis extend roughly 0.25 miles beyond the subject property's natural discharge location.

### Task 2. Resource Review

All of the resources below have been reviewed for existing and potential issues near the project site:

*Adopted Basin Plans*

No Adopted Basin Plans were located that include the project site.

*Drainage Basin*

This site is in the King Creek subbasin, within the Ebey Slough watershed. Discharge from the proposed development will discharge into a wetland area tributary to King Creek.

*Floodplain / Floodway (FEMA) maps*

Per FEMA Floodplain map #53061C0736F the subject property is not within a floodplain.

*Critical Areas Map*

There's a Category II wetland in the southern portion of the site. There are steep slopes located within the wetland buffer area near the central portion of the site. See section 7.0 for a complete list of reports prepared for the project including a Critical Areas Report, Wetland critical areas, and geotechnical and slope analysis reports.

*Drainage Complaints*

No relevant issues were identified near the proposed site.

*Road Drainage Problems*

No issues were identified near the proposed site.

*Soil Survey*

Site soils are classified as Tokul gravelly medial loam (0 to 8 percent slopes) which is classified as Hydrologic Soil Group B. Per geotechnical analysis, infiltration is infeasible onsite, which is consistent with NRCS soil mapping data.

*Wetland Inventory Maps*

Wetlands are identified to be on and immediately adjacent to the south of the project site. Reference the critical areas report submitted with this report for additional information regarding the wetland areas onsite.

*Migrating River Studies*

Migrating River Studies are not considered applicable to the proposed development.

*Section 303d List of Polluted Waters*

Washington State Department of Ecology's Water Quality Assessment for Washington contains a listing for King Creek which the project is tributary to. Please refer to Appendix 3 for copies of applicable 303(d) listings.

*Water Quality Problems*

King creek has a category 5 listing in the DOE Water Quality Assessment Review tools for temperature which does not fall under water quality problems. The development however will improve water quality tributary to the creek via basic treatment device(s).

*Stormwater Compliance Plans*

Not applicable to the proposed project.

**Task 3. Field Inspection/Downstream Analysis**
On November 27th, 2023, a Downstream Analysis was performed at the site. The weather consisted of 46ºF and clear skies. The following observations were verified during the visit.

The subject property contains impervious areas associated with an existing home, driveways, and associated outbuildings surrounded by lawn area in the northeastern portion of the site. Slopes are generally moderate in the developed portion. The rest of the site consists of steep slopes generally descending south with dense forest/vegetation, and an existing wetland and wetland buffer area in the south-central portion. Frontages along 49th St NE (north) and 83rd Ave NE (east) were observed for potential upstream run-on. 49th St does not produce upstream run-on to the site (Images 1 & 2) while 83rd Ave does yield some upstream flow from the existing road centerline (Image 3).

The site is located within a single threshold discharge area (TDA) since all runoff exits the southern property line and converges prior to exiting the quarter mile boundary of analysis. The flow path is formed where runoff enters Wetland A either onsite or offsite to the south. Flow continues south/southwest through several undeveloped properties until ultimately joining King Creek prior to crossing under 44th St NE and continuing beyond the quarter mile boundary of analysis (Images 4 & 5).

**Task 4. Drainage System Description and Problem Descriptions**
Based on the information available and all the resources available including visual inspection of the downstream flow path to the ¼-mile boundary, there is no evidence of existing or anticipated downstream drainage problems. All flows are adequately carried through natural channels to the quarter mile buffer of analysis.

**Task 5. Mitigation of Existing or Potential Drainage Problems**
No evidence of existing or potential problems with downstream drainage conveyance infrastructure was found. Mitigation is not required.

## SECTION 4: DETENTION AND WATER QUALITY TREATMENT DESIGN

### 4.1 Predeveloped Site Hydrology

The pre-developed and developed conditions were modeled in WWHM for the purpose of peak flow determination for direct discharge. Based on the site location, the WWHM used the Seatac Gage with a Precipitation Scale factor of 1.20. For visual representation of the listed basins, see the Predeveloped Hydrology Map.

*Onsite Basin:*

The predeveloped condition applied to the Onsite Basin results in a forested land cover condition. It includes all disturbed areas onsite. The values as modeled in WWHM are as follows:

*Table 1: Predeveloped Conditions: Onsite Basin*

| Onsite Basin | |
|---|---|
| Ground Cover | Area (acre) |
| Forest, steep | 2.84 |
| **Total** | **2.84** |

*Frontage Basin:*

The predeveloped condition is applied to the Frontage Basin, which includes area within 49th St NE and 83rd Ave NE to be developed. In the developed condition, this basin will be detained and mitigated in the proposed detention vault. The values as modeled in WWHM are as follows:

*Table 2: Predeveloped Conditions: Frontage Basin*

| Frontage Basin | |
|---|---|
| Ground Cover | Area (acre) |
| Forest, flat | 0.47 |
| **Total** | **0.47** |

*Upstream Basin:*

In the predeveloped condition, a portion of the pavement within the 83rd Ave NE ROW is tributary to the project site. In the developed condition, this pavement will continue to be tributary to the site. This area has been modeled as upstream flow through in WWH\M in both the predeveloped and developed conditions. The values as modeled in WWHM are as follows:

*Table 3: Predeveloped Conditions: Upstream Basin*

| Upstream Basin | |
|---|---|
| Ground Cover | Area (acre) |
| Roads, flat | 0.09 |
| **Total** | **0.09** |

### 4.2 Developed Site Hydrology

In the developed condition, the proposed apartment project will construct 20 new single family lots with proposed ROW access, stormwater detention and utilities. Frontage improvements along 49th St NE and 83rd Ave NE are proposed.

In compliance with the 2019 DOE Manual, all runoff from onsite developed/disturbed surfaces will be collected, treated, and discharged directly to existing/historic flow paths or will bypass detention and be mitigated within the proposed flow control system.

*Onsite Basin:*
The developed Onsite Basin includes the onsite disturbed area, including all lot areas. The maximum lot impervious value (65%) per zoning code was utilized in determine proposed site impervious coverage. In the developed condition, the Onsite Basin has been modeled using WWHM with the following areas and ground cover designations:

*Table 4: Developed Conditions: Onsite Basin*

| Onsite Basin | |
|---|---|
| Ground Cover | Area (acre) |
| Roof, flat | 1.04 |
| Roads, flat | 0.36 |
| Driveway, flat | 0.35 |
| Sidewalks, flat | 0.07 |
| Pasture, flat | 0.75 |
| Pasture, mod | 0.27 |
| **Total** | **2.84** |

*Frontage Basin:*
The developed Frontage Basin is comprised of area within 49th St NE and 83rd Ave NE to be developed for ROW improvements. The Frontage Basin was modeled using WWHM with the following areas and ground cover designations:

*Table 5: Developed Conditions: Fontage Basin*

| Frontage Basin | |
|---|---|
| Ground Cover | Area (acre) |
| Roads, flat | 0.25 |
| Sidewalk, flat | 0.10 |
| Pasture, flat | 0.10 |
| **Total** | **0.45** |

*Frontage Bypass Basin:*
The developed Frontage Bypass Basin is comprised of 83rd Ave NE pavement that cannot be collected due to topographical reasons. The Frontage Bypass Basin was modeled using WWHM with the following areas and ground cover designations:

*Table 6: Developed Conditions: Frontage Bypass Basin*

| Frontage Bypass Basin | |
|---|---|
| Ground Cover | Area (acre) |
| Road, flat | 0.02 |
| **Total** | **0.02** |

*Upstream Basin:*
In the predeveloped condition, a portion of the pavement within the 83rd Ave NE ROW is tributary to the project site. In the developed condition, this pavement will continue to be tributary to the site. This area has been modeled as upstream flow through in WWH\M in both the predeveloped and developed conditions. The values as modeled in WWHM are as follows:

*Table 7: Predeveloped Conditions: Upstream Basin*

| Upstream Basin | |
|---|---|
| Ground Cover | Area (acre) |
| Roads, flat | 0.09 |
| **Total** | **0.09** |

**4.3 Detention Facility Design**

The proposed detention vault facility used for mitigating developed condition flows was designed in compliance with the 2019 DOE requirements to model hydrologic conditions and detention in a continuous runoff model (WWHM2012) where the following evaluation parameters are employed:

> *"Flow duration is computed by counting the number of flow values that exceed a specified flow level. The specified flow levels used by WWHM in the flow duration*
> *analysis are listed below.*
> 1. *50% of the 2-year predevelopment peak flow.*
> 2. *100% of the 2-year predevelopment peak flow.*
> 3. *100% of the 50-year predevelopment peak flow.*
>
> *There are three criteria by which flow duration values are compared:*
> 1. *If the postdevelopment flow duration values exceed any of the predevelopment flow levels between 50% and 100% of the 2-year predevelopment peak flow values (100 Percent Threshold) then the flow duration requirement has not been met.*
> 2. *If the postdevelopment flow duration values exceed any of the predevelopment flow levels between 100% of the 2-year and 100% of the 50-year predevelopment peak flow values more than 10 percent of the time (110 Percent Threshold) then the flow duration requirement has not been met.*
> 3. *If more than 50 percent of the flow duration levels exceed the 100 percent threshold then the flow duration requirement has not been met."*

*Detention Vault Facility*
The proposed cast in place concrete detention facility detains, and releases collected storm water runoff from the Onsite Basin, Upstream Basin and Frontage Basin. The facility is located in Tract 997. Flows from the developed basins are collected and conveyed to the detention vault via a proposed network of catch basins and storm water conveyance pipes. Detailed WWHM output is provided in Appendix 4. A summary of the detailed statistics and inputs used for modeling the system in WWHM2012 can be found below.

*Table 8: Detention Vault Design Summary*

| Detention Vault | |
|---|---|
| Live Storage Bottom Area (modeled) | *6,300 SF* |
| Live Storage Bottom Area (provided) | *6,300 SF* |
| Number of Cells | *3* |
| Cell Dimensions | *(3 x 23.3' x 90)* |
| Begin Live Storage Elevation | 336.0 |
| Riser Height | 6.00' |
| Volume (modeled) | 37,800 CF |
| Volume (provided) | 37,800 CF |

See table below for the flow rates and water surface elevations by storm event for the detention vault.

*Table 9: Flow Rates and Water Surface Elevations by Storm Event*

| Storm Event | Predeveloped Rate (cfs) | Mitigated Rates (cfs) | Water Surface Elevation (ft) |
|---|---|---|---|
| 2-Year | 0.1952 | 0.1053 | 338.52 |
| 10-Year | 0.4076 | 0.1723 | 340.25 |
| 50-Year | 0.6837 | 0.2484 | 340.67 |
| 100-Year | 0.8320 | 0.2869 | 341.01 |

### 4.4 Water Quality Treatment

*Perkfilter*
Water quality treatment for the mitigated site is accomplished through a Perkfilter structure located downstream of the detention vault. A summary of design criteria is provided below:

*Table 10: Perkfilter Design Summary*

| 60" Ø Perkfilter Manhole | |
|---|---|
| Tributary Area | 3.38 AC |
| Tributary PGIS Area | 1.05 AC |
| Water Quality Flow Rate (2 yr mitigated peak) | 0.1053 cfs |
| WQ Treatment Capacity | 0.1130 cfs |
| Number of Cartridges | 3 |
| Cartridge Height | 12"+18" |
| Internal Drop | 3.5' |
| Peak Flow Rate | 0.2869 cfs |
| Peak Flow Storm Event | 100-year |

### 4.5 Onsite Stormwater Management

The project does not the LID performance standard and minimum requirements 1-9 are required for the project but choose to implement List #2 to evaluate low impact design. The following BMP's below are assessed for implementation:

Lawn and Landscaped Areas:

1. *Post-Construction Soil Quality and Depth*
    - BMP T5.13 soils will be applied to all permeable and landscaped areas in developed condition.
        i. **Conclusion: Feasible**

Roofs:

1. *Downspout Full Infiltration per BMP T5.10A or Downspout Full Dispersion per BMP T5.30*
    - Infiltration is not feasible on site due to the lack of infiltratable soils which has been confirmed by testing found in the geotechnical report and thus BMP T5.10A is infeasible. Due to site specific constraints including building locations as well as the proximity of slopes and walls to the developed site improvements, there is inadequate flow path to disperse on site per BMP T5.30.
        i. **Conclusion: Infeasible**

2. *Bioretention*
    - Due to spatial constraints provide by the development footprint and infiltration infeasibility as confirmed by testing in the geotechnical report, a bioretention facility cannot be designed to provide the required horizontally projected surface area.
        i. **Conclusion: Infeasible**

3. *Downspout Dispersion per BMP T5.10B.*
    - Due to site specific constraints including building location as well as the proximity of slopes and walls to the developed site improvements, there is inadequate flow path length to disperse on site.
        i. **Conclusion: Infeasible**

4. *Perforated Stub-Out Connections per BMP T5.10C.*
    - No stub-out connections will be implemented in the design as soils are not suitable for infiltration as well as the site's proximity to steep slopes.
        i. **Conclusion: Infeasible**

Other Hard Surfaces:

1. *Full Dispersion per BMP T5.30*
    - Due to site specific constraints including building as well as the proximity of slopes and walls to the developed site improvements, there is inadequate flow path to disperse on site.
        i. **Conclusion: Infeasible**

2. *BMP T5.15 Permeable Pavement*
    - Infiltration is not feasible on site per the Geotechnical Engineer, which has been confirmed by testing found in the geotechnical report.
        i. **Conclusion: Infeasible**

3. *Bioretention*
    - Due to spatial constraints provide by the development footprint and infiltration infeasibility as confirmed by testing in the geotechnical report, a bioretention facility cannot be designed to provide the required horizontally projected surface area.
        i. **Conclusion: Infeasible**

4. *Sheet Flow Dispersion or Concentrated Flow Dispersion in accordance with BMP T5.12 or BMP T5.11*
    - Due to site specific constraints including building location as well as the proximity of slopes and walls to the developed site improvements, there is inadequate flow path length to disperse on site.
        i. **Conclusion: Infeasible**

**SECTION 5: CONVEYANCE DESIGN**

The stormwater conveyance system is comprised of a network of open/closed grate catch basins, buried pipe, a concrete detention vault and a Perkfilter water quality unit. Catch basins have been located such that each section of storm drainage pipe may adequately convey associated tributary area flows.

A fully prepared conveyance capacity analysis of the proposed pipes onsite will be prepared at a future submittal.

**SECTION 6: OPERATIONS AND MAINTENANCE MANUAL**

The proposed storm drainage system consists of buried pipes, catch basins, a detention vault, and a perkfilter water quality treatment structure. These facilities will require periodic maintenance and inspection. Inspection and maintenance procedures are contained on the following pages.

