Drainage Report

for

Tract 8720 – Panorama Heights
Alameda County, California

Prepared by:

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Introduction

The purpose of this report is to document the preliminary storm drain system design for Tract 8720 – Panorama Heights (Project) as shown on the Vesting Tentative Map dated August 2, 2024. 10-year storms and 100-year storms are evaluated to show the proposed drainage improvements will result in no adverse drainage impacts to downstream areas.

Site Location and Description

The project site is approximately 14.3 acres in size, is zoned R1-BE-10,000, and has an existing abandoned residence on the property. It is located on Fairview Avenue, between Karina Street and Walter Dinos Court in the Fairview Community of Alameda County, California.

The site has significant topographic variation with existing slopes ranging from relatively flat hilltops to slopes in excess of 2:1 (H:V). Elevations range from approximately 535 feet at Fairview Avenue to 707 feet at the upper-most point on the property.

Climate

The area has a climate characterized by wet winters and dry summers. The site has mean annual precipitation of 23 inches per County rain data (ACFC&WCD, File MA-180). The typical wet season is from October to April with occasional, uncharacteristic rainfall during the other months.

Existing Drainage Patterns

The existing site topography is split into two drainage areas, as shown in the "Existing and Proposed Drainage Exhibit" (Appendix B).

Shed 1 is 13.72 acres and drains to the existing storm drain system in Fairview Avenue. The lower 8.17 acres drains directly into Fairview Avenue into an existing 18 inch storm drain. The middle 5.45 acres drains toward the west and to an existing detention basin on the adjacent property Tract 6102. This basin discharges into the public storm drain in Tract 6102, which routes into the Fairview Avenue storm drain at Jelincic Drive.

The upper 6.16 acres (Shed 2) drains toward the east onto property owned by PG&E and then flows through an undeveloped watershed to discharge to Deer Creek & Don Castro Reservoir.

Proposed Drainage Patterns

The proposed development drainage will very closely match the existing condition drainage patterns. Shed 1 will be slightly modified such that all onsite run-off will discharge directly into Fairview Avenue. Existing shed boundaries and historic points of discharge are being respected.

Proposed Hydrology & Stormwater Treatment

The site is subject to the Alameda County Cleanwater C.3 requirements for treatment and hydromodification management plan (HMP). Impervious portions of the proposed site will be directed to bio-retention/HMP facilities. Pervious (undeveloped) areas do not require stormwater treatment or hydromodification and will be collected in boundary channels and "clean water" pipes to bypass the onsite treatment facilities. These flows will be routed directly to offsite can be conveyed to the downstream storm drain systems. Refer to the "Preliminary Stormwater Control Plan" (Appendix C). Stormwater treatment of impervious areas will be provided through filtering in bio-retention basins and silva cells. The "Preliminary Stormwater Control Plan" (Appendix C) shows the locations and sizing of the treatment areas.
Three bio-retention areas are provided for treatment; Bio-retention #1 & #2 and Bio-retention #3 (in the form of Silva Cells) will connect to a 72 inch concrete box storage for HMP purposes. Refer to the "Preliminary On-site Stormwater Runoff Detention Plan" (Appendix D).

Shed 1 collects a portion of runoff from Panorama Lane and Panorama Court, Lots 1-13, 25-28, B, C, D and E overland flow into Panorama Lane and then are directed into Bio-retention #1 and #2. After treatment, stormwater will be directed into a 72" concrete box with 2000 CF of storage that will act as a detention facility. Treated water will be collected and piped via a 18" pipe to the southern end of Panorama Lane and then continue to the existing storm drain system on Fairview Avenue.

Shed 2 collects a portion of runoff from Panorama Lane and runoff from lots 14-24. Runoff from Panorama Lane will flow into silva cells for treatment as part of treatment area #3. After treatment, stormwater will be directed into a 72" concrete box with 2900 CF of storage that will act as a detention facility. Flow will be released from the box storage at pre-development rates into a 18" and 24" pipe that will flow through Lot A and onto the adjacent PG&E property.

Hydromodification Analysis

Hydromodification is required to maintain runoff at pre-development levels for storms ranging from 10% of the 2-year storm up to the 10-year storm event. Two storage vaults, two bio-retention areas, and silva cells are used to mitigate for the C.3 Hydromodification requirements. Bay Area Hydrology Model (BAHM) software was used to model these facilities to meet HMP. The BAHM report is included in Appendix A. Flow control in Sheds 1 and 2 is provided by riser structures with low flow orifices.

