ATTACHMENT H:

Preliminary Drainage Assessment
Summary & Background

Wood Rodgers has prepared a drainage assessment review of the Meadowview 102 site. The focus of this analysis is to identify drainage infrastructure constraints and opportunities and to provide a conceptual design of the proposed drainage facilities, including detention basins and potential trunk drainage facilities. In addition, we have identified areas of additional study that will need to be addressed in future phases of the Project, including offsite flow conveyance, wetlands, and the existing pond.

Background

In January of 2022, the City of Sacramento purchased 102 acres of surplus federal land in the Meadowview area of south Sacramento. With input from City staff and the community, Wood Rodgers prepared four preliminary land use scenarios for the City’s consideration with the goal of exploring site development alternatives and feasibility of site development. It was determined that Land Use Concept #2A, dated September 1, 2023 and included as Appendix A, should be used for continued analysis of site development feasibility.

Land Use Summary

Table 1: Land Use Summary

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDR: Medium Density Residential</td>
<td>±13.6 ac.</td>
</tr>
<tr>
<td>HDR: High Density Residential</td>
<td>±5.5 ac.</td>
</tr>
<tr>
<td>Park: Regional Sports Complex</td>
<td>±60.5 ac.</td>
</tr>
<tr>
<td>OS: Wetlands &amp; Storm Drainage Facility</td>
<td>±19.4 ac.</td>
</tr>
<tr>
<td>ROW: Roads &amp; Greenbelts</td>
<td>±3.0 ac.</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>±102.0 ac.</strong></td>
</tr>
</tbody>
</table>

Land Use Concept #2A highlights a 60.5-acre Regional Park and Sports Complex as its primary use with 13.6 acres of medium-density residential, 5.5 acres of high-density residential and 15.3 acres of wetland preservation open space as secondary uses. Remaining acreage shall accommodate the projects roads, green belts and the storm drain basin facility. Preliminary sizing of the storm drain facilities is addressed later in this report.
Design Standards

**City of Sacramento Development Standards**

The City of Sacramento is responsible for review of drainage plans and hydrologic and hydraulic analyses for the Project. Drainage design standards for the potential development shall comply with the Department of Utilities’ "Onsite Design Manual" and all applicable City drainage standard drawings and specifications.

**Stormwater Quality/Low Impact Development (LID)**

The Project will be required to comply with standards in the Sacramento Region Storm Water Quality Design Manual. Water quality treatment within the detention basin footprints is the preferred and typically most efficient water quality treatment control measure along with upstream measures. Alternative means of compliance include localized water quality features at a neighborhood level. Treatment control measures will be designed using either volume-based design or flow-based design. An approximation for the required size of Treatment BMPs to meet stormwater quality requirements is five percent of the drainage area (see detention basin sizing calcs later in this memo). Based on an assumed density of 9 dwelling units per acres, the proposed land use plan would accommodate approximately 176 units. Full trash capture device(s) will be required for the project.

Low Impact Development (LID) will need to be implemented for the proposed project based on the credit criteria outlined by the Storm Water Quality Design Manual. Included in Appendix B is the LID Credits spreadsheet that outlines how the Meadowview 102 project could achieve LID compliance. A combination of parks and open space will provide a large portion of the LID credits in combination with disconnected roof drains, interceptor trees, and amended soils. Total LID credits came out to 102.7 which meets the minimum requirement of 100 credits. Below is a list of assumptions used for the LID Credit spreadsheet:

- 15.3 acres (wetland preservation & storm drain facilities) were included as natural areas.
- 25 acres of landscape area/park was assumed. This value is thought to be conservative given that a portion of the 60.5-acre regional sports complex could be developed as impervious area.
- 9 units per acre was assumed for medium-density-residential areas.
- Less than 10-foot setback assumed for efficiency multiplier related to runoff across landscaping.
- 50% of roof drains to be disconnected.
- No separated sidewalks are anticipated due to housing density.
- 400 trees were assumed (200 evergreen and 200 deciduous) split between the park and the residential areas.

If amended soils are not allowed by the City of Sacramento, then it is anticipated that approximately 1.1 acres (48,000 square feet) of additional bioretention BMPs would be required to supplement the runoff management credits to meet the 100-point minimum.