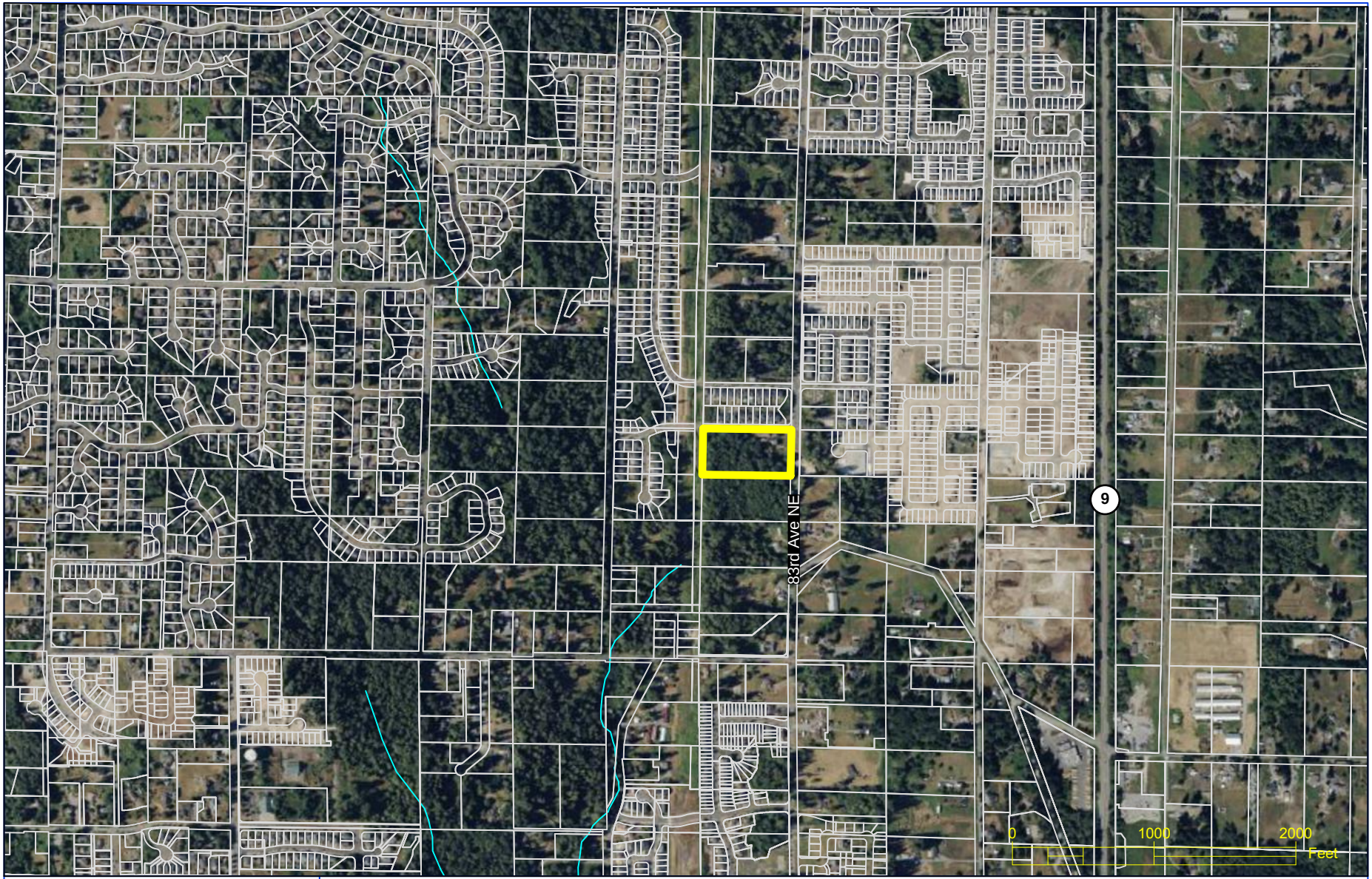
**SECTION 7: SPECIAL REPORTS AND STUDIES**

The following studies were conducted in preparation of this Report:

- Critical Areas Report, Wetland Resources, January 2024
- Geotechnical Report, Earth Solutions NW, January 2024

**Appendix 1: Project Overview**

1. Vicinity Map
2. Existing Conditions Map
3. Proposed Development Map




Solid Ground Engineering
8105 166th Ave NE
Redmond, WA 98052

# CORNERSTONE HOMES

## TAYLOR LANE

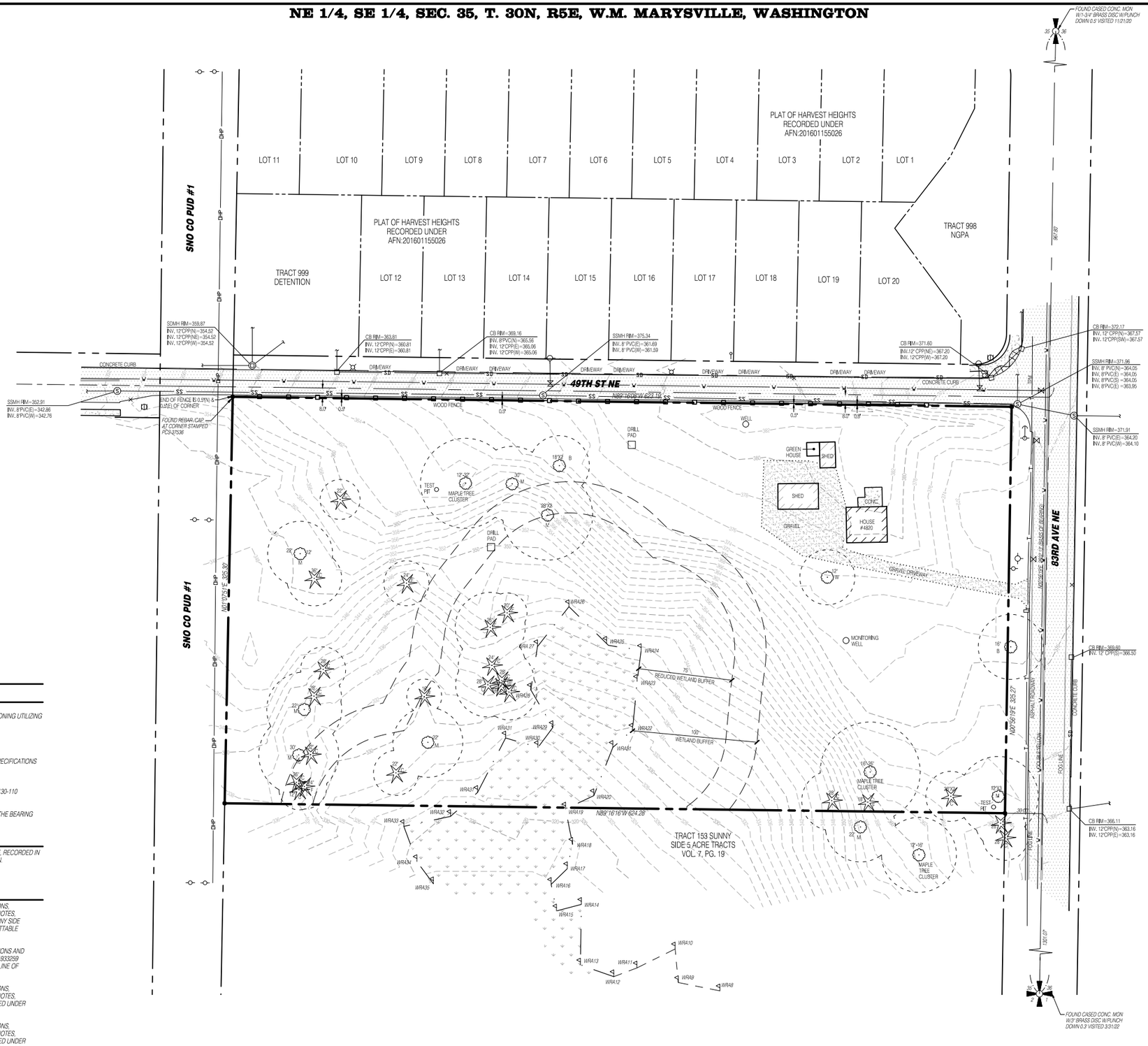
## VICINITY MAP

| | | | |
|---|---|---|---|
| JOB NUMBER: | 23-0009 | DATE: | 1-15-24 |
| JURISDICTION: | Marysville | DRAWN BY: | CJD |



C:\Users\CooperDanby\Documents\CAD-GIS\Maps\Taylor Marysville\Taylor Vicinity Map.dwg

# NE 1/4, SE 1/4, SEC. 35, T. 30N, R5E, W.M. MARYSVILLE, WASHINGTON




## SURVEY INFORMATION

### EQUIPMENT & PROCEDURES

*METHOD OF SURVEY:*
*SURVEY PERFORMED BY FIELD TRAVERSE AND REAL TIME KINEMATIC GPS POSITIONING UTILIZING THE HxGN SMARTNET NETWORK*

*INSTRUMENTATION:*
*LEICA TS16 ROBOTIC ELECTRONIC TOTAL STATION*
*LEICA VIVA GNSS GS08 RECEIVER*
*ALL EQUIPMENT HAS BEEN MAINTAINED IN ADJUSTMENT TO MANUFACTURER'S SPECIFICATIONS AS REQUIRED BY WAC 331-130-100*

*PRECISION:*
*MEETS OR EXCEEDS STATE STANDARDS SET BY WAC 332-130-080 THROUGH 332-130-110*

*BASIS OF BEARING:*
*THE MONUMENTED EAST LINE OF THE SOUTHEAST QUARTER OF SECTION 35 AS THE BEARING NORTH 005619' EAST*

### LEGAL DESCRIPTION

*TRACT 136, SUNNY SIDE FIVE ACRES TRACTS, ACCORDING TO THE PLAT THEREOF, RECORDED IN VOLUME 7 OF PLATS, PAGE 19, RECORDS OF SNOHOMISH COUNTY, WASHINGTON.*

*SITUATE IN THE COUNTY OF SNOHOMISH, STATE OF WASHINGTON.*

### EASEMENT AND RESTRICTIONS

*1. SUBJECT TO COVENANTS, CONDITIONS, RESTRICTIONS, RECITALS, RESERVATIONS, EASEMENTS, EASEMENT PROVISIONS, DEDICATIONS, BUILDING SETBACK LINES, NOTES, STATEMENTS, AND OTHER MATTERS, IF ANY, AS SET FORTH ON THE PLAT OF SUNNY SIDE FIVE ACRE TRACTS, AS RECORDED UNDER RECORDING NUMBER 122901 (NO PLOTTABLE ENCUMBRANCES).*

*2. SUBJECT TO EASEMENT FOR TREE TRIMMING, INCLUDING THE TERMS, CONDITIONS AND PROVISIONS CONTAINED THEREIN, AS RECORDED UNDER RECORDING NUMBER 1933259 (EASEMENT DIMENSIONS ARE NOT DEFINED IN DOCUMENT, ADJACENT TO WEST LINE OF PROPERTY).*

*3. SUBJECT TO COVENANTS, CONDITIONS, RESTRICTIONS, RECITALS, RESERVATIONS, EASEMENTS, EASEMENT PROVISIONS, DEDICATIONS, BUILDING SETBACK LINES, NOTES, STATEMENTS, AND OTHER MATTERS, IF ANY, AS SET FORTH ON SURVEY RECORDED UNDER RECORDING NUMBER 9601045005 (NO PLOTTABLE ENCUMBRANCES).*

*4. SUBJECT TO COVENANTS, CONDITIONS, RESTRICTIONS, RECITALS, RESERVATIONS, EASEMENTS, EASEMENT PROVISIONS, DEDICATIONS, BUILDING SETBACK LINES, NOTES, STATEMENTS, AND OTHER MATTERS, IF ANY, AS SET FORTH ON SURVEY RECORDED UNDER RECORDING NUMBER 9601185006 (NO PLOTTABLE ENCUMBRANCES).*

### VERTICAL DATUM

**NAVD 88** *(NAVD88 -3.67'= NGVD29)*

*FOUND CASED MON WITH 3" BRASS DISC WITH PUNCH AT THE INTERSECTION OF 83RD AVE NE AND 44TH ST NE. ELEVATION = 358.93' PER GPS OBSERVATIONS*

### SURVEY REFERENCES

*(R1) PLAT OF HARVEST HEIGHTS - AFN 201601155026*
*(R2) PLAT OF SUNNY SIDE FIVE ACRE TRACTS - VOL. 7, PG. 19*
*(R3) HARVEST HILLS PHASE 2 - AFN 201503135002*

### DRAINFIELD NOTE

NO KNOWN DRAINFIELD RECORDS ARE AVAILABLE FOR THE PROJECT SITE. IF DRAINFIELDS ARE ENCOUNTERED DURING CONSTRUCTION, SEPTIC TANK SHALL BE PUMPED AND DRAINFIELD SHALL BE REMOVED. REMOVAL OF TANK AND DRAINFIELD SHALL BE REPORTED TO SNOHOMISH COUNTY HEALTH DISTRICT.

### WELL NOTE

NO KNOWN WELL RECORDS ARE AVAILABLE FOR THE PROJECT SITE. IF WELLS ARE ENCOUNTERED DURING CONSTRUCTION, THEY SHALL BE DECOMMISSIONED BASED ON WADOE STANDARDS.

### UTILITY NOTE

THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION. AGENCIES INVOLVED SHALL BE NOTIFIED WITHIN A REASONABLE TIME PRIOR TO THE START OF CONSTRUCTION.

### SURVEY DISCLAIMER

*THE TOPOGRAPHIC SURVEY WAS PERFORMED BY PACIFIC COAST SURVEYS. SOLID GROUND ENGINEERING ASSUMES NO LIABILITY AS TO THE ACCURACY AND COMPLETENESS OF THIS DATA. ANY DISCREPANCIES FOUND BETWEEN WHAT IS SHOWN ON THE PLANS AND WHAT IS NOTED IN THE FIELD SHOULD BE BROUGHT IMMEDIATELY TO THE ATTENTION OF THE ENGINEER.*

811 SAFETY IS IN YOUR HANDS. EVERY DIG. EVERY TIME.

THOMAS P. ABBOTT STATE OF WASHINGTON 56921 REGISTERED PROFESSIONAL ENGINEER

ENGINEER'S STAMP

REVISIONS

| # | DESCRIPTION | DATE |
|---|---|---|


Solid Ground Engineering
8105 166th Ave NE
Redmond, WA 98052


# EXISTING CONDITIONS MAP

KEYSTONE LAND, LLC.