100 Year Storm Analysis

For storms exceeding the 10-year design storm, bio-retention facilities will become inundated, and the site will enter a state of overland discharge. Overland release is provided in street via Panorama Lane out to Fairview Avenue.

Drainage System Ownership and Maintenance

All drainage systems within the project boundary will be privately owned and maintained. Facilities that convey, detain and/or treat runoff from more than one lot will be owned and maintained by the project Home Owners Association (HOA). This includes boundary swales, pipes in the streets, Bio-retention Areas 1, 2, and 3, and the hydromodification storage in Sheds 1 and 2. Swales, inlets and pipes on individual lots that serve only one lot will be owned and maintained by that lot owner.

Summary

The proposed bio-retention and hydromodification facilities for the planned developed meet the County HMP requirements, as shown in the enclosed BAHM report. Developed areas for both sheds do not exceed the predevelopment runoff rate for storms ranging from 10% of the 2-year event up to a 10-year event.

References

1. "Hydrology and Hydraulics Manual," Alameda County Flood Control and Water Conservation District, issued by Alameda County Public Works Agency, 399 Elmhurst Street, Hayward, CA 94544, dated 2018.

Appendix A
BAHM Calculations

BAHM2013

PROJECT REPORT

General Model Information

Project Name:	091093D-Panorama Heights
Site Name:	Panorama Heights
Site Address:	24830 Fairview Ave
City:	Hayward
Report Date:	8/5/2024
Gage:	NRWARK
Data Start:	1959/10/01
Data End:	2003/09/30
Timestep:	Hourly
Precip Scale:	0.000 (adjusted)
Version Date:	2020/10/14

POC Thresholds

Low Flow Threshold for POC1:	10 Percent of the 2 Year
High Flow Threshold for POC1:	10 Year
Low Flow Threshold for POC2:	10 Percent of the 2 Year
High Flow Threshold for POC2:	10 Year

Landuse Basin Data

Predeveloped Land Use

Shed 1 - Existing

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Grass,Ste(10-20)	1.7
C D,Grass,Very(>20%)	1
Pervious Total	2.7

Impervious Land Use	acre
Roads,VeryStee(>20%)	0.1
Roof Area	0.1
Impervious Total	0.2
Basin Total	2.9

Element Flows To:

Surface	Interflow	Groundwater

Shed 2 - Existing

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C D,Grass,Very(>20%)	3.7
C D,Grass,Ste(10-20)	1.7
Pervious Total	5.4

Impervious Land Use	acre
Roads,VeryStee(>20%)	0.1
Roof Area	0.1
Impervious Total	0.2
Basin Total	5.6

Element Flows To:

Surface	Interflow	Groundwater

Shed 3 - Existing

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C D,Grass,Very(>20%)	6.2
Pervious Total	6.2
Impervious Land Use	acre
Impervious Total	0
Basin Total	6.2

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Shed 2 - Proposed

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
B,Urban,Stee(10-20%)	0.3
B,Urban,Very S(>20%)	3.2
Pervious Total	3.5

Impervious Land Use	acre
Roads,Steep(10-20%)	0.64
Roof Area	0.75
Driveways,St(10-20%)	0.4
Impervious Total	1.79
Basin Total	5.29

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 2	Surface retention 2	

Shed 1-Proposed

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
B,Urban,Very S(>20%)	1.09
B,Urban,Stee(10-20%)	0.15
Pervious Total	1.24

Impervious Land Use	acre
Roads,Steep(10-20%)	0.5
Roof Area	0.58
Driveways,St(10-20%)	0.1
Impervious Total	1.18
Basin Total	2.42

Element Flows To:

Surface	Interflow	Groundwater
Surface retention 1	Surface retention 1	

Shed 3 - Proposed

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
B,Urban,Stee(10-20%)	0.2
C D,Grass,Ste(10-20)	0.95
Pervious Total	1.15

Impervious Land Use	acre
Roads,Steep(10-20%)	0.72
Roof Area	0.84
Driveways,St(10-20%)	0.27
Impervious Total	1.83
Basin Total	2.98

Element Flows To:

Surface	Interflow	Groundwater
Surface ilva Cells 3	Surface ilva Cells 3	

Shed 1 - To Remain

Bypass:	Yes
GroundWater:	No
Pervious Land Use	acre
Pervious Total	0
Impervious Land Use	acre
Roads,Steep(10-20%)	0.2
Impervious Total	0.2
Basin Total	0.2

Element Flows To:

Surface	Interflow	Groundwater

Shed 3 - To Remain

Bypass:	Yes
GroundWater:	No

Pervious Land Use	acre
C D,Grass,Very(>20%)	2.95
Pervious Total	2.95

Impervious Land Use	acre
Sidewalks,Flat(0-5%)	0.28
Impervious Total	0.28
Basin Total	3.23

Element Flows To:

Surface	Interflow	Groundwater

Routing Elements
Predeveloped Routing

Mitigated Routing

Silva Cells 3

Bottom Length:	87.22 ft.
Bottom Width:	50.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	Amended 5 in/hr
Material thickness of second layer:	1
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	2
Offset (in.):	0
Flow Through Underdrain (ac-ft.):	132.104
Total Outflow (ac-ft.):	177.237
Percent Through Underdrain:	74.54
Discharge Structure	
Riser Height:	1 ft.
Riser Diameter:	24 in.
Notch Type:	Rectangular
Notch Width:	0.000 ft.
Notch Height:	0.000 ft.
Orifice 1 Diameter:	2 in. Elevation:0 ft.
Orifice 2 Diameter:	6 in. Elevation:0.5 ft.
Element Flows To:	
Outlet 1	Outlet 2
Vault 2	

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.1001	0.0000	0.0000	0.0000
0.0495	0.1001	0.0010	0.0000	0.0000
0.0989	0.1001	0.0021	0.0000	0.0000
0.1484	0.1001	0.0031	0.0000	0.0000
0.1978	0.1001	0.0042	0.0000	0.0000
0.2473	0.1001	0.0052	0.0062	0.0000
0.2967	0.1001	0.0062	0.0067	0.0000
0.3462	0.1001	0.0073	0.0127	0.0000
0.3956	0.1001	0.0083	0.0149	0.0000
0.4451	0.1001	0.0094	0.0190	0.0000
0.4945	0.1001	0.0104	0.0259	0.0000
0.5440	0.1001	0.0114	0.0295	0.0000
0.5934	0.1001	0.0125	0.0312	0.0000
0.6429	0.1001	0.0135	0.0357	0.0000
0.6923	0.1001	0.0146	0.0397	0.0000
0.7418	0.1001	0.0156	0.0433	0.0000
0.7912	0.1001	0.0166	0.0466	0.0000
0.8407	0.1001	0.0177	0.0497	0.0000
0.8901	0.1001	0.0198	0.0526	0.0000
0.9396	0.1001	0.0218	0.0554	0.0000
0.9890	0.1001	0.0239	0.0580	0.0000
1.0385	0.1001	0.0260	0.0605	0.0000
1.0879	0.1001	0.0281	0.0629	0.0000
1.1374	0.1001	0.0301	0.0652	0.0000

1.1868	0.1001	0.0322	0.0674	0.0000
1.2363	0.1001	0.0343	0.0696	0.0000
1.2857	0.1001	0.0364	0.0717	0.0000
1.3352	0.1001	0.0385	0.0737	0.0000
1.3846	0.1001	0.0405	0.0757	0.0000
1.4341	0.1001	0.0426	0.0776	0.0000
1.4835	0.1001	0.0447	0.0795	0.0000
1.5330	0.1001	0.0468	0.0813	0.0000
1.5824	0.1001	0.0488	0.0831	0.0000
1.6319	0.1001	0.0509	0.0849	0.0000
1.6813	0.1001	0.0529	0.0866	0.0000
1.7308	0.1001	0.0550	0.0883	0.0000
1.7802	0.1001	0.0570	0.0900	0.0000
1.8297	0.1001	0.0591	0.0916	0.0000
1.8791	0.1001	0.0611	0.0932	0.0000
1.9286	0.1001	0.0632	0.0948	0.0000
1.9780	0.1001	0.0653	0.0963	0.0000
2.0275	0.1001	0.0673	0.0978	0.0000
2.0769	0.1001	0.0694	0.0994	0.0000
2.1264	0.1001	0.0714	0.1008	0.0000
2.1758	0.1001	0.0735	0.1023	0.0000
2.2253	0.1001	0.0755	0.1038	0.0000
2.2747	0.1001	0.0776	0.1053	0.0000
2.3242	0.1001	0.0796	0.1068	0.0000
2.3736	0.1001	0.0817	0.1093	0.0000
2.4231	0.1001	0.0837	0.1106	0.0000
2.4725	0.1001	0.0858	0.1119	0.0000
2.5000	0.1001	0.0869	0.1126	0.0000