**Existing Conditions**

**Onsite Pond**

In the northwest quadrant of the Project site lies a 3.3-acre seasonal, graded pond. Based on preliminary review of historical satellite imagery, this pond was graded sometime in early 2007 and accepts flow from the federal property to the north via a graded earthen channel. The purpose and functionality of the pond is unknown and there is no known outfall that connects the pond to a permanent drainage infrastructure system. Additional information regarding drainage of the federal property will be required to fully evaluate the drainage impacts on the Meadowview 102 site.
As shown in the Preliminary Land Use Concept #2A (attached in Appendix A), the pond will be filled to accommodate portions of the proposed Regional Sport’s Park facility. The current drainage from the offsite channel will be captured by future storm drainage infrastructure and tied into the future storm water quality detention basin. The existing pond volume has been accounted for in the sizing of the future detention basin later in this report.

Seasonal Wetland Features

Throughout the 102-acre project site, seasonal wetland features totaling nearly 7 acres have been identified by Madrone Ecological Consulting (see exhibit included as Appendix C). It is believed that many of these wetland features were created due to the banked and elevated training track and the lack of drainage infrastructure onsite. In the proposed land use concept, 16-acres of open space has been proposed to preserve a significant portion of the existing seasonal wetland features. Remaining wetland features not preserved by the open space area will be eliminated by the development of the proposed Medium-Density Residential and Regional Sport’s Park land uses.

On-site Drainage Infrastructure

Along the western site boundary, there is existing storm drain infrastructure consisting of parallel 24-inch and 36-inch mains that are not known to serve the Meadowview 102 site. It is believed that the existing infrastructure is in place to service the existing residential subdivision northwest of the Project site and the City of Sacramento Solid Waste Corporation Yard via easements on both the federal land and the City owned Meadowview 102 property. The drainage infrastructure and easement terminate and turn westward approximately 800 feet from the northern property boundary. It is believed that these facilities and easement will remain in place and undisturbed as part of the future development and will not be used to service any portion of the proposed Project.

Additionally, there is a 21-inch reinforced concrete pressure pipe that bisects the Project site west to east and turns north in the eastern third of the property to the State of California property site. This pipe outfalls to the same 48” public drain line as the two parallel mains and is assumed to serve the entirety of the State property. This storm drain infrastructure may be relocated during future development but will not be used to service any portion of the proposed Project. Note that recent post-winter aerials reveal overflows at storm drain manholes which appear to discharge into the existing pond.

SUMP 89 Pump Station

The existing offsite storm drain “Z Line” infrastructure discharges into the existing SUMP 89 Pump Station that sits adjacent to Morrison Creek southeast of Delta Shores Circle South. While the Stone Beetland project does provide a connection point and accounts for a bypass drain line servicing the Meadowview 102 project, it is unknown whether the pump station has capacity to accept additional flow as a result of the proposed project. Further analysis would need to be completed to determine if pump station upgrades are required or if additional detention basin storage will be required.

The Drainage Master Plan for the Delta Shores development provides some 10-year and 100-year flow assumptions for the Meadowview 102 property (Federal Lands parcel). However, the land use assumptions have evolved as part of the City’s land purchase efforts, and site flow rates and contributions to the SUMP 89 Pump Station will need to be further evaluated within the complete drainage study efforts for the Meadowview 102 project.
Proposed Conditions

Offsite Drainage Infrastructure

At the southern Project boundary, there is a 24-inch drain that serves the existing site. This drain pipeline is referred to as the “Z Line” in the 2013 Delta Shores Drainage Master Plan and ranges from 24-inch to 30-inch in diameter. The Z Line will be replaced as part of the Stone Beetland development and is planned to serve the Meadowview 102 property. It is anticipated that the proposed drain stub from the Stone Beetland development to the Project site will be the primary connection to drain infrastructure.

Preliminary grading and drainage exhibits for Stone Beetland development show removal of Z Line storm drain infrastructure and replacement with a storm drain bypass system. The proposed bypass will intercept flows at the existing drain service at the south end of the Meadowview site, route the storm drain pipes through proposed streets within the Stone Beetland development and ultimately reconnect with the Z line system just north of Consumnes River Blvd.