TAYLOR LANE

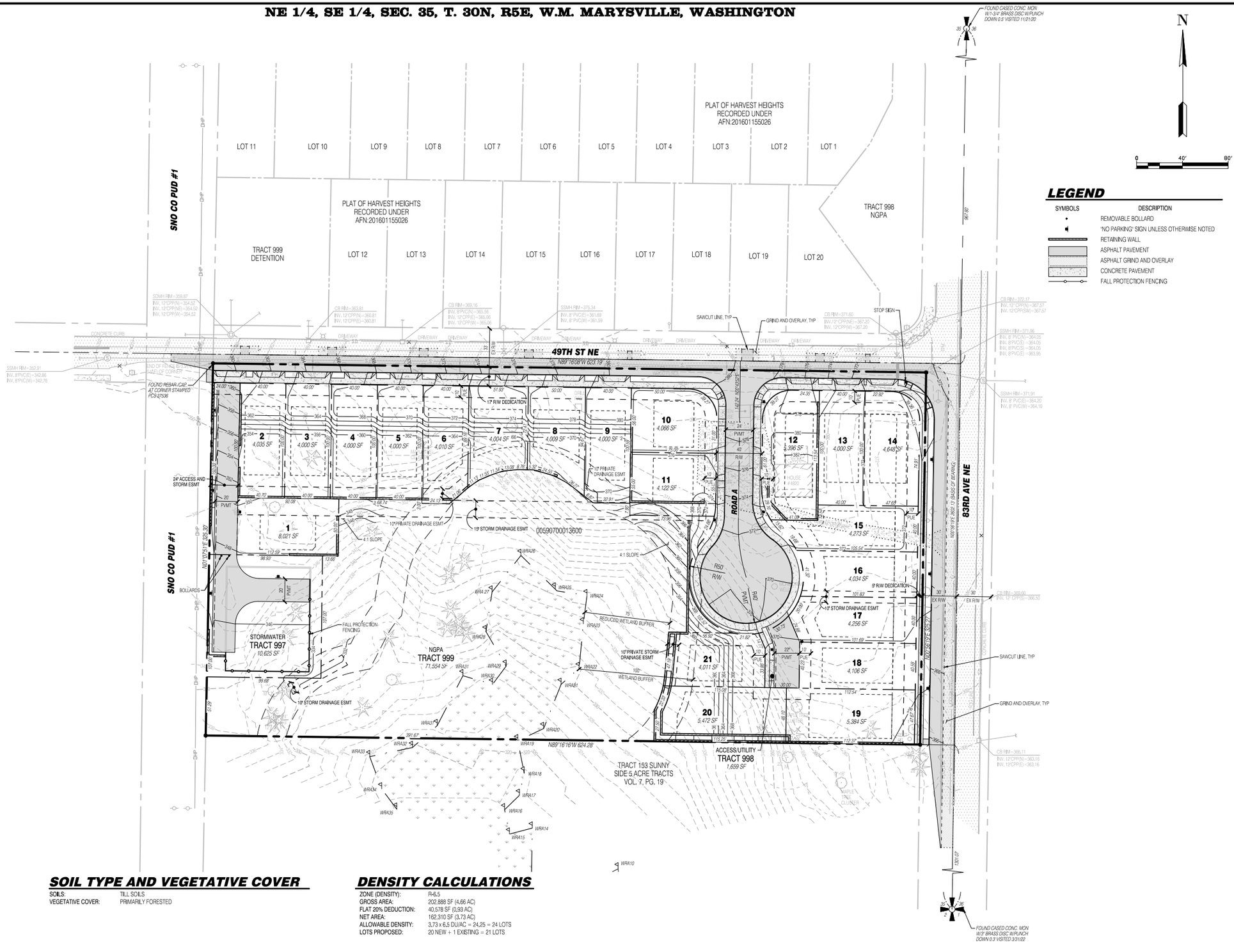
MARYSVILLE, WA

| | |
|---|---|
| DRAWN BY: | AJP |
| CHECKED BY: | TPA |
| DATE: | 12-05-23 |
| JURISDICTION: | CITY OF MARYSVILLE |
| JOB NUMBER: | 23-0009 |

**EC-01**

**2 OF 8**

# NE 1/4, SE 1/4, SEC. 35, T. 30N, R5E, W.M. MARYSVILLE, WASHINGTON




## LEGEND

| SYMBOLS | DESCRIPTION |
|---|---|
| • | REMOVABLE BOLLARD |
| | 'NO PARKING' SIGN UNLESS OTHERWISE NOTED |
| | RETAINING WALL |
| | ASPHALT PAVEMENT |
| | ASPHALT GRIND AND OVERLAY |
| | CONCRETE PAVEMENT |
| | FALL PROTECTION FENCING |

## PROJECT INFORMATION

| | |
|---|---|
| TAX PARCELS: | 005907000013600 |
| SITE ADDRESS: | 4820 83RD AVE NE, MARYSVILLE |
| SITE AREA: | 202,889 SF 4.66 AC |
| PROPOSED ZONING: | R6.5 |
| PROPOSED LAND USE: | DETACHED SINGLE FAMILY HOMES |
| FUTURE LAND USE: (PER COMP PLAN) | URBAN LOW RESIDENTIAL |
| PROPOSED LOTS: | 21 LOTS |
| BUILDING SETBACKS: | 20' FRONT<br>5' SIDE / 11' WHEN ADJACENT TO R/W<br>20' REAR<br>10' NGPA |
| WATER: | CITY OF MARYSVILLE |
| SEWER: | CITY OF MARYSVILLE |
| POWER: | SNOHOMISH COUNTY PUD |
| GAS: | CASCADE NATURAL GAS |
| TELEPHONE: | COMCAST |
| CABLE: | COMCAST |
| SCHOOL DISTRICT: | LAKE STEVENS SCHOOL DISTRICT #4 |
| FIRE DISTRICT: | MARYSVILLE FIRE DISTRICT RFA |

## SOIL TYPE AND VEGETATIVE COVER

| | |
|---|---|
| SOILS: | TILL SOILS |
| VEGETATIVE COVER: | PRIMARILY FORESTED |

## DENSITY CALCULATIONS

| | |
|---|---|
| ZONE (DENSITY): | R-6.5 |
| GROSS AREA: | 202,888 SF (4.66 AC) |
| FLAT 20% DEDUCTION: | 40,578 SF (0.93 AC) |
| NET AREA: | 162,310 SF (3.73 AC) |
| ALLOWABLE DENSITY: | 3.73 x 6.5 DU/AC = 24.25 = 24 LOTS |
| LOTS PROPOSED: | 20 NEW + 1 EXISTING = 21 LOTS |

## UTILITY NOTE

THE CONTRACTOR SHALL VERIFY THE LOCATION OF ALL EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION. AGENCIES INVOLVED SHALL BE NOTIFIED WITHIN A REASONABLE TIME PRIOR TO THE START OF CONSTRUCTION.

## SURVEY DISCLAIMER

*THE TOPOGRAPHIC SURVEY WAS PERFORMED BY PACIFIC COAST SURVEYS. SOLID GROUND ENGINEERING ASSUMES NO LIABILITY AS TO THE ACCURACY AND COMPLETENESS OF THIS DATA. ANY DISCREPANCIES FOUND BETWEEN WHAT IS SHOWN ON THE PLANS AND WHAT IS NOTED IN THE FIELD SHOULD BE BROUGHT IMMEDIATELY TO THE ATTENTION OF THE ENGINEER.*

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ENGINEER'S STAMP

REVISIONS

| # | DATE | DESCRIPTION |
|---|---|---|


Solid Ground Engineering
8105 166th Ave NE
Redmond, WA 98052


# PRELIMINARY PLAT MAP

KEYSTONE LAND, LLC.

TAYLOR LANE

MARYSVILLE, WA

| | |
|---|---|
| DRAWN BY: | AJP |
| CHECKED BY: | TPA |
| DATE: | 12-05-23 |
| JURISDICTION: | CITY OF MARYSVILLE |
| JOB NUMBER: | 23-0009 |

**PP-01**

**3 OF 8**

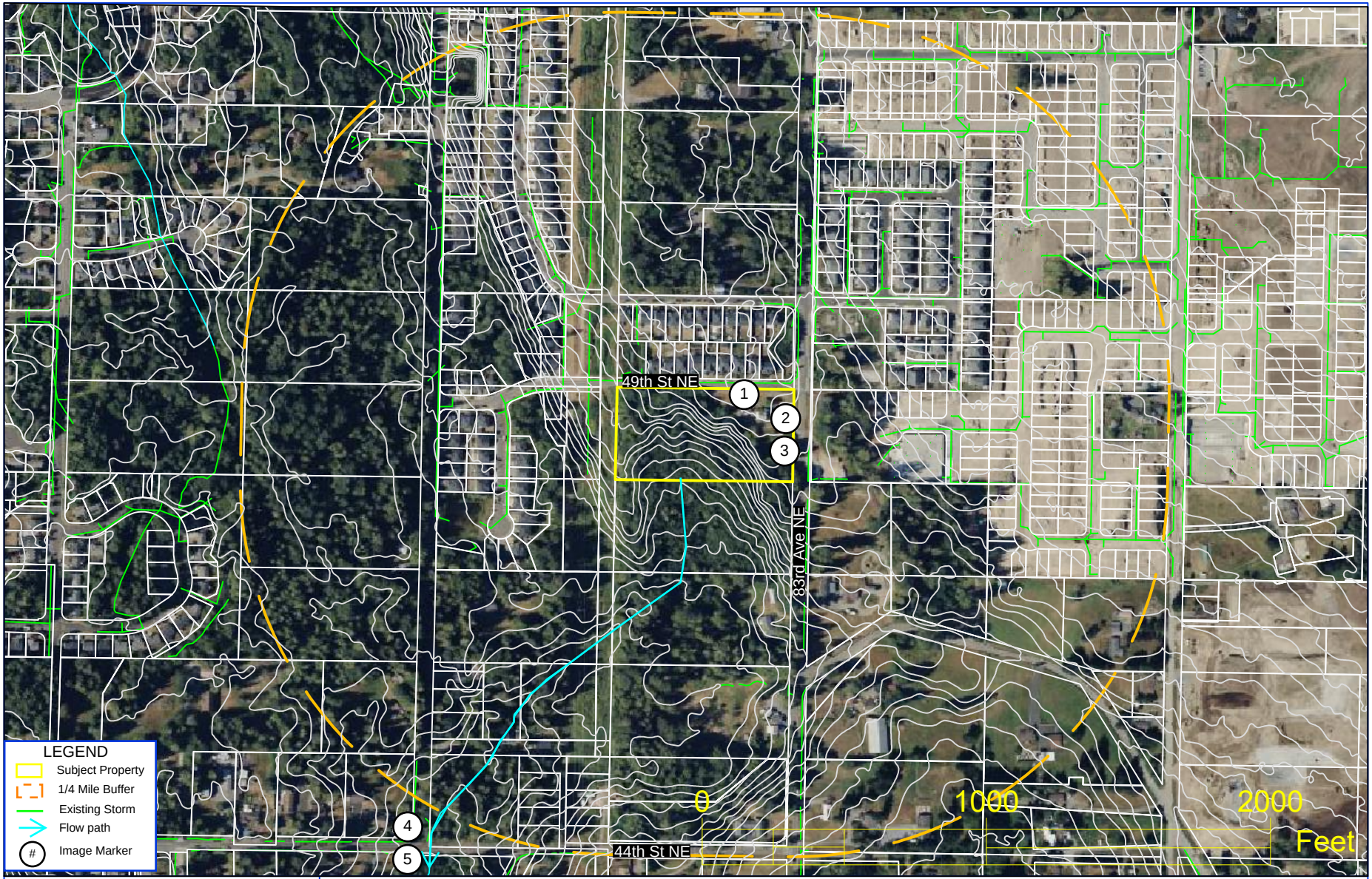
C:\Users\ryan\DOCACDocs\Solid Ground Engineering\23-0009 Taylor Lane\Project Files\Drawings\Preliminary\23-0009P-PP-PL.dwg

**Appendix 2: Temporary Erosion and Sediment Control Design**

1. TESC Plans (to be provided in later submittal)

**Appendix 3: Downstream Analysis**

1. Downstream Analysis Map
2. Downstream Analysis Site Visit Pictures
3. USDA Soils Map & Description

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# CORNERSTONE HOMES

# TAYLOR LANE

## DOWNSTREAM ANALYSIS MAP

| | | | |
|---|---|---|---|
| JOB NUMBER: | 23-0009 | DATE: | 1-15-24 |
| JURISDICTION: | Marysville | DRAWN BY: | CJD |



C:\Users\CooperDanby\Documents\CAD-GIS\Maps\Taylor Marysville\Taylor Downstream Map.dwg

**Downstream Analysis Photographs**

**Image 1:** 49th St NE frontage, does not contribute upstream run-on

**Image 2:** 49th St NE and 83rd Ave NE intersection property corner

**Image 3:** 83rd Ave NE frontage, contributes some upstream run-on due to lack of existing swale/ditch

**Image 4:** North side of 44th St NE, prior to King Creek crossing

**Image 5:** South side of 44th St NE, King Creek continues beyond quarter mile boundary


Map Scale: 1:1,060 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

## MAP LEGEND

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

**Soils**
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

**Special Point Features**
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

**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:
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: Snohomish County Area, Washington
Survey Area Data: Version 25, Aug 29, 2023

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

Date(s) aerial images were photographed: Aug 14, 2022—Sep 1, 2022

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.

# Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| 72 | Tokul gravelly medial loam, 0 to 8 percent slopes | 5.0 | 100.0% |
| **Totals for Area of Interest** | | **5.0** | **100.0%** |

# Snohomish County Area, Washington

## 72—Tokul gravelly medial loam, 0 to 8 percent slopes

### Map Unit Setting

*National map unit symbol:* 2t61k
*Elevation:* 160 to 1,150 feet
*Mean annual precipitation:* 45 to 70 inches
*Mean annual air temperature:* 46 to 52 degrees F
*Frost-free period:* 140 to 200 days
*Farmland classification:* All areas are prime farmland

### Map Unit Composition

*Tokul and similar soils:* 85 percent
*Minor components:* 15 percent
*Estimates are based on observations, descriptions, and transects of the mapunit.*

### Description of Tokul

#### Setting

*Landform:* Hillslopes, till plains
*Landform position (two-dimensional):* Toeslope
*Landform position (three-dimensional):* Side slope, tread
*Down-slope shape:* Convex
*Across-slope shape:* Convex
*Parent material:* Volcanic ash mixed with loess over glacial till

#### Typical profile

*Oi - 0 to 1 inches:* slightly decomposed plant material
*Oa - 1 to 2 inches:* highly decomposed plant material
*A - 2 to 6 inches:* gravelly medial loam
*Bs1 - 6 to 9 inches:* gravelly medial loam
*Bs2 - 9 to 17 inches:* gravelly medial loam
*Bs3 - 17 to 24 inches:* gravelly medial loam
*BC - 24 to 33 inches:* gravelly medial fine sandy loam
*2Bsm - 33 to 62 inches:* cemented material

#### Properties and qualities

*Slope:* 0 to 8 percent
*Depth to restrictive feature:* 20 to 39 inches to densic material; 20 to 39 inches to cemented horizon
*Drainage class:* Moderately well drained
*Capacity of the most limiting layer to transmit water (Ksat):* Very low to moderately low (0.00 to 0.06 in/hr)
*Depth to water table:* About 18 to 36 inches
*Frequency of flooding:* None
*Frequency of ponding:* None
*Available water supply, 0 to 60 inches:* Moderate (about 8.7 inches)

**Interpretive groups**

*Land capability classification (irrigated):* None specified
*Land capability classification (nonirrigated):* 3s
*Hydrologic Soil Group:* B
*Ecological site:* F002XA005WA - Puget Lowlands Moist Forest
*Forage suitability group:* Limited Depth Soils (G002XN302WA), Limited Depth Soils (G002XF303WA)
*Other vegetative classification:* Limited Depth Soils (G002XN302WA), Limited Depth Soils (G002XF303WA)
*Hydric soil rating:* No

**Minor Components**

**Pastik**

*Percent of map unit:* 5 percent
*Landform:* Terraces
*Landform position (three-dimensional):* Tread
*Down-slope shape:* Linear
*Across-slope shape:* Linear
*Hydric soil rating:* No

**Barneston**

*Percent of map unit:* 5 percent
*Landform:* Moraines, eskers, kames
*Landform position (two-dimensional):* Summit, shoulder
*Landform position (three-dimensional):* Interfluve, crest
*Down-slope shape:* Convex
*Across-slope shape:* Convex
*Hydric soil rating:* No