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.5000	0.1001	0.0869	0.0000	0.5167	0.0000
2.5495	0.1001	0.0919	0.0241	0.5167	0.0000
2.5989	0.1001	0.0968	0.0341	0.5507	0.0000
2.6484	0.1001	0.1018	0.0418	0.5678	0.0000
2.6978	0.1001	0.1067	0.0483	0.5848	0.0000
2.7473	0.1001	0.1117	0.0540	0.6018	0.0000
2.7967	0.1001	0.1166	0.0591	0.6189	0.0000
2.8462	0.1001	0.1216	0.0639	0.6359	0.0000
2.8956	0.1001	0.1265	0.0683	0.6529	0.0000
2.9451	0.1001	0.1315	0.0724	0.6700	0.0000
2.9945	0.1001	0.1364	0.0763	0.6870	0.0000
3.0440	0.1001	0.1414	0.2849	0.7040	0.0000
3.0934	0.1001	0.1463	0.3822	0.7211	0.0000
3.1429	0.1001	0.1513	0.4563	0.7381	0.0000
3.1923	0.1001	0.1562	0.5187	0.7551	0.0000
3.2418	0.1001	0.1612	0.5738	0.7722	0.0000
3.2912	0.1001	0.1661	0.6237	0.7892	0.0000
3.3407	0.1001	0.1711	0.6697	0.8062	0.0000
3.3901	0.1001	0.1761	0.7126	0.8233	0.0000
3.4396	0.1001	0.1810	0.7529	0.8403	0.0000
3.4890	0.1001	0.1860	0.7911	0.8573	0.0000
3.5385	0.1001	0.1909	0.9876	0.8744	0.0000
3.5879	0.1001	0.1959	1.4149	0.8914	0.0000
3.6374	0.1001	0.2008	1.9735	0.9084	0.0000
3.6868	0.1001	0.2058	2.6328	0.9255	0.0000
3.7363	0.1001	0.2107	3.3729	0.9425	0.0000
3.7857	0.1001	0.2157	4.1769	0.9595	0.0000

3.8352	0.1001	0.2206	5.0286	0.9766	0.0000
3.8846	0.1001	0.2256	5.9114	0.9936	0.0000
3.9341	0.1001	0.2305	6.8086	1.0106	0.0000
3.9835	0.1001	0.2355	7.7029	1.0277	0.0000
4.0330	0.1001	0.2404	8.5773	1.0447	0.0000
4.0824	0.1001	0.2454	9.4155	1.0617	0.0000
4.1319	0.1001	0.2503	10.202	1.0788	0.0000
4.1813	0.1001	0.2553	10.925	1.0958	0.0000
4.2308	0.1001	0.2602	11.574	1.1128	0.0000
4.2802	0.1001	0.2652	12.143	1.1299	0.0000
4.3297	0.1001	0.2701	12.630	1.1469	0.0000
4.3791	0.1001	0.2751	13.040	1.1639	0.0000
4.4286	0.1001	0.2800	13.386	1.1810	0.0000
4.4780	0.1001	0.2850	13.687	1.1980	0.0000
4.5000	0.1001	0.2872	14.132	1.2056	0.0000

Surface ilva Cells 3

Element Flows To:

Outlet 1	Outlet 2
Vault 2	Silva Cells 3

Bioretention 2

Bottom Length:	50.00 ft.
Bottom Width:	86.02 ft.
Material thickness of first layer:	1.5
Material type for first layer:	Amended 5 in/hr
Material thickness of second layer:	1
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.005
Infiltration safety factor:	1
Wetted surface area On	
Total Volume Infiltrated (ac-ft.):	1.914
Total Volume Through Riser (ac-ft.):	76.941
Total Volume Through Facility (ac-ft.):	275.584
Percent Infiltrated:	0.69
Total Precip Applied to Facility:	7.952
Total Evap From Facility:	4.812
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	2
Offset (in.):	0
Flow Through Underdrain (ac-ft.):	196.729
Total Outflow (ac-ft.):	275.584
Percent Through Underdrain:	71.39
Discharge Structure	
Riser Height:	1 ft.
Riser Diameter:	12 in.
Element Flows To:	
Outlet 1	Outlet 2
Vault 1	