The Stone Beetland project also proposes to connect to the downstream end of the 30-inch Z Line. While Stone Beetland does account for existing drainage flows from Meadowview 102, it is unclear how proposed development of both projects will affect the capacity of the existing Z Line downstream and if additional offsite infrastructure upgrades would be necessary. It is anticipated that a detention basin will be required to service the proposed site to regulate storm water discharge and that a full drainage study will be required with future entitlement efforts.

Hydromodification

The Project will tie into portions of the existing “Z Line” as outlined above and conveyed to Morrison Creek. With use of the Hydromodification Mitigation Applicability Flow Chart (provided as Appendix E), it is believed that the project will be exempt via HMP section 3.2.8, Projects Discharging Directly to Exempted Channels. In section 3.2.8 of the HMP, Morrison Creek from the Sacramento River to Franklin Boulevard is listed as having completed construction on levee improvements which have prepared the creek for potential hydromodification impact. The Meadowview 102 project would discharge into this exempt channel via the SUMP 89 Pump Station.

Flow Calculations and Narrative

In this section, we will identify existing and proposed flows that are tributary to the proposed connection to the Stone Beetland bypass drain and connection to the “Z Line”. Those flows will be compared to the assumed pipe stub capacity to determine if additional detention/retention mitigation measure are necessary for inclusion in our preliminary basin sizing.

Offsite Flow Tributary to Onsite Pond

As mentioned earlier in this technical memorandum, there are some unknowns regarding the existing onsite pond including the tributary area that is conveyed to the pond. Additional information on the Federal Lands site to the north would be needed for further analysis for preliminary drainage study efforts. That said, we can assume that the water volume from the pond must be accounted for if the pond is to be filled and the current storm water tributary to the pond will ultimately be conveyed to a proposed storm water quality facility. Based on existing topography provided by the City of Sacramento, the existing pond is 3-acres in area and approximately 10 feet deep which yields a water volume of 30 acre-feet that needs to be accounted for in the proposed basin sizing.
Proposed Onsite Flow

Preliminary Land Use Concept #2A was again used for the purpose of determining onsite flow for the 100-year storm event. Additionally, the Sacramento City/County Drainage Manual was used to determine the onsite 100-year peak flow based on the Sacramento Method in Rainfall Zone 2 for projects 80-640 acres. Based upon the proposed land uses, it was assumed that the proposed site would be 50% impervious and using the Figure 2-15 chart from the Drainage Manual (and included as Appendix D in red), we were able to approximate the 100-year peak onsite flow at 77 CFS.

Based on our current understanding of the site topography, we can approximate the offsite area that flows to the Meadowview site from the north at 26 acres. We have outlined this approximate area on the Land Use Map in Appendix A for reference. If we add that area to the onsite flow calculations, we would use the same Figure 2-15 chart from the Drainage Manual to determine the approximate 100-year peak onsite and offsite flow at 91 CFS (as shown in blue in Appendix D).

Outfall Pipe Capacity

Existing pipe slope and invert elevation information for the 24-inch Z line stub to the proposed Meadowview 102 site is unknown and therefore, for the purposes of this drain assessment memo, it will be assumed that the pipes are at minimum slope to provide the most conservative approach. Using the “Hydraflow Express Extension” for Autodesk Civil3D, the maximum flow for a 24-inch pipe running at minimum slope is 9.41 CFS. Based on this information, it is anticipated that onsite detention will be required as the proposed flows are larger than the outfall pipe capacity.

Preliminary Stormwater Quality Detention/Retention Basin Sizing

The current land use concept provides this 4.0 acres in the southeast corner of the site. Providing the storm drainage facilities on the southern end of the site makes the most sense as this is where the existing connection to drainage infrastructure occurs and is the lowest area of elevation within the Project site.

Based on the information provided in the flow calculations and narrative, there is likely a need for a larger parcel to serve the storm water needs for this proposed project. The sizing will vary upon the ultimate land use decisions made by the City of Sacramento but the need for a detention component (due to outfall pipe capacity) and for additional storage volume (due to the existing onsite pond) will increase the footprint needed for storm water facilities.