**Norma**

*Percent of map unit:* 3 percent
*Landform:* Drainageways, depressions
*Landform position (three-dimensional):* Dip
*Down-slope shape:* Linear, concave
*Across-slope shape:* Concave
*Hydric soil rating:* Yes

**Mckenna**

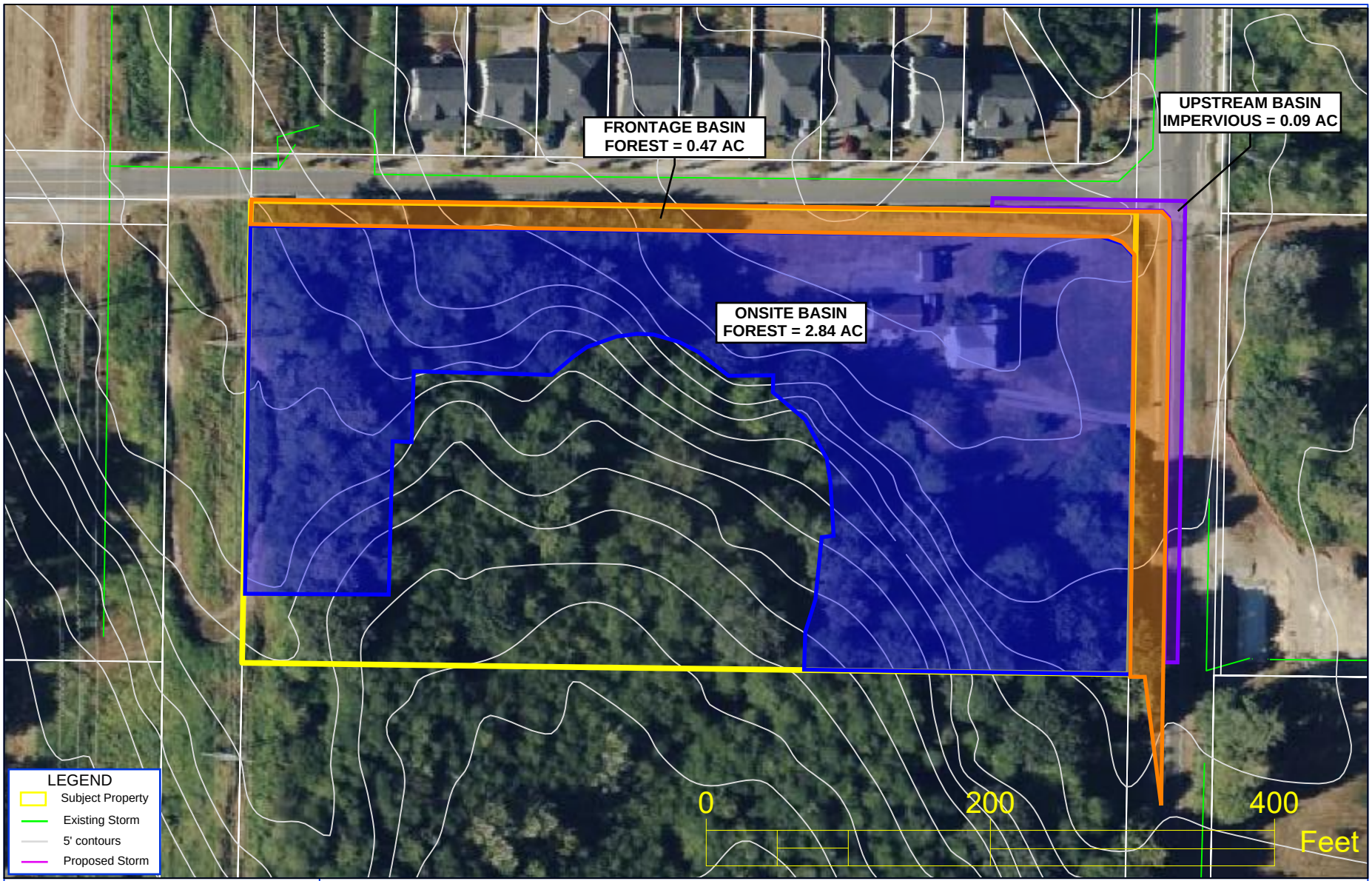
*Percent of map unit:* 2 percent
*Landform:* Drainageways, depressions
*Landform position (three-dimensional):* Dip
*Down-slope shape:* Linear, concave
*Across-slope shape:* Concave
*Hydric soil rating:* Yes

# Data Source Information

Soil Survey Area: Snohomish County Area, Washington
Survey Area Data: Version 25, Aug 29, 2023

**Appendix 4: Detention and Water Quality Design Analysis**

1. Predeveloped Hydrology Map
2. Developed Hydrology Map
3. Perkfilter Detail
4. WWHM2012 Output – Detention Vault

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# CORNERSTONE HOMES

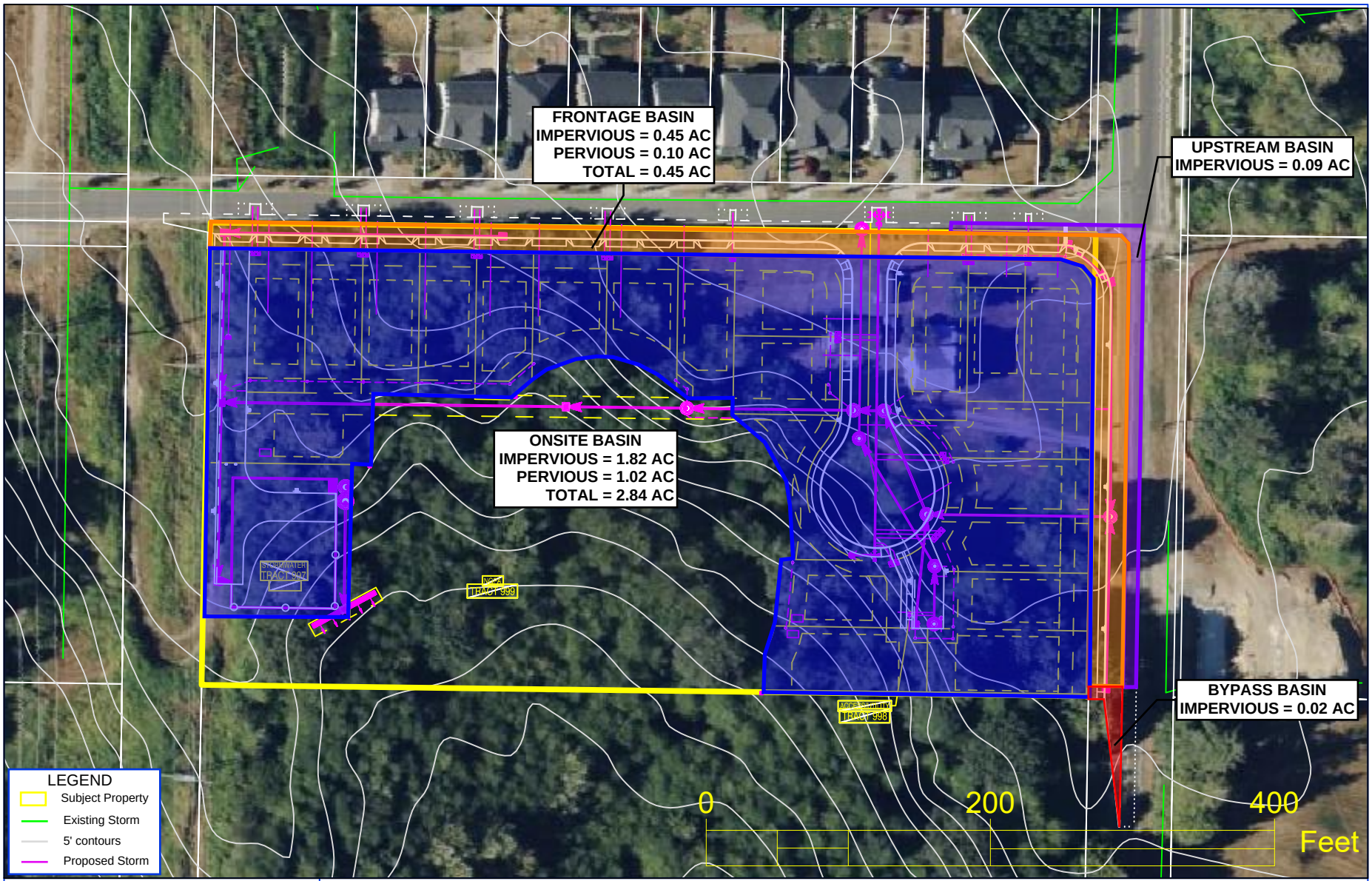
# TAYLOR LANE

## PREDEVELOPED HYDROLOGY MAP

| | | | |
|---|---|---|---|
| JOB NUMBER: | 23-0009 | DATE: | 1-15-24 |
| JURISDICTION: | Marysville | DRAWN BY: | CJD |



C:\Users\CooperDanby\Documents\CAD-GIS\Maps\Taylor Marysville\Taylor PreDev Basin Map.dwg

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Redmond, WA 98052

# CORNERSTONE HOMES

# TAYLOR LANE

## DEVELOPED HYDROLOGY MAP

| | | | |
|---|---|---|---|
| JOB NUMBER: | 23-0009 | DATE: | 1-15-24 |
| JURISDICTION: | Marysville | DRAWN BY: | CJD |



C:\Users\CooperDanby\Documents\CAD-GIS\Maps\Taylor Marysville\Taylor Dev Basin Map.dwg

| SITE SPECIFIC DATA | |
|---|---|
| Structure ID | - |
| Treatment Flow Rate (gpm/cfs) | - |
| Peak Flow Rate (cfs) | - |
| Cartridge Quantity | - |
| Rim Elevation | - |

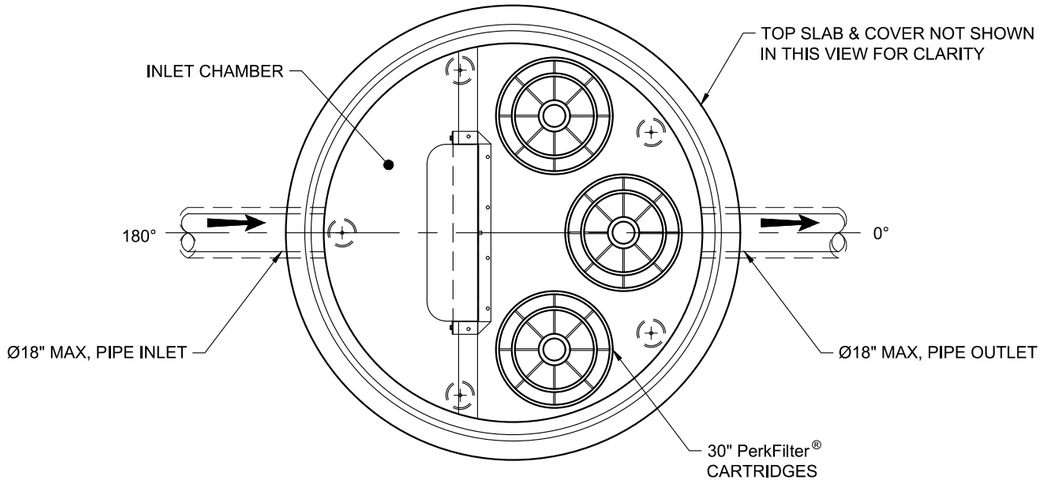
| Pipe Data | Pipe Location | Pipe Size | Pipe Type | Invert Elevation |
|---|---|---|---|---|
| Inlet | - | - | - | - |
| Outlet | - | - | - | - |

Notes:
-

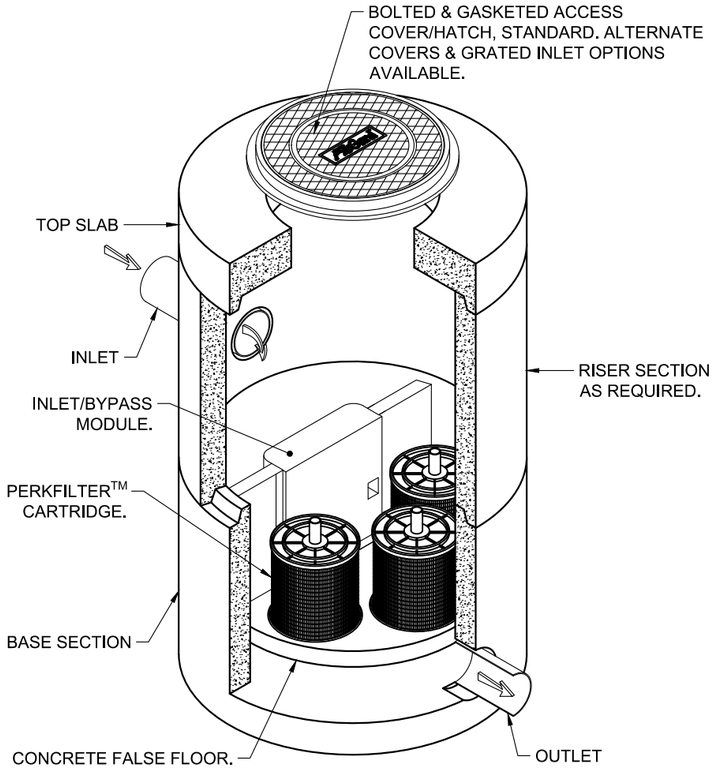
| PERFORMANCE SPECIFICATIONS | |
|---|---|
| Peak Treatment Capacities: [1] | |
| Max. Cartridge Quantity | 3 |
| NJDEP 80% Removal, 75 micron | 102 gpm / 0.227 cfs |
| WA Ecology GULD - Basic & Phosphorus | 51 gpm / 0.113 cfs |
| Max. Bypass Capacity | 3.62 cfs |