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.1198	0.0000	0.0000	0.0000
0.0549	0.1195	0.0023	0.0000	0.0000
0.1099	0.1191	0.0046	0.0000	0.0000
0.1648	0.1186	0.0069	0.0000	0.0000
0.2198	0.1181	0.0092	0.0000	0.0000
0.2747	0.1176	0.0115	0.0071	0.0003
0.3297	0.1172	0.0139	0.0106	0.0005
0.3846	0.1167	0.0162	0.0155	0.0005
0.4396	0.1162	0.0186	0.0184	0.0005
0.4945	0.1158	0.0209	0.0215	0.0005
0.5495	0.1153	0.0233	0.0284	0.0005
0.6044	0.1148	0.0257	0.0338	0.0005
0.6593	0.1144	0.0281	0.0384	0.0005
0.7143	0.1139	0.0305	0.0425	0.0005
0.7692	0.1134	0.0329	0.0463	0.0005
0.8242	0.1130	0.0354	0.0497	0.0005
0.8791	0.1125	0.0378	0.0529	0.0005
0.9341	0.1120	0.0402	0.0560	0.0005
0.9890	0.1116	0.0427	0.0588	0.0005
1.0440	0.1111	0.0452	0.0616	0.0005
1.0989	0.1106	0.0477	0.0642	0.0005

1.1538	0.1102	0.0502	0.0667	0.0005
1.2088	0.1097	0.0527	0.0691	0.0005
1.2637	0.1092	0.0552	0.0714	0.0006
1.3187	0.1088	0.0577	0.0737	0.0006
1.3736	0.1083	0.0602	0.0759	0.0006
1.4286	0.1078	0.0628	0.0780	0.0006
1.4835	0.1074	0.0653	0.0801	0.0006
1.5385	0.1069	0.0679	0.0821	0.0006
1.5934	0.1065	0.0704	0.0841	0.0006
1.6484	0.1060	0.0730	0.0860	0.0006
1.7033	0.1055	0.0756	0.0879	0.0006
1.7582	0.1051	0.0781	0.0898	0.0006
1.8132	0.1046	0.0807	0.0916	0.0006
1.8681	0.1042	0.0833	0.0934	0.0006
1.9231	0.1037	0.0860	0.0951	0.0006
1.9780	0.1033	0.0886	0.0968	0.0006
2.0330	0.1028	0.0912	0.0985	0.0006
2.0879	0.1024	0.0939	0.1002	0.0006
2.1429	0.1019	0.0965	0.1018	0.0006
2.1978	0.1014	0.0992	0.1035	0.0006
2.2527	0.1010	0.1019	0.1051	0.0006
2.3077	0.1005	0.1045	0.1068	0.0006
2.3626	0.1001	0.1072	0.1094	0.0006
2.4176	0.0996	0.1100	0.1109	0.0006
2.4725	0.0992	0.1127	0.1124	0.0006
2.5000	0.0987	0.1140	0.1131	0.0006

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.5000	0.1198	0.1140	0.0000	0.6206	0.0000
2.5549	0.1203	0.1206	0.0000	0.6206	0.0000
2.6099	0.1207	0.1273	0.0000	0.6687	0.0000
2.6648	0.1212	0.1339	0.0000	0.6943	0.0000
2.7198	0.1217	0.1406	0.0000	0.7200	0.0000
2.7747	0.1222	0.1473	0.0000	0.7459	0.0000
2.8297	0.1226	0.1540	0.0000	0.7720	0.0000
2.8846	0.1231	0.1607	0.0000	0.7983	0.0000
2.9396	0.1236	0.1675	0.0000	0.8248	0.0000
2.9945	0.1241	0.1743	0.0000	0.8514	0.0000
3.0495	0.1246	0.1812	0.0000	0.8783	0.0000
3.1044	0.1250	0.1880	0.0000	0.9053	0.0000
3.1593	0.1255	0.1949	0.0000	0.9325	0.0000
3.2143	0.1260	0.2018	0.0000	0.9599	0.0000
3.2692	0.1265	0.2087	0.0000	0.9875	0.0000
3.3242	0.1270	0.2157	0.0000	1.0153	0.0000
3.3791	0.1275	0.2227	0.0000	1.0432	0.0000
3.4341	0.1279	0.2297	0.0000	1.0714	0.0000
3.4890	0.1284	0.2368	0.0000	1.0997	0.0000
3.5440	0.1289	0.2438	0.0977	1.1282	0.0000
3.5989	0.1294	0.2509	0.3281	1.1570	0.0001
3.6538	0.1299	0.2580	0.6273	1.1859	0.0001
3.7088	0.1304	0.2652	0.9624	1.2149	0.0001
3.7637	0.1309	0.2724	1.3006	1.2442	0.0001
3.8187	0.1313	0.2796	1.6096	1.2737	0.0001
3.8736	0.1318	0.2868	1.8629	1.3033	0.0001
3.9286	0.1323	0.2941	2.0472	1.3332	0.0001
3.9835	0.1328	0.3013	2.1721	1.3632	0.0001
4.0385	0.1333	0.3087	2.3112	1.3935	0.0001