Summary

The proposed Meadowview Project as shown in Land Use Concept #2A can meet all required storm drainage requirements with some modifications. A larger area designated for the water quality basin will need to be allocated to comply with LID. Questions remain regarding the SUMP 89 Pump Station capacity and the tributary area and intended function of the on-site pond but it is believed that necessary mitigation can be accomplished. It is anticipated that a full drainage study will further define offsite flow entering the site and conveyance to SUMP 89 pump station.
Sources

Sacramento City/County Drainage Manual

Sacramento Region Storm Water Quality Design Manual

Sacramento Stormwater Quality Partnership Hydromodification Management Plan

Stone Beetland Development – Preliminary Grading & Drainage Design
Appendix A – Land Use Concept #2A
IT IS BELIEVED THAT SOME PORTION OF THE STATE PROPERTY DRAINS TO THE MEADOWVIEW SITE BUT THAT TRIBUTARY AREA IS CURRENTLY UNKNOWN. ADDITIONAL ANALYSIS OF THE STATE PROPERTY TO BE COMPLETED WITH FULL DRAINAGE REPORT EFFORT.

EXISTING 21" DRAIN LINE THROUGH SITE SERVICING STATE PROPERTY. CAPACITY AND HGLs TO BE STUDIED IN FULL DRAINAGE REPORT.

ASSUMED OFFSITE AREA (~26 AC) TRIBUTARY TO MEADOWVIEW 102 PROJECT SITE

Note
This land use concept is for analysis purposes only and is not intended for development/constitution.

**LAND USE SUMMARY**

<table>
<thead>
<tr>
<th>LAND USE</th>
<th>ASSUMED DENSITY</th>
<th>ACRES</th>
<th>EST. DU</th>
</tr>
</thead>
<tbody>
<tr>
<td>MDR 6.1 AC.</td>
<td>9.0 DU/AC.</td>
<td>13.6</td>
<td>122</td>
</tr>
<tr>
<td>HDR 5.5 AC.</td>
<td>30.0 DU/AC.</td>
<td>5.5</td>
<td>165</td>
</tr>
<tr>
<td>OS 4.1 AC.</td>
<td>19.4</td>
<td>3.9</td>
<td>19.4</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>101.9</td>
<td>287 DU</td>
</tr>
</tbody>
</table>
Appendix B – Low Impact Development Credits
Spreadsheet
Step 1 - Open Space and Pervious Area Credits

Is your project within the drainage area of a common drainage plan that includes open space? If not, skip to 1 b.

1 a. Common Drainage Plan Area

<table>
<thead>
<tr>
<th>Description</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural storage reservoirs and drainage corridors</td>
<td>0</td>
</tr>
<tr>
<td>Buffer zones for natural water bodies</td>
<td>0</td>
</tr>
<tr>
<td>Natural areas including existing trees, other vegetation, and soil</td>
<td>0</td>
</tr>
<tr>
<td>Common landscape area/park</td>
<td>0</td>
</tr>
<tr>
<td>Regional Flood Control/Drainage basins</td>
<td>0</td>
</tr>
</tbody>
</table>

1 b. Project Drainage Shed Area (Total)

<table>
<thead>
<tr>
<th>Description</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural storage reservoirs and drainage corridors</td>
<td>0</td>
</tr>
<tr>
<td>Buffer zones for natural water bodies</td>
<td>0</td>
</tr>
<tr>
<td>Natural areas including existing trees, other vegetation, and soil</td>
<td>15.4</td>
</tr>
<tr>
<td>Landscape area/park</td>
<td>25.0</td>
</tr>
<tr>
<td>Regional Flood Control/Drainage basins</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Area with Runoff Reduction Potential

\[ A - A_{PSOS} = 57.60 \text{ acres} \]

\[ A \]

Number of Units in \( A \)

\[ \text{Number of units per acre} \times \text{DUA} = 176 \]

Assumed Initial Impervious Fraction of \( A \)

\[ I = 0.35 \]

Open Space & Pervious Area LID Credit (Step 1)

\[ \left( \frac{A_{OS} + A_{PSOS}}{A_{CDP}} \right) \times 100 = 44 \text{ pts} \]

---

Step 2 - Runoff Reduction Credits

<table>
<thead>
<tr>
<th>Runoff Reduction Measures</th>
<th>Effective Area Managed (( A_{EAM} ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disconnected Roof Drains</td>
<td>0.83 acres</td>
</tr>
<tr>
<td>Disconnected Pavement</td>
<td>0.00 acres</td>
</tr>
<tr>
<td>Interceptor Trees</td>
<td>0.28 acres</td>
</tr>
<tr>
<td>Alternative Driveway Design</td>
<td>0.00 acres</td>
</tr>
</tbody>
</table>