1. Contact Oldcastle for alternative treatment and peak flow capacities.

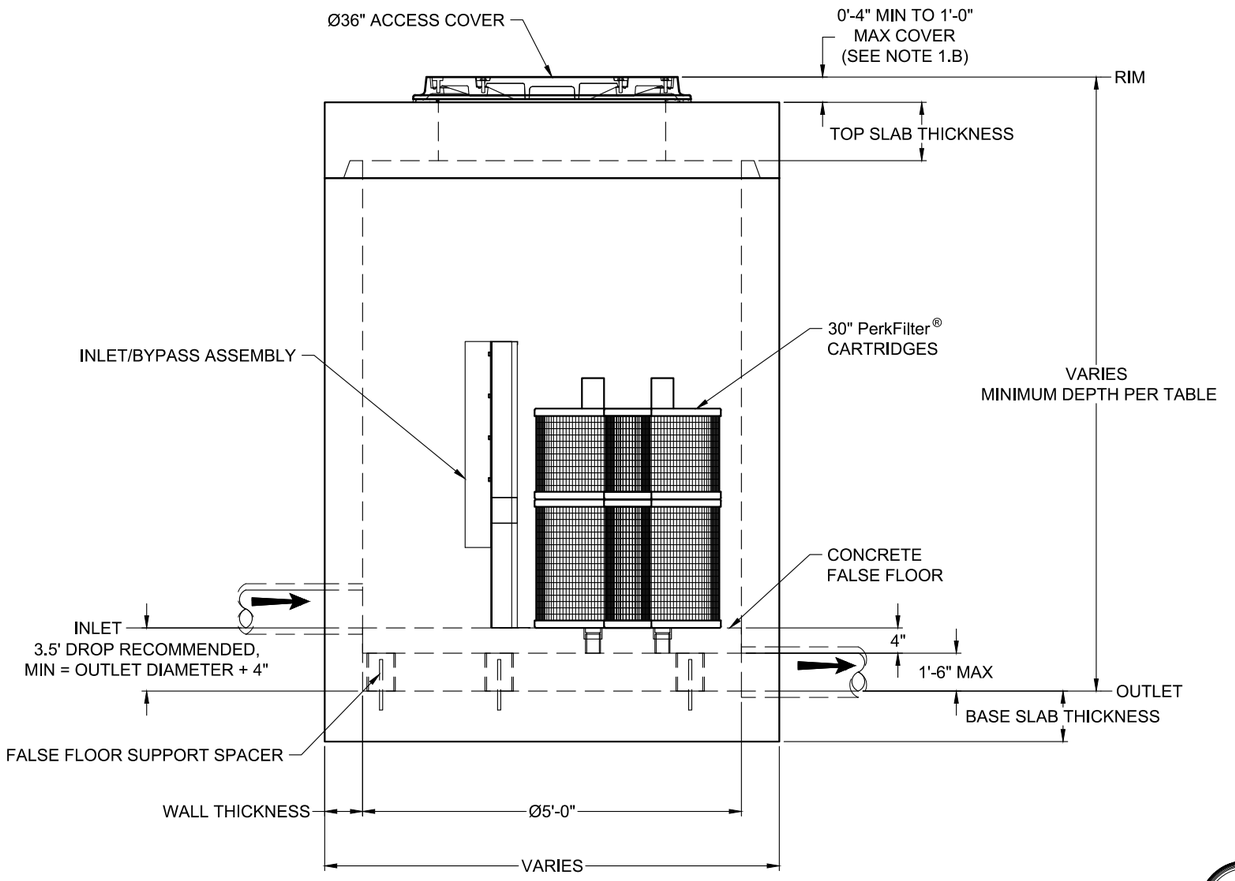
| MINIMUM DEPTH | |
|---|---|
| Outlet Pipe Size | Minimum Rim to Outlet Depth |
| Ø6" | 6.08' |
| Ø8" | 6.33' |
| Ø10" | 6.58' |
| Ø12" | 6.83' |
| Ø15" | 7.08' |
| Ø18" | 7.33' |




PLAN VIEW




ISOMETRIC VIEW




ELEVATION VIEW

NOTES:

1. DESIGN LOADINGS:
   A. AASHTO HS-20-44 (WITH IMPACT)
   B. DESIGN SOIL COVER: 1'-0" MAXIMUM
   C. ASSUMED WATER TABLE: BELOW INVERT.
   D. LATERAL EARTH PRESSURE: 45 PCF (DRAINED)
   E. LATERAL LIVE LOAD SURCHARGE: 80 PSF (APPLIED TO 8'-0" BELOW GRADE)
   F. NO LATERAL SURCHARGE FROM ADJACENT BUILDINGS, WALLS, PIERS, OR FOUNDATIONS.
2. CONCRETE 28-DAY MINIMUM COMPRESSIVE STRENGTH: 5,000 PSI MINIMUM.
3. REINFORCING: REBAR, ASTM A615/A706, GRADE 60
4. CEMENT: ASTM C150
5. REQUIRED ALLOWABLE SOIL BEARING CAPACITY: 2,500 PSF
6. REFERENCE STANDARD:
   A. ASTM C 478
   B. ASTM C 497
7. THIS STRUCTURE IS DESIGNED TO THE PARAMETERS NOTED HEREIN. ENGINEER-OF-RECORD SHALL VERIFY THAT NOTED PARAMETERS MEET OR EXCEED PROJECT REQUIREMENTS. IF DESIGN PARAMETERS ARE INCORRECT, REVIEWING ENGINEER/AUTHORITY SHALL NOTIFY OLDCASTLE INFRASTRUCTURE UPON REVIEW OF THIS SUBMITTAL.
8. OVERSIZED HOLES TO ACCOMMODATE SPECIFIC PIPE TYPE MUST BE CONCENTRIC TO PIPE ID. AFTER PIPES ARE INSTALLED, ALL ANNULAR SPACES SHALL BE FILLED WITH A MINIMUM OF 3,000 PSI CONCRETE FOR FULL THICKNESS OF PRECAST WALLS. PIPES ARE TO BE FLUSH WITH THE INSIDE SURFACE OF THE CONCRETE STRUCTURE.
9. CONTRACTOR RESPONSIBLE TO VERIFY ALL SIZES, LOCATIONS, AND ELEVATIONS OF OPENINGS.
10. CONTRACTOR RESPONSIBLE TO ENSURE ADEQUATE BEARING SURFACE IS PROVIDED (I.E. COMPACTED AND LEVEL PER PROJECT SPECIFICATIONS).
11. SECTION HEIGHTS, SLAB/WALL THICKNESSES, AND KEYWAYS ARE SUBJECT TO CHANGE AS REQUIRED FOR SITE REQUIREMENTS AND/OR DUE TO PRODUCT AVAILABILITY AND PRODUCTION FACILITY CONSTRAINTS.
12. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT OLDCASTLE INFRASTRUCTURE.
13. MAXIMUM PICK WEIGHTS:
   A. TOP SLAB: XX,XXX LBS
   B. RISER: XX,XXX LBS
   C. BASE: XX,XXX LBS*
   (* COMBINED WEIGHT OF BASE INCLUDES FALSE FLOOR, AND PRODUCT INTERNALS.)
14. INTERNALS SHALL CONSIST OF CARTRIDGES, INLET/BYPASS ASSEMBLIES, FALSE FLOOR AND FALSE FLOOR SUPPORT SPACERS.

Oldcastle Infrastructure™
A CRH COMPANY

Ph: 800.579.8819 | www.oldcastleinfrastructure.com/stormwater



PerkFilter® Manhole (STANDARD)
Ø60" with 30" Cartridges

CUSTOMER
-

PROJECT NAME
-

| SHEET NAME | REVISION | SHEET |
|---|---|---|
| Specifier Drawing PFMH-60-30 | - | 1 OF 1 |
| | REV DATE - | |

Media Filtration

# WWHM2012

# PROJECT REPORT

# General Model Information

WWHM2012 Project Name: Prelim Vault Sizing
Site Name:
Site Address:
City:

| | |
|---|---|
| Report Date: | 11/30/2023 |
| Gage: | Everett |
| Data Start: | 1948/10/01 |
| Data End: | 2009/09/30 |
| Timestep: | 15 Minute |
| Precip Scale: | 1.200 |
| Version Date: | 2023/01/27 |
| Version: | 4.2.19 |

## 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*

### onsite

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | acre |
| C, Forest, Steep | 2.84 |
| Pervious Total | 2.84 |
| Impervious Land Use | acre |
| Impervious Total | 0 |
| Basin Total | 2.84 |

## frontage

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | acre |
| C, Forest, Flat | 0.47 |
| Pervious Total | 0.47 |
| Impervious Land Use | acre |
| Impervious Total | 0 |
| Basin Total | 0.47 |

## upstream

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | acre |
| Pervious Total | 0 |
| Impervious Land Use | acre |
| ROADS FLAT | 0.09 |
| Impervious Total | 0.09 |
| Basin Total | 0.09 |

## *Mitigated Land Use*

### onsite

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

| Pervious Land Use | acre |
|---|---|
| C, Pasture, Flat | 0.75 |
| C, Pasture, Mod | 0.27 |
| Pervious Total | 1.02 |

| Impervious Land Use | acre |
|---|---|
| ROADS FLAT | 0.36 |
| ROOF TOPS FLAT | 1.04 |
| DRIVEWAYS FLAT | 0.35 |
| SIDEWALKS FLAT | 0.07 |
| Impervious Total | 1.82 |
| Basin Total | 2.84 |

## frontage

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

| Pervious Land Use | acre |
|---|---|
| C, Pasture, Flat | 0.1 |
| Pervious Total | 0.1 |

| Impervious Land Use | acre |
|---|---|
| ROADS FLAT | 0.25 |
| SIDEWALKS FLAT | 0.1 |
| Impervious Total | 0.35 |
| Basin Total | 0.45 |

## frontage bypass

| | |
|---|---|
| Bypass: | Yes |
| GroundWater: | No |
| Pervious Land Use | acre |
| Pervious Total | 0 |
| Impervious Land Use | acre |
| ROADS FLAT | 0.02 |
| Impervious Total | 0.02 |
| Basin Total | 0.02 |

## upstream

| | |
|---|---|
| Bypass: | No |
| GroundWater: | No |
| Pervious Land Use | acre |
| Pervious Total | 0 |
| Impervious Land Use | acre |
| ROADS FLAT | 0.09 |
| Impervious Total | 0.09 |
| Basin Total | 0.09 |

# Routing Elements
## Predeveloped Routing

## *Mitigated Routing*

### Vault 1

Width: 90 ft.
Length: 70 ft.
Depth: 7 ft.
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 1.563 in. Elevation:0 ft.
Orifice 2 Diameter: 2.375 in. Elevation:4.2 ft.
Orifice 3 Diameter: 1.531 in. Elevation:5.3 ft.
Element Flows To:
Outlet 1 Outlet 2

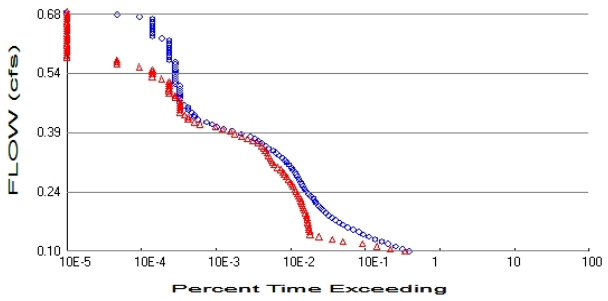
Vault Hydraulic Table

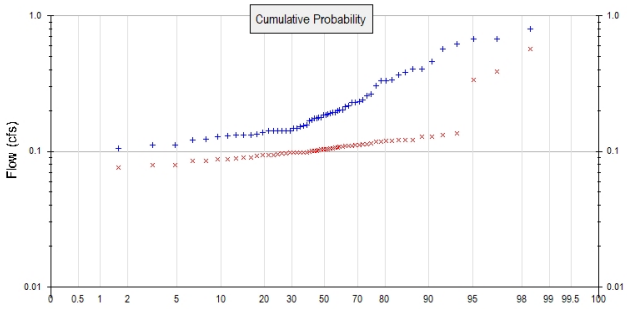
| Stage(feet) | Area(ac.) | Volume(ac-ft.) | Discharge(cfs) | Infilt(cfs) |
|---|---|---|---|---|
| 0.0000 | 0.144 | 0.000 | 0.000 | 0.000 |
| 0.0778 | 0.144 | 0.011 | 0.018 | 0.000 |
| 0.1556 | 0.144 | 0.022 | 0.026 | 0.000 |
| 0.2333 | 0.144 | 0.033 | 0.032 | 0.000 |
| 0.3111 | 0.144 | 0.045 | 0.037 | 0.000 |
| 0.3889 | 0.144 | 0.056 | 0.041 | 0.000 |
| 0.4667 | 0.144 | 0.067 | 0.045 | 0.000 |
| 0.5444 | 0.144 | 0.078 | 0.048 | 0.000 |
| 0.6222 | 0.144 | 0.090 | 0.052 | 0.000 |
| 0.7000 | 0.144 | 0.101 | 0.055 | 0.000 |
| 0.7778 | 0.144 | 0.112 | 0.058 | 0.000 |
| 0.8556 | 0.144 | 0.123 | 0.061 | 0.000 |
| 0.9333 | 0.144 | 0.135 | 0.064 | 0.000 |
| 1.0111 | 0.144 | 0.146 | 0.066 | 0.000 |
| 1.0889 | 0.144 | 0.157 | 0.069 | 0.000 |
| 1.1667 | 0.144 | 0.168 | 0.071 | 0.000 |
| 1.2444 | 0.144 | 0.180 | 0.073 | 0.000 |
| 1.3222 | 0.144 | 0.191 | 0.076 | 0.000 |
| 1.4000 | 0.144 | 0.202 | 0.078 | 0.000 |
| 1.4778 | 0.144 | 0.213 | 0.080 | 0.000 |
| 1.5556 | 0.144 | 0.225 | 0.082 | 0.000 |
| 1.6333 | 0.144 | 0.236 | 0.084 | 0.000 |
| 1.7111 | 0.144 | 0.247 | 0.086 | 0.000 |
| 1.7889 | 0.144 | 0.258 | 0.088 | 0.000 |
| 1.8667 | 0.144 | 0.270 | 0.090 | 0.000 |
| 1.9444 | 0.144 | 0.281 | 0.092 | 0.000 |
| 2.0222 | 0.144 | 0.292 | 0.094 | 0.000 |
| 2.1000 | 0.144 | 0.303 | 0.096 | 0.000 |
| 2.1778 | 0.144 | 0.315 | 0.097 | 0.000 |
| 2.2556 | 0.144 | 0.326 | 0.099 | 0.000 |
| 2.3333 | 0.144 | 0.337 | 0.101 | 0.000 |
| 2.4111 | 0.144 | 0.348 | 0.102 | 0.000 |
| 2.4889 | 0.144 | 0.360 | 0.104 | 0.000 |
| 2.5667 | 0.144 | 0.371 | 0.106 | 0.000 |
| 2.6444 | 0.144 | 0.382 | 0.107 | 0.000 |
| 2.7222 | 0.144 | 0.393 | 0.109 | 0.000 |
| 2.8000 | 0.144 | 0.405 | 0.110 | 0.000 |
| 2.8778 | 0.144 | 0.416 | 0.112 | 0.000 |