4.0934	0.1338	0.3160	2.4263	1.4239	0.0001
4.1484	0.1343	0.3234	2.5361	1.4545	0.0001
4.2033	0.1348	0.3308	2.6414	1.4853	0.0001
4.2582	0.1353	0.3382	2.7426	1.5163	0.0001
4.3132	0.1358	0.3456	2.8402	1.5475	0.0001
4.3681	0.1362	0.3531	2.9346	1.5789	0.0001
4.4231	0.1367	0.3606	3.0261	1.6104	0.0001
4.4780	0.1372	0.3681	3.1148	1.6422	0.0001
4.5330	0.1377	0.3757	3.2011	1.6585	0.0001
4.5879	0.1382	0.3832	3.2852	1.6645	0.0001
4.6429	0.1387	0.3909	3.3671	1.6705	0.0001
4.6978	0.1392	0.3985	3.4471	1.6765	0.0001
4.7527	0.1397	0.4062	3.5253	1.6825	0.0001
4.8077	0.1402	0.4138	3.6017	1.6884	0.0001
4.8626	0.1407	0.4216	3.6766	1.6944	0.0001
4.9176	0.1412	0.4293	3.7500	1.7005	0.0001
4.9725	0.1417	0.4371	3.8220	1.7065	0.0001
5.0000	0.1420	0.4410	3.8927	1.7095	0.0000

Surface retention 2

Element Flows To:

Outlet 1	Outlet 2
Vault 1	Bioretention 2

Bioretention 1

Bottom Length:	53.34 ft.
Bottom Width:	50.00 ft.
Material thickness of first layer:	1.5
Material type for first layer:	Amended 5 in/hr
Material thickness of second layer:	1
Material type for second layer:	GRAVEL
Material thickness of third layer:	0
Material type for third layer:	GRAVEL
Infiltration On	
Infiltration rate:	0.005
Infiltration safety factor:	1
Wetted surface area On	
Total Volume Infiltrated (ac-ft.):	0.95
Total Volume Through Riser (ac-ft.):	17.885
Total Volume Through Facility (ac-ft.):	138.667
Percent Infiltrated:	0.69
Total Precip Applied to Facility:	5.055
Total Evap From Facility:	2.933
Underdrain used	
Underdrain Diameter (feet):	0.5
Orifice Diameter (in.):	2
Offset (in.):	0
Flow Through Underdrain (ac-ft.):	119.832
Total Outflow (ac-ft.):	138.667
Percent Through Underdrain:	86.42
Discharge Structure	
Riser Height:	1 ft.
Riser Diameter:	24 in.
Element Flows To:	
Outlet 1	Outlet 2
Vault 1	

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0821	0.0000	0.0000	0.0000
0.0549	0.0818	0.0014	0.0000	0.0000
0.1099	0.0814	0.0028	0.0000	0.0000
0.1648	0.0809	0.0043	0.0000	0.0000
0.2198	0.0804	0.0057	0.0000	0.0000
0.2747	0.0799	0.0072	0.0045	0.0001
0.3297	0.0795	0.0087	0.0068	0.0002
0.3846	0.0790	0.0101	0.0098	0.0003
0.4396	0.0785	0.0116	0.0108	0.0003
0.4945	0.0781	0.0131	0.0184	0.0003
0.5495	0.0776	0.0146	0.0212	0.0003
0.6044	0.0771	0.0162	0.0275	0.0003
0.6593	0.0767	0.0177	0.0284	0.0003
0.7143	0.0762	0.0192	0.0338	0.0003
0.7692	0.0758	0.0208	0.0384	0.0003
0.8242	0.0753	0.0224	0.0425	0.0003
0.8791	0.0748	0.0239	0.0463	0.0003
0.9341	0.0744	0.0255	0.0497	0.0003
0.9890	0.0739	0.0271	0.0529	0.0003
1.0440	0.0734	0.0287	0.0560	0.0004
1.0989	0.0730	0.0303	0.0588	0.0004