Total Effective Area Managed (Credit Area)

\[ A_{EAM} = 1.10 \text{ acres} \]

Runoff Reduction Credit (Step 2)

\[ \left( \frac{A_{EAM}}{A_{T}} \right) \times 100 = 2 \text{ pts} \]
### Form D-1a: Disconnected Roof Drains Worksheet

See Fact Sheet for more information regarding Disconnected Roof Drain credit guidelines. Effective Area Managed ($A_c$)

1. **Determine efficiency Multiplier**
   - Runoff is directed to a dispersal trench or dry well (Type A and B soils only)
   - Use multiplier of 1.00
   - Runoff is directed across landscaping, determine setback:
     - 25 ft + Use multiplier of 1.00
     - 20 to 25 ft Use multiplier of 0.90
     - 15 to 20 ft Use multiplier of 0.70
     - 10 to 15 ft Use multiplier of 0.45
     - 5 to 10 ft Use multiplier of 0.25
     - Efficiency Multiplier: 0.25

2. **Determine percentage of roof drains disconnected**
   - Box J1

3. **Select project density in dwelling units per acre**:
   - Use reduction factor of
     - 1: 0.08
     - 2: 0.13
     - 3,4: 0.19
     - 5,6: 0.23
     - 7: 0.29
     - 8,9: 0.33
     - 10-14: 0.37
     - 15-20: 0.44
   - Reduction Factor: 0.19

4. **Determine Area Managed**
   - Multiply Box J3 by $A_T$, and enter the result in Box J4
   - acres

5. **Multiply Boxes J1, J2 and J4**, and enter 60% of the Result in Box J
   - This is the amount of area credit to enter into the “Disconnected Roof Drains” Box of Form D-1
   - 0.8 acres

### Form D-1b: Disconnected Pavement Worksheet

See Fact Sheet for more information regarding NDC Pavement credit guidelines. Effective Area Managed ($A_c$)

1. **Determine percentage of units with divided Sidewalks**
   - Box K1

2. **Multiply Box K1, $A_T$, and 0.04 and enter 60% of the result in Box K**
   - 0.00 acres

### Form D-1c: Interceptor Tree Worksheet

See Fact Sheet for more information regarding Interceptor Tree credit guidelines. Effective Area Managed ($A_c$)

1. **New Evergreen Trees**
   - Enter number of new evergreen trees that qualify as Interceptor Trees in Box L1.
   - 200 trees

2. **Multiply Box L1 by 200 and enter result in Box L2**
   - 40000 sq. ft.

3. **New Deciduous Trees**
   - Enter number of new deciduous trees that qualify as Interceptor Trees in Box L3.
   - 200 trees

4. **Multiply Box L3 by 100 and enter result in Box L4**
   - 20000 sq. ft.

5. **Existing Tree Canopy**
   - Enter square footage of existing tree canopy that qualifies as Existing Tree canopy in Box L5.
   - 0 sq. ft.

6. **Multiply Box L5 by 0.5 and enter the result in Box L6**
   - 0 sq. ft.

### Total Interceptor Tree Credits

Add Boxes L2, L4, and L6 and enter it into Box L7
- 0 sq. ft.

Divide Box L7 by 43,560 and multiply by 20% to get effective area managed and enter the result in Box L8
- 0.28 acres

This is the amount of area credit to enter into the “Interceptor Trees” Box of Form D-1

### Form D-1d: Alternative Driveway Design

See Fact Sheet for more information regarding Alternative Driveway Design credit guidelines.

1. **Select type of driveway**
   - Previous Driveway: Multiplier
     - Cobblestone Block: 0.40
     - Pervious Concrete: 0.60
     - Porous Block: 0.75
     - Permeable Paving: 0.75
     - Porous Granular: 0.75
     - Not Directly-connected: 1.00
   - Box M1

2. **Determine percentage of units with Alternative Driveways**
   - Box M2

4. **Multiply Boxes M1, M2, $A_T$ and 0.04, and enter the result in Box M**
   - 0.00 acres

This is the amount of area credit to enter into the “Alternative Driveway Design” Box of Form D-1
Step 3 - Runoff Management Credits

Capture and Use Credits

Impervious Area Managed by Rain barrels, Cisterns, and automatically-emptied systems