| | | | | |
|---|---|---|---|---|
| 2.9556 | 0.144 | 0.427 | 0.113 | 0.000 |
| 3.0333 | 0.144 | 0.438 | 0.115 | 0.000 |
| 3.1111 | 0.144 | 0.450 | 0.116 | 0.000 |
| 3.1889 | 0.144 | 0.461 | 0.118 | 0.000 |
| 3.2667 | 0.144 | 0.472 | 0.119 | 0.000 |
| 3.3444 | 0.144 | 0.483 | 0.121 | 0.000 |
| 3.4222 | 0.144 | 0.494 | 0.122 | 0.000 |
| 3.5000 | 0.144 | 0.506 | 0.123 | 0.000 |
| 3.5778 | 0.144 | 0.517 | 0.125 | 0.000 |
| 3.6556 | 0.144 | 0.528 | 0.126 | 0.000 |
| 3.7333 | 0.144 | 0.539 | 0.128 | 0.000 |
| 3.8111 | 0.144 | 0.551 | 0.129 | 0.000 |
| 3.8889 | 0.144 | 0.562 | 0.130 | 0.000 |
| 3.9667 | 0.144 | 0.573 | 0.132 | 0.000 |
| 4.0444 | 0.144 | 0.584 | 0.133 | 0.000 |
| 4.1222 | 0.144 | 0.596 | 0.134 | 0.000 |
| 4.2000 | 0.144 | 0.607 | 0.135 | 0.000 |
| 4.2778 | 0.144 | 0.618 | 0.179 | 0.000 |
| 4.3556 | 0.144 | 0.629 | 0.198 | 0.000 |
| 4.4333 | 0.144 | 0.641 | 0.213 | 0.000 |
| 4.5111 | 0.144 | 0.652 | 0.226 | 0.000 |
| 4.5889 | 0.144 | 0.663 | 0.237 | 0.000 |
| 4.6667 | 0.144 | 0.674 | 0.247 | 0.000 |
| 4.7444 | 0.144 | 0.686 | 0.257 | 0.000 |
| 4.8222 | 0.144 | 0.697 | 0.266 | 0.000 |
| 4.9000 | 0.144 | 0.708 | 0.274 | 0.000 |
| 4.9778 | 0.144 | 0.719 | 0.282 | 0.000 |
| 5.0556 | 0.144 | 0.731 | 0.290 | 0.000 |
| 5.1333 | 0.144 | 0.742 | 0.298 | 0.000 |
| 5.2111 | 0.144 | 0.753 | 0.305 | 0.000 |
| 5.2889 | 0.144 | 0.764 | 0.312 | 0.000 |
| 5.3667 | 0.144 | 0.776 | 0.335 | 0.000 |
| 5.4444 | 0.144 | 0.787 | 0.349 | 0.000 |
| 5.5222 | 0.144 | 0.798 | 0.361 | 0.000 |
| 5.6000 | 0.144 | 0.809 | 0.372 | 0.000 |
| 5.6778 | 0.144 | 0.821 | 0.383 | 0.000 |
| 5.7556 | 0.144 | 0.832 | 0.392 | 0.000 |
| 5.8333 | 0.144 | 0.843 | 0.402 | 0.000 |
| 5.9111 | 0.144 | 0.854 | 0.411 | 0.000 |
| 5.9889 | 0.144 | 0.866 | 0.419 | 0.000 |
| 6.0667 | 0.144 | 0.877 | 0.610 | 0.000 |
| 6.1444 | 0.144 | 0.888 | 1.008 | 0.000 |
| 6.2222 | 0.144 | 0.899 | 1.490 | 0.000 |
| 6.3000 | 0.144 | 0.911 | 1.961 | 0.000 |
| 6.3778 | 0.144 | 0.922 | 2.338 | 0.000 |
| 6.4556 | 0.144 | 0.933 | 2.580 | 0.000 |
| 6.5333 | 0.144 | 0.944 | 2.774 | 0.000 |
| 6.6111 | 0.144 | 0.956 | 2.943 | 0.000 |
| 6.6889 | 0.144 | 0.967 | 3.102 | 0.000 |
| 6.7667 | 0.144 | 0.978 | 3.252 | 0.000 |
| 6.8444 | 0.144 | 0.989 | 3.395 | 0.000 |
| 6.9222 | 0.144 | 1.001 | 3.532 | 0.000 |
| 7.0000 | 0.144 | 1.012 | 3.664 | 0.000 |
| 7.0778 | 0.144 | 1.023 | 3.790 | 0.000 |
| 7.1556 | 0.000 | 0.000 | 3.912 | 0.000 |

# *Analysis Results*

## *POC 1*




\+ Predeveloped  x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.31
Total Impervious Area: 0.09

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.12
Total Impervious Area: 2.28

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.195214 |
| 5 year | 0.311313 |
| 10 year | 0.407627 |
| 25 year | 0.554341 |
| 50 year | 0.68372 |
| 100 year | 0.832006 |

Flow Frequency Return Periods for Mitigated. POC #1

| **Return Period** | **Flow(cfs)** |
|---|---|
| 2 year | 0.10527 |
| 5 year | 0.143273 |
| 10 year | 0.172345 |
| 25 year | 0.213816 |
| 50 year | 0.248357 |
| 100 year | 0.28621 |

## Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

| **Year** | **Predeveloped** | **Mitigated** |
|---|---|---|
| 1949 | 0.228 | 0.098 |
| 1950 | 0.256 | 0.101 |
| 1951 | 0.171 | 0.094 |
| 1952 | 0.174 | 0.079 |
| 1953 | 0.176 | 0.085 |
| 1954 | 0.677 | 0.104 |
| 1955 | 0.239 | 0.110 |
| 1956 | 0.192 | 0.118 |
| 1957 | 0.265 | 0.121 |
| 1958 | 0.673 | 0.098 |

| | | |
|---|---|---|
| 1959 | 0.169 | 0.107 |
| 1960 | 0.201 | 0.113 |
| 1961 | 0.799 | 0.106 |
| 1962 | 0.201 | 0.102 |
| 1963 | 0.331 | 0.093 |
| 1964 | 0.212 | 0.093 |
| 1965 | 0.131 | 0.103 |
| 1966 | 0.105 | 0.088 |
| 1967 | 0.190 | 0.097 |
| 1968 | 0.232 | 0.121 |
| 1969 | 0.620 | 0.094 |
| 1970 | 0.128 | 0.090 |
| 1971 | 0.231 | 0.110 |
| 1972 | 0.177 | 0.108 |
| 1973 | 0.141 | 0.098 |
| 1974 | 0.367 | 0.097 |
| 1975 | 0.194 | 0.089 |
| 1976 | 0.135 | 0.108 |
| 1977 | 0.123 | 0.095 |
| 1978 | 0.142 | 0.079 |
| 1979 | 0.382 | 0.113 |
| 1980 | 0.185 | 0.088 |
| 1981 | 0.138 | 0.096 |
| 1982 | 0.177 | 0.128 |
| 1983 | 0.305 | 0.098 |
| 1984 | 0.152 | 0.118 |
| 1985 | 0.218 | 0.115 |
| 1986 | 0.459 | 0.337 |
| 1987 | 0.200 | 0.135 |
| 1988 | 0.142 | 0.109 |
| 1989 | 0.185 | 0.071 |
| 1990 | 0.141 | 0.111 |
| 1991 | 0.156 | 0.111 |
| 1992 | 0.155 | 0.100 |
| 1993 | 0.132 | 0.090 |
| 1994 | 0.111 | 0.104 |
| 1995 | 0.149 | 0.119 |
| 1996 | 0.333 | 0.119 |
| 1997 | 0.571 | 0.573 |
| 1998 | 0.148 | 0.085 |
| 1999 | 0.130 | 0.104 |
| 2000 | 0.121 | 0.121 |
| 2001 | 0.059 | 0.076 |
| 2002 | 0.141 | 0.106 |
| 2003 | 0.111 | 0.098 |
| 2004 | 0.189 | 0.133 |
| 2005 | 0.141 | 0.104 |
| 2006 | 0.404 | 0.128 |
| 2007 | 0.335 | 0.102 |
| 2008 | 0.405 | 0.386 |
| 2009 | 0.132 | 0.099 |

## Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated.  POC #1

| Rank | Predeveloped | Mitigated |
|---|---|---|
| 1 | 0.7991 | 0.5725 |
| 2 | 0.6774 | 0.3858 |
| 3 | 0.6727 | 0.3371 |

| | | |
|---|---|---|
| 4 | 0.6201 | 0.1352 |
| 5 | 0.5705 | 0.1327 |
| 6 | 0.4588 | 0.1284 |
| 7 | 0.4054 | 0.1278 |
| 8 | 0.4040 | 0.1213 |
| 9 | 0.3819 | 0.1210 |
| 10 | 0.3665 | 0.1205 |
| 11 | 0.3354 | 0.1194 |
| 12 | 0.3326 | 0.1192 |
| 13 | 0.3306 | 0.1181 |
| 14 | 0.3052 | 0.1175 |
| 15 | 0.2648 | 0.1146 |
| 16 | 0.2555 | 0.1129 |
| 17 | 0.2386 | 0.1126 |
| 18 | 0.2324 | 0.1112 |
| 19 | 0.2308 | 0.1110 |
| 20 | 0.2283 | 0.1100 |
| 21 | 0.2179 | 0.1096 |
| 22 | 0.2124 | 0.1094 |
| 23 | 0.2013 | 0.1079 |
| 24 | 0.2008 | 0.1076 |
| 25 | 0.2004 | 0.1072 |
| 26 | 0.1939 | 0.1065 |
| 27 | 0.1922 | 0.1055 |
| 28 | 0.1905 | 0.1045 |
| 29 | 0.1892 | 0.1044 |
| 30 | 0.1851 | 0.1042 |
| 31 | 0.1851 | 0.1040 |
| 32 | 0.1774 | 0.1031 |
| 33 | 0.1772 | 0.1017 |
| 34 | 0.1761 | 0.1015 |
| 35 | 0.1741 | 0.1012 |
| 36 | 0.1707 | 0.1004 |
| 37 | 0.1687 | 0.0991 |
| 38 | 0.1564 | 0.0984 |
| 39 | 0.1553 | 0.0978 |
| 40 | 0.1517 | 0.0978 |
| 41 | 0.1486 | 0.0976 |
| 42 | 0.1480 | 0.0976 |
| 43 | 0.1420 | 0.0974 |
| 44 | 0.1417 | 0.0968 |
| 45 | 0.1415 | 0.0959 |
| 46 | 0.1412 | 0.0950 |
| 47 | 0.1411 | 0.0942 |
| 48 | 0.1407 | 0.0942 |
| 49 | 0.1381 | 0.0934 |
| 50 | 0.1348 | 0.0931 |
| 51 | 0.1324 | 0.0899 |
| 52 | 0.1319 | 0.0896 |
| 53 | 0.1312 | 0.0888 |
| 54 | 0.1302 | 0.0877 |
| 55 | 0.1275 | 0.0877 |
| 56 | 0.1234 | 0.0853 |
| 57 | 0.1209 | 0.0846 |
| 58 | 0.1108 | 0.0791 |
| 59 | 0.1108 | 0.0787 |
| 60 | 0.1052 | 0.0758 |
| 61 | 0.0585 | 0.0707 |

## Duration Flows

The Facility PASSED

| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.0976 | 8339 | 7330 | 87 | Pass |
| 0.1035 | 6688 | 4648 | 69 | Pass |
| 0.1094 | 5407 | 3041 | 56 | Pass |
| 0.1154 | 4336 | 1946 | 44 | Pass |
| 0.1213 | 3531 | 1075 | 30 | Pass |
| 0.1272 | 2890 | 769 | 26 | Pass |
| 0.1331 | 2398 | 512 | 21 | Pass |
| 0.1390 | 2021 | 388 | 19 | Pass |
| 0.1450 | 1754 | 383 | 21 | Pass |
| 0.1509 | 1472 | 376 | 25 | Pass |
| 0.1568 | 1239 | 372 | 30 | Pass |
| 0.1627 | 1070 | 368 | 34 | Pass |
| 0.1687 | 955 | 362 | 37 | Pass |
| 0.1746 | 848 | 357 | 42 | Pass |
| 0.1805 | 755 | 353 | 46 | Pass |
| 0.1864 | 685 | 347 | 50 | Pass |
| 0.1923 | 630 | 339 | 53 | Pass |
| 0.1983 | 578 | 329 | 56 | Pass |
| 0.2042 | 538 | 316 | 58 | Pass |
| 0.2101 | 506 | 308 | 60 | Pass |
| 0.2160 | 471 | 299 | 63 | Pass |
| 0.2219 | 452 | 294 | 65 | Pass |
| 0.2279 | 431 | 284 | 65 | Pass |
| 0.2338 | 398 | 271 | 68 | Pass |
| 0.2397 | 366 | 263 | 71 | Pass |
| 0.2456 | 347 | 251 | 72 | Pass |
| 0.2515 | 328 | 243 | 74 | Pass |
| 0.2575 | 314 | 233 | 74 | Pass |
| 0.2634 | 302 | 221 | 73 | Pass |
| 0.2693 | 289 | 211 | 73 | Pass |
| 0.2752 | 274 | 198 | 72 | Pass |
| 0.2811 | 264 | 188 | 71 | Pass |
| 0.2871 | 254 | 176 | 69 | Pass |
| 0.2930 | 243 | 169 | 69 | Pass |
| 0.2989 | 230 | 159 | 69 | Pass |
| 0.3048 | 220 | 143 | 65 | Pass |
| 0.3107 | 202 | 128 | 63 | Pass |
| 0.3167 | 189 | 121 | 64 | Pass |
| 0.3226 | 178 | 117 | 65 | Pass |
| 0.3285 | 165 | 114 | 69 | Pass |
| 0.3344 | 150 | 109 | 72 | Pass |
| 0.3403 | 135 | 103 | 76 | Pass |
| 0.3463 | 125 | 97 | 77 | Pass |
| 0.3522 | 109 | 92 | 84 | Pass |
| 0.3581 | 100 | 87 | 87 | Pass |
| 0.3640 | 86 | 78 | 90 | Pass |
| 0.3699 | 78 | 66 | 84 | Pass |
| 0.3759 | 70 | 56 | 80 | Pass |
| 0.3818 | 62 | 47 | 75 | Pass |
| 0.3877 | 47 | 38 | 80 | Pass |
| 0.3936 | 35 | 33 | 94 | Pass |
| 0.3995 | 27 | 26 | 96 | Pass |
| 0.4055 | 22 | 21 | 95 | Pass |

| | | | | |
|---|---|---|---|---|
| 0.4114 | 19 | 13 | 68 | Pass |
| 0.4173 | 16 | 11 | 68 | Pass |
| 0.4232 | 12 | 9 | 75 | Pass |
| 0.4291 | 11 | 9 | 81 | Pass |
| 0.4351 | 11 | 8 | 72 | Pass |
| 0.4410 | 10 | 7 | 70 | Pass |
| 0.4469 | 9 | 7 | 77 | Pass |
| 0.4528 | 9 | 7 | 77 | Pass |
| 0.4587 | 8 | 7 | 87 | Pass |
| 0.4647 | 7 | 7 | 100 | Pass |
| 0.4706 | 7 | 7 | 100 | Pass |
| 0.4765 | 7 | 6 | 85 | Pass |
| 0.4824 | 7 | 6 | 85 | Pass |
| 0.4883 | 7 | 5 | 71 | Pass |
| 0.4943 | 7 | 5 | 71 | Pass |
| 0.5002 | 7 | 5 | 71 | Pass |
| 0.5061 | 7 | 5 | 71 | Pass |
| 0.5120 | 6 | 5 | 83 | Pass |
| 0.5180 | 6 | 5 | 83 | Pass |
| 0.5239 | 6 | 4 | 66 | Pass |
| 0.5298 | 6 | 3 | 50 | Pass |
| 0.5357 | 6 | 3 | 50 | Pass |
| 0.5416 | 6 | 3 | 50 | Pass |
| 0.5476 | 6 | 3 | 50 | Pass |
| 0.5535 | 6 | 2 | 33 | Pass |
| 0.5594 | 6 | 1 | 16 | Pass |
| 0.5653 | 6 | 1 | 16 | Pass |
| 0.5712 | 5 | 1 | 20 | Pass |
| 0.5772 | 5 | 0 | 0 | Pass |
| 0.5831 | 5 | 0 | 0 | Pass |
| 0.5890 | 5 | 0 | 0 | Pass |
| 0.5949 | 5 | 0 | 0 | Pass |
| 0.6008 | 5 | 0 | 0 | Pass |
| 0.6068 | 5 | 0 | 0 | Pass |
| 0.6127 | 5 | 0 | 0 | Pass |
| 0.6186 | 5 | 0 | 0 | Pass |
| 0.6245 | 4 | 0 | 0 | Pass |
| 0.6304 | 3 | 0 | 0 | Pass |
| 0.6364 | 3 | 0 | 0 | Pass |
| 0.6423 | 3 | 0 | 0 | Pass |
| 0.6482 | 3 | 0 | 0 | Pass |
| 0.6541 | 3 | 0 | 0 | Pass |
| 0.6600 | 3 | 0 | 0 | Pass |
| 0.6660 | 3 | 0 | 0 | Pass |
| 0.6719 | 3 | 0 | 0 | Pass |
| 0.6778 | 2 | 0 | 0 | Pass |
| 0.6837 | 1 | 0 | 0 | Pass |

## Water Quality

Water Quality BMP Flow and Volume for POC #1

| | |
|---|---|
| On-line facility volume: | 0.1562 acre-feet |
| On-line facility target flow: | 0.0818 cfs. |
| Adjusted for 15 min: | 0.0818 cfs. |
| Off-line facility target flow: | 0.0523 cfs. |
| Adjusted for 15 min: | 0.0523 cfs. |

# LID Report

| LID Technique | Used for Treatment ? | Total Volume Needs Treatment (ac-ft) | Volume Through Facility (ac-ft) | Infiltration Volume (ac-ft) | Cumulative Volume Infiltration Credit | Percent Volume Infiltrated | Water Quality | Percent Water Quality Treated | Comment |
|---|---|---|---|---|---|---|---|---|---|
| Vault 1 POC | ☐ | 475.34 | | | ☐ | 0.00 | | | |
| Total Volume Infiltrated | | 475.34 | 0.00 | 0.00 | | 0.00 | 0.00 | 0% | No Treat. Credit |
| Compliance with LID Standard 8% of 2-yr to 50% of 2-yr | | | | | | | | | Duration Analysis Result = Passed |
| | | | | | | | | | |

# Model Default Modifications

Total of 0 changes have been made.