1.1538	0.0725	0.0320	0.0616	0.0004
1.2088	0.0721	0.0336	0.0642	0.0004
1.2637	0.0716	0.0352	0.0667	0.0004
1.3187	0.0712	0.0369	0.0691	0.0004
1.3736	0.0707	0.0386	0.0714	0.0004
1.4286	0.0702	0.0402	0.0737	0.0004
1.4835	0.0698	0.0419	0.0759	0.0004
1.5385	0.0693	0.0436	0.0780	0.0004
1.5934	0.0689	0.0453	0.0801	0.0004
1.6484	0.0684	0.0470	0.0821	0.0004
1.7033	0.0680	0.0487	0.0841	0.0004
1.7582	0.0675	0.0504	0.0860	0.0004
1.8132	0.0671	0.0522	0.0879	0.0004
1.8681	0.0666	0.0539	0.0898	0.0004
1.9231	0.0662	0.0557	0.0916	0.0004
1.9780	0.0657	0.0574	0.0934	0.0004
2.0330	0.0653	0.0592	0.0951	0.0004
2.0879	0.0648	0.0610	0.0968	0.0004
2.1429	0.0644	0.0628	0.0985	0.0004
2.1978	0.0639	0.0646	0.1002	0.0004
2.2527	0.0635	0.0664	0.1018	0.0004
2.3077	0.0630	0.0682	0.1035	0.0004
2.3626	0.0626	0.0701	0.1051	0.0004
2.4176	0.0621	0.0719	0.1068	0.0004
2.4725	0.0617	0.0738	0.1094	0.0004
2.5000	0.0612	0.0747	0.1102	0.0004

Bioretention Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Infilt(cfs)
2.5000	0.0821	0.0747	0.0000	0.4259	0.0000
2.5549	0.0825	0.0792	0.0000	0.4259	0.0000
2.6099	0.0830	0.0838	0.0000	0.4597	0.0000
2.6648	0.0835	0.0884	0.0000	0.4781	0.0000
2.7198	0.0839	0.0930	0.0000	0.4967	0.0000
2.7747	0.0844	0.0976	0.0000	0.5154	0.0000
2.8297	0.0849	0.1022	0.0000	0.5344	0.0000
2.8846	0.0854	0.1069	0.0000	0.5535	0.0000
2.9396	0.0858	0.1116	0.0000	0.5728	0.0000
2.9945	0.0863	0.1164	0.0000	0.5923	0.0000
3.0495	0.0868	0.1211	0.0000	0.6119	0.0000
3.1044	0.0873	0.1259	0.0000	0.6318	0.0000
3.1593	0.0877	0.1307	0.0000	0.6518	0.0000
3.2143	0.0882	0.1355	0.0000	0.6721	0.0000
3.2692	0.0887	0.1404	0.0000	0.6925	0.0000
3.3242	0.0892	0.1453	0.0000	0.7130	0.0000
3.3791	0.0897	0.1502	0.0000	0.7338	0.0000
3.4341	0.0901	0.1551	0.0000	0.7548	0.0000
3.4890	0.0906	0.1601	0.0000	0.7759	0.0000
3.5440	0.0911	0.1651	0.1956	0.7973	0.0000
3.5989	0.0916	0.1701	0.6592	0.8188	0.0001
3.6538	0.0921	0.1752	1.2766	0.8405	0.0001
3.7088	0.0925	0.1802	2.0109	0.8624	0.0001
3.7637	0.0930	0.1853	2.8369	0.8845	0.0001
3.8187	0.0935	0.1904	3.7318	0.9067	0.0001
3.8736	0.0940	0.1956	4.6731	0.9292	0.0001
3.9286	0.0945	0.2008	5.6376	0.9518	0.0001
3.9835	0.0950	0.2060	6.6018	0.9747	0.0001
4.0385	0.0954	0.2112	7.5423	0.9977	0.0001