<table>
<thead>
<tr>
<th>Subsystem Elevation</th>
<th>acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rain barrels, Cisterns, and automatically-emptied systems</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Bioretention/Infiltration Credits

Impervious Area Managed by Bioretention BMPs

<table>
<thead>
<tr>
<th>Bioretention Area</th>
<th>sq ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsystem Elevation</td>
<td>0.00</td>
</tr>
<tr>
<td>Ponding Depth, inches</td>
<td>12.0</td>
</tr>
</tbody>
</table>

 Impervious Area Managed by Infiltration BMPs

<table>
<thead>
<tr>
<th>Drawdown Time, hrs</th>
<th>capture_vol_inf</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil Infiltration Rate, in/hr</td>
<td>soil_inf_rate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capture Volume, acre-ft</th>
<th>soil_surface_area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sizing Option 1:</td>
<td>Sizing Option 2:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capture Volume, acre-ft</th>
<th>soil_surface_area</th>
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</thead>
<tbody>
<tr>
<td>Drawdown Time, hrs</td>
<td>soil_inf_rate</td>
</tr>
</tbody>
</table>

Impervious Area Managed by Amended Soil or Mulch Beds

<table>
<thead>
<tr>
<th>Mulched Infiltration Area, sq ft</th>
<th>acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-units, detached</td>
<td>Folsom</td>
</tr>
<tr>
<td>Apartment dwelling areas</td>
<td>Roseville</td>
</tr>
<tr>
<td>Multi-units, attached</td>
<td>Sacramento</td>
</tr>
</tbody>
</table>

Total Effective Area Managed by Capture-and-Use/Bioretention/Infiltration BMPs

<table>
<thead>
<tr>
<th>Total Effective Area Managed by Capture-and-Use/Bioretention/Infiltration BMPs</th>
<th>acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.40</td>
<td></td>
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</table>

Runoff Management Credit (Step 3)

<table>
<thead>
<tr>
<th>Runoff Management Credit (Step 3)</th>
<th>pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIDc/Ac</td>
<td>56.9</td>
</tr>
</tbody>
</table>

Total LID Credits (Step 1+2+3)

<table>
<thead>
<tr>
<th>Total LID Credits (Step 1+2+3)</th>
<th>pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIDc/Ac</td>
<td>102.4</td>
</tr>
</tbody>
</table>

Further treatment is required, see choose flow-based or volume-based sizing in Step 4

Step 4a Treatment - Flow-Based (Rational Method)

Form D-1e

Calculate treatment flow (cfs):

Flow = Runoff Coefficient x Rainfall Intensity x Adjusted Treatment Area

<table>
<thead>
<tr>
<th>Development Type</th>
<th>Runoff Coefficient (Rational), C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-family areas</td>
<td>0.50</td>
</tr>
<tr>
<td>Multi-units, detached</td>
<td>0.60</td>
</tr>
<tr>
<td>Apartment dwelling areas</td>
<td>0.70</td>
</tr>
<tr>
<td>Multi-units, attached</td>
<td>0.75</td>
</tr>
<tr>
<td>User Specified</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Determine C Factor using Table D-1b

<table>
<thead>
<tr>
<th>Development Type</th>
<th>Runoff Coefficient (Rational), C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-family areas</td>
<td>0.50</td>
</tr>
<tr>
<td>Multi-units, detached</td>
<td>0.60</td>
</tr>
<tr>
<td>Apartment dwelling areas</td>
<td>0.70</td>
</tr>
<tr>
<td>Multi-units, attached</td>
<td>0.75</td>
</tr>
<tr>
<td>User Specified</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Determine i using Table D-1c (Rainfall Intensity)

<table>
<thead>
<tr>
<th>Development Type</th>
<th>Runoff Coefficient (Rational), C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-family areas</td>
<td>0.50</td>
</tr>
<tr>
<td>Multi-units, detached</td>
<td>0.60</td>
</tr>
<tr>
<td>Apartment dwelling areas</td>
<td>0.70</td>
</tr>
<tr>
<td>Multi-units, attached</td>
<td>0.75</td>
</tr>
<tr>
<td>User Specified</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Calculate treatment volume (acre-ft):