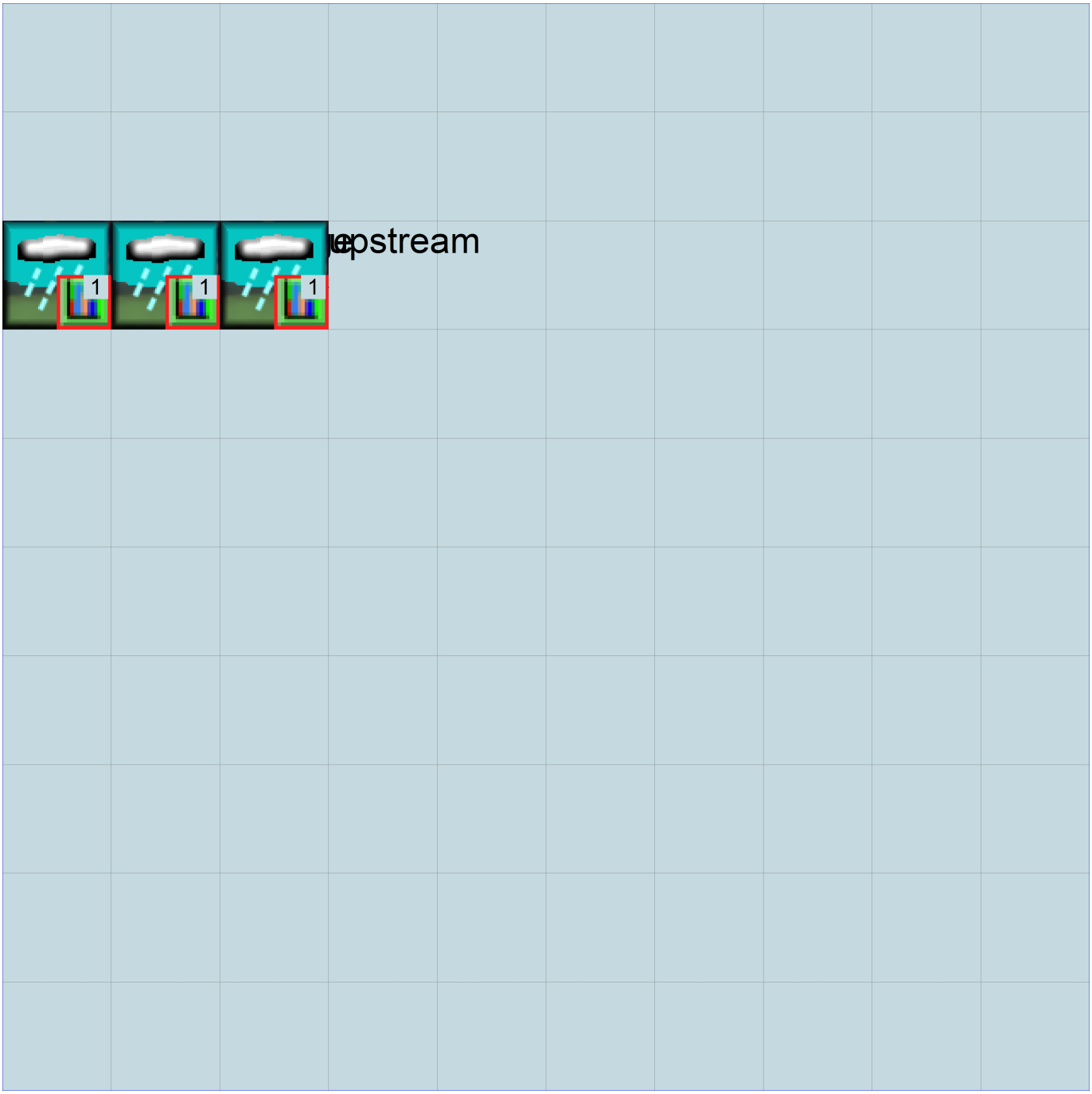
## PERLND Changes

No PERLND changes have been made.

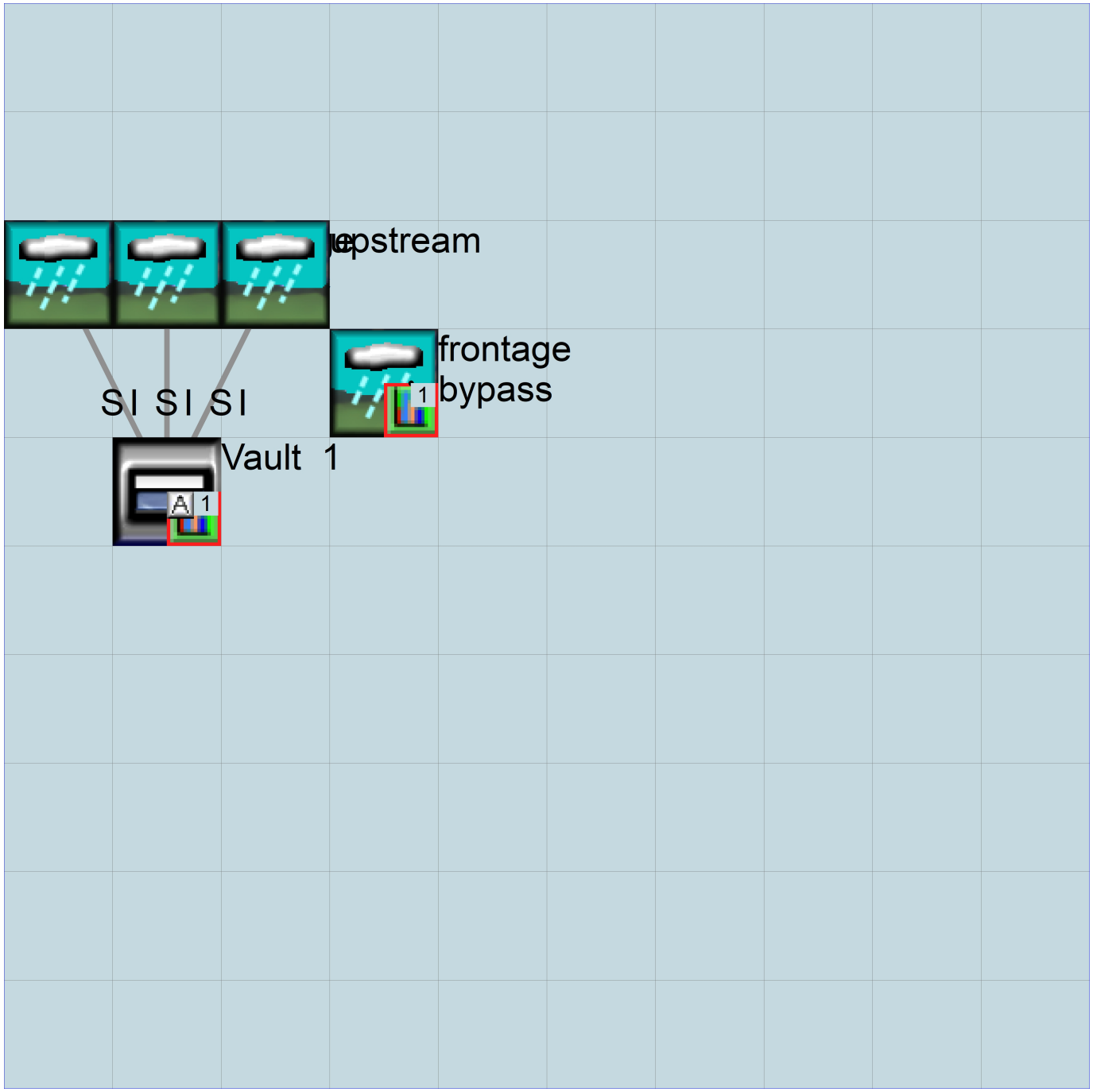
## IMPLND Changes

No IMPLND changes have been made.

# *Appendix*
## *Predeveloped Schematic*



## *Mitigated Schematic*



## *Predeveloped UCI File*

```
RUN

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

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   Prelim Vault Sizing.wdm
MESSU      25   PrePrelim Vault Sizing.MES
           27   PrePrelim Vault Sizing.L61
           28   PrePrelim Vault Sizing.L62
           30   POCPrelim Vault Sizing1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      12
      PERLND      10
      IMPLND       1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        onsite                     MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
   12     C, Forest, Steep        1    1    1    1   27    0
   10     C, Forest, Flat         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   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
  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
  END PRINT-INFO

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

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
   12              0       4.5      0.08       400      0.15       0.5     0.996
   10              0       4.5      0.08       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   12              0         0         2         2         0         0         0
   10              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   12            0.2       0.3      0.35         6       0.3       0.7
   10            0.2       0.5      0.35         6       0.5       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
   12              0         0         0         0       2.5         1         0
   10              0         0         0         0       2.5         1         0
  END PWAT-STATE1

END PERLND

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

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

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

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

  IWAT-PARM2
```

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

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

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

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
onsite***
PERLND  12                       2.84     COPY   501     12
PERLND  12                       2.84     COPY   501     13
frontage***
PERLND  10                       0.47     COPY   501     12
PERLND  10                       0.47     COPY   501     13
upstream***
IMPLND   1                       0.09     COPY   501     15

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

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



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

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

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

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

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

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

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1.2            PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.2            IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76           PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76           IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

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

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

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

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


END MASS-LINK

END RUN
```

## *Mitigated UCI File*

```
RUN

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

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Prelim Vault Sizing.wdm
MESSU       25   MitPrelim Vault Sizing.MES
            27   MitPrelim Vault Sizing.L61
            28   MitPrelim Vault Sizing.L62
            30   POCPrelim Vault Sizing1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      13
      PERLND      14
      IMPLND       1
      IMPLND       4
      IMPLND       5
      IMPLND       8
      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        Vault  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           ***
   13     C, Pasture, Flat        1    1    1    1   27    0
   14     C, Pasture, Mod         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

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

```
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
   13         0    0    1    0    0    0    0    0    0    0    0    0
   14         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
   13         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   14         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
   13         0    0    0    0    0    0    0    0    0    0    0
   14         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR      KVARY      AGWRC
   13              0       4.5      0.06       400      0.05        0.5      0.996
   14              0       4.5      0.06       400       0.1        0.5      0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   13              0         0         2         2         0         0         0
   14              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   13           0.15       0.4       0.3         6       0.5       0.4
   14           0.15       0.4       0.3         6       0.5       0.4
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS       IFWS       LZS       AGWS      GWVS
   13              0         0         0         0       2.5          1         0
   14              0         0         0         0       2.5          1         0
  END PWAT-STATE1

END PERLND

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

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    4         0    0    1    0    0    0
    5         0    0    1    0    0    0
    8         0    0    1    0    0    0
  END ACTIVITY
```

```
  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    4    1    9
    4         0    0    4    0    0    0    1    9
    5         0    0    4    0    0    0    1    9
    8         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
    4         0    0    0    0    0
    5         0    0    0    0    0
    8         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    4            400      0.01       0.1       0.1
    5            400      0.01       0.1       0.1
    8            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    4              0         0
    5              0         0
    8              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    4              0         0
    5              0         0
    8              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
onsite***
PERLND  13                       0.75     RCHRES   1      2
PERLND  13                       0.75     RCHRES   1      3
PERLND  14                       0.27     RCHRES   1      2
PERLND  14                       0.27     RCHRES   1      3
IMPLND   1                       0.36     RCHRES   1      5
IMPLND   4                       1.04     RCHRES   1      5
IMPLND   5                       0.35     RCHRES   1      5
IMPLND   8                       0.07     RCHRES   1      5
frontage***
PERLND  13                        0.1     RCHRES   1      2
PERLND  13                        0.1     RCHRES   1      3
IMPLND   1                       0.25     RCHRES   1      5
IMPLND   8                        0.1     RCHRES   1      5
upstream***
IMPLND   1                       0.09     RCHRES   1      5
frontage bypass***
IMPLND   1                       0.02     COPY   501     15
IMPLND   1                       0.02     COPY   601     15
```

```
******Routing******
PERLND  13                      0.75     COPY     1     12
PERLND  14                      0.27     COPY     1     12
IMPLND   1                      0.36     COPY     1     15
IMPLND   4                      1.04     COPY     1     15
IMPLND   5                      0.35     COPY     1     15
IMPLND   8                      0.07     COPY     1     15
PERLND  13                      0.75     COPY     1     13
PERLND  14                      0.27     COPY     1     13
PERLND  13                       0.1     COPY     1     12
IMPLND   1                      0.25     COPY     1     15
IMPLND   8                       0.1     COPY     1     15
PERLND  13                       0.1     COPY     1     13
IMPLND   1                      0.09     COPY     1     15
RCHRES   1                         1     COPY   501     16
END SCHEMATIC

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



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

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

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

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

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

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

```
SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   92    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.144628  0.000000  0.000000
  0.077778  0.144628  0.011249  0.018477
  0.155556  0.144628  0.022498  0.026130
  0.233333  0.144628  0.033747  0.032003
  0.311111  0.144628  0.044995  0.036954
  0.388889  0.144628  0.056244  0.041315
  0.466667  0.144628  0.067493  0.045259
  0.544444  0.144628  0.078742  0.048885
  0.622222  0.144628  0.089991  0.052260
  0.700000  0.144628  0.101240  0.055430
  0.777778  0.144628  0.112489  0.058429
  0.855556  0.144628  0.123737  0.061281
  0.933333  0.144628  0.134986  0.064005
  1.011111  0.144628  0.146235  0.066619
  1.088889  0.144628  0.157484  0.069134
  1.166667  0.144628  0.168733  0.071560
  1.244444  0.144628  0.179982  0.073907
  1.322222  0.144628  0.191230  0.076182
  1.400000  0.144628  0.202479  0.078390
  1.477778  0.144628  0.213728  0.080538
  1.555556  0.144628  0.224977  0.082631
  1.633333  0.144628  0.236226  0.084671
  1.711111  0.144628  0.247475  0.086664
  1.788889  0.144628  0.258724  0.088612
  1.866667  0.144628  0.269972  0.090517
  1.944444  0.144628  0.281221  0.092384
  2.022222  0.144628  0.292470  0.094214
  2.100000  0.144628  0.303719  0.096008
  2.177778  0.144628  0.314968  0.097770
  2.255556  0.144628  0.326217  0.099501
  2.333333  0.144628  0.337466  0.101202
  2.411111  0.144628  0.348714  0.102874
  2.488889  0.144628  0.359963  0.104521
  2.566667  0.144628  0.371212  0.106141
  2.644444  0.144628  0.382461  0.107737
  2.722222  0.144628  0.393710  0.109310
  2.800000  0.144628  0.404959  0.110861
  2.877778  0.144628  0.416208  0.112390
  2.955556  0.144628  0.427456  0.113899
  3.033333  0.144628  0.438705  0.115388
  3.111111  0.144628  0.449954  0.116857
  3.188889  0.144628  0.461203  0.118309
  3.266667  0.144628  0.472452  0.119743
  3.344444  0.144628  0.483701  0.121160
  3.422222  0.144628  0.494949  0.122561
  3.500000  0.144628  0.506198  0.123946
  3.577778  0.144628  0.517447  0.125316
  3.655556  0.144628  0.528696  0.126670
  3.733333  0.144628  0.539945  0.128011
  3.811111  0.144628  0.551194  0.129338
  3.888889  0.144628  0.562443  0.130651
  3.966667  0.144628  0.573691  0.131951
  4.044444  0.144628  0.584940  0.133238
  4.122222  0.144628  0.596189  0.134513
  4.200000  0.144628  0.607438  0.135776
  4.277778  0.144628  0.618687  0.179716
  4.355556  0.144628  0.629936  0.198639
  4.433333  0.144628  0.641185  0.213436
  4.511111  0.144628  0.652433  0.226093
  4.588889  0.144628  0.663682  0.237378
  4.666667  0.144628  0.674931  0.247686
  4.744444  0.144628  0.686180  0.257252
```

```
  4.822222  0.144628  0.697429  0.266228
  4.900000  0.144628  0.708678  0.274721
  4.977778  0.144628  0.719927  0.282808
  5.055556  0.144628  0.731175  0.290547
  5.133333  0.144628  0.742424  0.297984
  5.211111  0.144628  0.753673  0.305156
  5.288889  0.144628  0.764922  0.312090
  5.366667  0.144628  0.776171  0.335241
  5.444444  0.144628  0.787420  0.349526
  5.522222  0.144628  0.798669  0.361693
  5.600000  0.144628  0.809917  0.372745
  5.677778  0.144628  0.821166  0.383050
  5.755556  0.144628  0.832415  0.392799
  5.833333  0.144628  0.843664  0.402106
  5.911111  0.144628  0.854913  0.411046
  5.988889  0.144628  0.866162  0.419673
  6.066667  0.144628  0.877410  0.610261
  6.144444  0.144628  0.888659  1.008783
  6.222222  0.144628  0.899908  1.490066
  6.300000  0.144628  0.911157  1.961409
  6.377778  0.144628  0.922406  2.338529
  6.455556  0.144628  0.933655  2.580843
  6.533333  0.144628  0.944904  2.773986
  6.611111  0.144628  0.956152  2.943065
  6.688889  0.144628  0.967401  3.101990
  6.766667  0.144628  0.978650  3.252427
  6.844444  0.144628  0.989899  3.395629
  6.922222  0.144628  1.001148  3.532567
  7.000000  0.144628  1.012397  3.664010
  7.077778  0.144628  1.023646  3.790583
  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    1.2           PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1.2           IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    0.76          PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    0.76          IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
COPY   601 OUTPUT MEAN   1 1     48.4      WDM    901 FLOW     ENGL      REPL
END EXT TARGETS

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

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

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

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

```
  END MASS-LINK   12

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

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

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


END MASS-LINK

END RUN
```

## *Predeveloped HSPF Message File*

## *Mitigated HSPF Message File*

# Disclaimer

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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 5: Conveyance Analysis

Nothing is necessary for this appendix at this time

**Appendix 6: Operations and Maintenance Manual**

1. Operations and Maintenance Manual

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

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

## Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)

| Maintenance Component | Defect | Conditions When Maintenance is Needed | Results Expected When Maintenance is Performed |
|---|---|---|---|
| Storage Area | Plugged Air Vents | One-half of the cross section of a vent is blocked at any point or the vent is damaged. | Vents open and functioning. |
| | Debris and Sediment | Accumulated sediment depth exceeds 10% of the diameter of the storage area for 1/2 length of storage vault or any point depth exceeds 15% of diameter.<br>(Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 1/2 length of tank.) | All sediment and debris removed from storage area. |
| | Joints Between Tank/Pipe Section | Any openings or voids allowing material to be transported into facility.<br>(Will require engineering analysis to determine structural stability). | All joint between tank/pipe sections are sealed. |
| | Tank Pipe Bent Out of Shape | Any part of tank/pipe is bent out of shape more than 10% of its design shape. (Review required by engineer to determine structural stability). | Tank/pipe repaired or replaced to design. |
| | Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab | Cracks wider than 1/2-inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound.<br>Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls. | Vault replaced or repaired to design specifications and is structurally sound.<br>No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe. |

## Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults) (continued)

| Maintenance Component | Defect | Conditions When Maintenance is Needed | Results Expected When Maintenance is Performed |
|---|---|---|---|
| Manhole | Cover Not in Place | Cover is missing or only partially in place. Any open manhole requires maintenance. | Manhole is closed. |
| | Locking Mechanism Not Working | Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids). | Mechanism opens with proper tools. |
| | Cover Difficult to Remove | One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance. | Cover can be removed and reinstalled by one maintenance person. |
| | Ladder Rungs Unsafe | Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks. | Ladder meets design standards. Allows maintenance person safe access. |
| Catch Basins | See Table V-A.5: Maintenance Standards - Catch Basins | See Table V-A.5: Maintenance Standards - Catch Basins | See Table V-A.5: Maintenance Standards - Catch Basins |

## Table V-A.4: Maintenance Standards - Control Structure/Flow Restrictor

| Maintenance Component | Defect | Condition When Maintenance is Needed | Results Expected When Maintenance is Performed |
|---|---|---|---|
| General | Trash and Debris (Includes Sediment) | Material exceeds 25% of sump depth or 1 foot below orifice plate. | Control structure orifice is not blocked. All trash and debris removed. |
| | Structural Damage | Structure is not securely attached to manhole wall.<br>Structure is not in upright position (allow up to 10% from plumb).<br>Connections to outlet pipe are not watertight and show signs of rust.<br>Any holes - other than designed holes - in the structure. | Structure securely attached to wall and outlet pipe.<br>Structure in correct position.<br>Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.<br>Structure has no holes other than designed holes. |
| Cleanout Gate | Damaged or Missing | Cleanout gate is not watertight or is missing.<br>Gate cannot be moved up and down by one maintenance person.<br>Chain/rod leading to gate is missing or damaged.<br>Gate is rusted over 50% of its surface area. | Gate is watertight and works as designed.<br>Gate moves up and down easily and is watertight.<br>Chain is in place and works as designed.<br>Gate is repaired or replaced to meet design standards. |
| Orifice Plate | Damaged or Missing | Control device is not working properly due to missing, out of place, or bent orifice plate. | Plate is in place and works as designed. |
| | Obstructions | Any trash, debris, sediment, or vegetation blocking the plate. | Plate is free of all obstructions and works as designed. |
| Overflow Pipe | Obstructions | Any trash or debris blocking (or having the potential of blocking) the overflow pipe. | Pipe is free of all obstructions and works as designed. |
| Manhole | See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults) | See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults) | See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults) |
| Catch Basin | See Table V-A.5: Maintenance Standards - Catch Basins | See Table V-A.5: Maintenance Standards - Catch Basins | See Table V-A.5: Maintenance Standards - Catch Basins |

## Table V-A.5: Maintenance Standards - Catch Basins

| Maintenance Component | Defect | Conditions When Maintenance is Needed | Results Expected When Maintenance is performed |
|---|---|---|---|
| General | Trash & Debris | Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.<br>Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe.<br>Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.<br>Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane). | No Trash or debris located immediately in front of catch basin or on grate opening.<br>No trash or debris in the catch basin.<br>Inlet and outlet pipes free of trash or debris.<br>No dead animals or vegetation present within the catch basin. |
| | Sediment | Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe. | No sediment in the catch basin |
| | Structure Damage to Frame and/or Top Slab | Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin).<br>Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached | Top slab is free of holes and cracks.<br>Frame is sitting flush on the riser rings or top slab and firmly attached. |
| | Fractures or Cracks in Basin Walls/ Bottom | Maintenance person judges that structure is unsound.<br>Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks. | Basin replaced or repaired to design standards.<br>Pipe is regrouted and secure at basin wall. |
| | Settlement/ Misalignment | If failure of basin has created a safety, function, or design problem. | Basin replaced or repaired to design standards. |
| | Vegetation | Vegetation growing across and blocking more than 10% of the basin opening.<br>Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart. | No vegetation blocking opening to basin.<br>No vegetation or root growth present. |
| | Contamination and Pollution | See Table V-A.1: Maintenance Standards - Detention Ponds | No pollution present. |
| Catch Basin Cover | Cover Not in Place | Cover is missing or only partially in place. Any open catch basin requires maintenance. | Cover/grate is in place, meets design standards, and is secured |
| | Locking Mechanism Not Working | Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread. | Mechanism opens with proper tools. |
| | Cover Difficult to Remove | One maintenance person cannot remove lid after applying normal lifting pressure.<br>(Intent is keep cover from sealing off access to maintenance.) | Cover can be removed by one maintenance person. |
| Ladder | Ladder Rungs Unsafe | Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges. | Ladder meets design standards and allows maintenance person safe access. |
| Metal Grates (If Applicable) | Grate opening Unsafe | Grate with opening wider than 7/8 inch. | Grate opening meets design standards. |
| | Trash and Debris | Trash and debris that is blocking more than 20% of grate surface inletting capacity. | Grate free of trash and debris. |
| | Damaged or Missing. | Grate missing or broken member(s) of the grate. | Grate is in place, meets the design standards, and is installed and aligned with the flow path. |

## Table V-A.13: Maintenance Standards - Sand Filters (Above Ground/Open) (continued)

| Maintenance Component | Defect | Condition When Maintenance is Needed | Results Expected When Maintenance is Performed |
|---|---|---|---|
| | Flow Spreader | Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter. | Spreader leveled and cleaned so that flows are spread evenly over sand filter. |
| | Damaged Pipes | Any part of the piping that is crushed or deformed more than 20% or any other failure to the piping. | Pipe repaired or replaced. |

## Table V-A.14: Maintenance Standards - Sand Filters (Below Ground/Enclosed)

| Maintenance Component | Defect | Condition When Maintenance is Needed | Results Expected When Maintenance is Performed |
|---|---|---|---|
| Below Ground Vault. | Sediment Accumulation on Sand Media Section | Sediment depth exceeds 1/2-inch. | No sediment deposits on sand filter section that which would impede permeability of the filter section. |
| | Sediment Accumulation in Pre-Settling Portion of Vault | Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6-inches. | No sediment deposits in first chamber of vault. |
| | Trash/Debris Accumulation | Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables. | Trash and debris removed from vault and inlet/outlet piping. |
| | Sediment in Drain Pipes/Cleanouts | When drain pipes, cleanouts become full with sediment and/or debris. | Sediment and debris removed. |
| | Short Circuiting | When seepage/flow occurs along the vault walls and corners. Sand eroding near inflow area. | Sand filter media section re-laid and compacted along perimeter of vault to form a semi-seal. Erosion protection added to dissipate force of incoming flow and curtail erosion. |
| | Damaged Pipes | Inlet or outlet piping damaged or broken and in need of repair. | Pipe repaired and/or replaced. |
| | Access Cover Damaged/Not Working | Cover cannot be opened, corrosion/deformation of cover.<br>Maintenance person cannot remove cover using normal lifting pressure. | Cover repaired to proper working specifications or replaced. |
| | Ventilation | Ventilation area blocked or plugged | Blocking material removed or cleared from ventilation area. A specified % of the vault surface area must provide ventilation to the vault interior (see design specifications). |
| | Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab. | Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.<br>Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks. | Vault replaced or repairs made so that vault meets design specifications and is structurally sound.<br>Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe. |
| | Baffles/Internal walls | Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person. | Baffles repaired or replaced to specifications. |
| | Access Ladder Damaged | Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned. | Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel. |

## Table V-A.15: Maintenance Standards - Manufactured Media Filters

| Maintenance Component | Defect | Condition When Maintenance is Needed | Results Expected When Maintenance is Performed |
|---|---|---|---|
| Below Ground | Sediment Accumulation on Media. | Sediment depth exceeds 0.25-inches. | No sediment deposits which would impede permeability of the |

## Table V-A.15: Maintenance Standards - Manufactured Media Filters (continued)

| Maintenance Component | Defect | Condition When Maintenance is Needed | Results Expected When Maintenance is Performed |
|---|---|---|---|
| Vault | | | compost media. |
| | Sediment Accumulation in Vault | Sediment depth exceeds 6-inches in first chamber. | No sediment deposits in vault bottom of first chamber. |
| | Trash/Debris Accumulation | Trash and debris accumulated on compost filter bed. | Trash and debris removed from the compost filter bed. |
| | Sediment in Drain Pipes/Clean-Outs | When drain pipes, clean-outs, become full with sediment and/or debris. | Sediment and debris removed. |
| | Damaged Pipes | Any part of the pipes that are crushed or damaged due to corrosion and/or settlement. | Pipe repaired and/or replaced. |
| | Access Cover Damaged/Not Working | Cover cannot be opened; one person cannot open the cover using normal lifting pressure, corrosion/deformation of cover. | Cover repaired to proper working specifications or replaced. |
| | Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab | Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.<br>Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks. | Vault replaced or repairs made so that vault meets design specifications and is structurally sound.<br>Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe. |
| | Baffles | Baffles corroding, cracking warping, and/or showing signs of failure as determined by maintenance/inspection person. | Baffles repaired or replaced to specifications. |
| | Access Ladder Damaged | Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned. | Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel. |
| Below Ground Cartridge Type | Media | Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently. | Media cartridges replaced. |
| | Short Circuiting | Flows do not properly enter filter cartridges. | Filter cartridges replaced. |

**Appendix 7: Special Reports and Studies**

1. Critical Areas Report, Wetland Resources, Inc., dated January 25th, 2024
2. Geotechnical Engineering Design Study, Earth Solutions NW, dated January 25th, 2024