<table>
<thead>
<tr>
<th>Development Type</th>
<th>Runoff Coefficient (Rational), C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-family areas</td>
<td>0.50</td>
</tr>
<tr>
<td>Multi-units, detached</td>
<td>0.60</td>
</tr>
<tr>
<td>Apartment dwelling areas</td>
<td>0.70</td>
</tr>
<tr>
<td>Multi-units, attached</td>
<td>0.75</td>
</tr>
<tr>
<td>User Specified</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Step 4b Treatment - Volume-Based (ASCE-WEF)

Calculate water quality volume (Acre-Feet):

WQV = Area x Maximized Detention Volume (P0)

Obtain A from Step 1

<table>
<thead>
<tr>
<th>Development Type</th>
<th>Runoff Coefficient (Rational), C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-family areas</td>
<td>0.50</td>
</tr>
<tr>
<td>Multi-units, detached</td>
<td>0.60</td>
</tr>
<tr>
<td>Apartment dwelling areas</td>
<td>0.70</td>
</tr>
<tr>
<td>Multi-units, attached</td>
<td>0.75</td>
</tr>
<tr>
<td>User Specified</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Obtain Poe, Maximized Detention Volume from figures E-1 to E-4 in Appendix E of this manual using i from Step 2

Calculate treatment volume (acre-ft):

<table>
<thead>
<tr>
<th>Development Type</th>
<th>Runoff Coefficient (Rational), C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-family areas</td>
<td>0.50</td>
</tr>
<tr>
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<td>0.75</td>
</tr>
<tr>
<td>User Specified</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Residential
Appendix C – Wetland Delineation Exhibit
Aquatic Resource Delineation
Meadowview 102 Acres
Sacramento County, California

±05 01 00 Feet

Prepared For:
City of Sacramento
915 I Street
Sacramento, CA 95814

Aquatic Resources Total: 10.475 acres

WETLANDS
Total Wetlands: 6.921 acres
Seasonal Wetland

OTHER WATERS
Total Other Waters: 3.554 acres
Ditch
Pond

Delineation Performed by:
B. Peterson, D. Snider
Map Prepared by:
N. Bente
Date Map Prepared:
27 March 2023

Definitions:
NAD = North American Datum
NAVD = North American Vertical Datum
NED = National Elevation Dataset
USGS = United States Geological Survey

1 inch = 100 feet
NAD 1983 State Plane California II
Datum: NAD83 (North American Datum 1983)
Projection: Lambert Conformal Conic
Vertical Data: NAVD88 (North American Vertical Datum 1988)
Aerial Base: Maxar
Aerial Base Flown: 12 April 2022.
Topographic Contours: USGS NED 1/3 arc-second Contours for Sacramento West, California. 1 October 2018

Notes:
Map Scale:
Coordinate System:
Datum:
Projection:
Vertical Data:
Prepared By:

Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community
Appendix D – 100-Year Peak Flow Sacramento Method for Rainfall Zone 2, 80-640 Acres (Figure 2-15)
Note: Refer to accompanying disk for assumptions made in deriving this figure.
Appendix E – Hydromodification Mitigation
Applicability Flow Chart
**Figure 5-1  Hydromodification Mitigation Applicability Flow Chart**

- **Project Located in Exempted Area** *(See Applicability Map)*
  - **YES** → Exempt (HMP Section 3.3)
  - **NO**
    - **Project meets Municipal Agency Project exemption criteria?**
      - **YES** → Exempt (HMP Section 3.2.5)
      - **NO**
        - **Prior Approved Project**
          - **YES** → Exempt (HMP Section 3.2.6)
          - **NO**
            - **Priority Project** *(See Table 1-2)*
              - **NO** → Exempt (HMP Section 3.2.7)
              - **YES**
                - **Project discharges directly to Exempt Channels** *(See Figure 5-2)*
                  - **YES** → Exempt (HMP Section 3.2.8)
                  - **NO**
                    - **Project meets redeveloped exemption criteria**
                      - **YES** → Exempt (HMP Section 3.2.9)
                      - **NO**
                        - Hydromodification Management Requirements Apply

*Exempted Areas were identified based on the following criteria:
- Drains directly to the Sacramento or Lower American River (HMP Section 3.2.2)
- Areas within a highly developed watershed (HMP Section 3.2.3)
- Drains to an exempted Special drainage area (HMP Section 3.2.4)*