4.0934	0.0959	0.2165	8.4368	1.0209	0.0001
4.1484	0.0964	0.2217	9.2649	1.0443	0.0001
4.2033	0.0969	0.2271	10.010	1.0679	0.0001
4.2582	0.0974	0.2324	10.660	1.0917	0.0001
4.3132	0.0979	0.2378	11.211	1.1157	0.0001
4.3681	0.0984	0.2432	11.664	1.1398	0.0001
4.4231	0.0989	0.2486	12.034	1.1642	0.0001
4.4780	0.0993	0.2540	12.347	1.1887	0.0001
4.5330	0.0998	0.2595	12.805	1.2022	0.0001
4.5879	0.1003	0.2650	13.141	1.2081	0.0001
4.6429	0.1008	0.2705	13.468	1.2140	0.0001
4.6978	0.1013	0.2761	13.788	1.2199	0.0001
4.7527	0.1018	0.2816	14.101	1.2258	0.0001
4.8077	0.1023	0.2873	14.407	1.2318	0.0001
4.8626	0.1028	0.2929	14.707	1.2377	0.0001
4.9176	0.1033	0.2985	15.000	1.2437	0.0001
4.9725	0.1038	0.3042	15.288	1.2496	0.0001
5.0000	0.1040	0.3071	15.571	1.2526	0.0000

Surface retention 1

Element Flows To:

Outlet 1	Outlet 2
Vault 1	Bioretention 1

Vault 2

Width:	6 ft.	
Length:	80 ft.	
Depth:	6 ft.	
Discharge Structure		
Riser Height:	5.5 ft.	
Riser Diameter:	12 in.	
Orifice 1 Diameter:	6 in.	Elevation:0 ft.
Orifice 2 Diameter:	8 in.	Elevation:2.5 ft.
Orifice 3 Diameter:	8 in.	Elevation:4.5 ft.
Element Flows To:		
Outlet 1	Outlet 2	

Vault Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.011	0.000	0.000	0.000
0.0667	0.011	0.000	0.252	0.000
0.1333	0.011	0.001	0.356	0.000
0.2000	0.011	0.002	0.436	0.000
0.2667	0.011	0.002	0.504	0.000
0.3333	0.011	0.003	0.564	0.000
0.4000	0.011	0.004	0.617	0.000
0.4667	0.011	0.005	0.667	0.000
0.5333	0.011	0.005	0.713	0.000
0.6000	0.011	0.006	0.756	0.000
0.6667	0.011	0.007	0.797	0.000
0.7333	0.011	0.008	0.836	0.000
0.8000	0.011	0.008	0.873	0.000
0.8667	0.011	0.009	0.909	0.000
0.9333	0.011	0.010	0.943	0.000
1.0000	0.011	0.011	0.976	0.000
1.0667	0.011	0.011	1.009	0.000
1.1333	0.011	0.012	1.040	0.000
1.2000	0.011	0.013	1.070	0.000
1.2667	0.011	0.014	1.099	0.000
1.3333	0.011	0.014	1.128	0.000
1.4000	0.011	0.015	1.155	0.000
1.4667	0.011	0.016	1.183	0.000
1.5333	0.011	0.016	1.209	0.000
1.6000	0.011	0.017	1.235	0.000
1.6667	0.011	0.018	1.261	0.000
1.7333	0.011	0.019	1.286	0.000
1.8000	0.011	0.019	1.310	0.000
1.8667	0.011	0.020	1.334	0.000
1.9333	0.011	0.021	1.358	0.000
2.0000	0.011	0.022	1.381	0.000
2.0667	0.011	0.022	1.404	0.000
2.1333	0.011	0.023	1.426	0.000
2.2000	0.011	0.024	1.449	0.000
2.2667	0.011	0.025	1.470	0.000
2.3333	0.011	0.025	1.492	0.000
2.4000	0.011	0.026	1.513	0.000
2.4667	0.011	0.027	1.534	0.000
2.5333	0.011	0.027	1.872	0.000
2.6000	0.011	0.028	2.124	0.000

2.6667	0.011	0.029	2.304	0.000
2.7333	0.011	0.030	2.454	0.000
2.8000	0.011	0.030	2.586	0.000
2.8667	0.011	0.031	2.705	0.000
2.9333	0.011	0.032	2.816	0.000
3.0000	0.011	0.033	2.920	0.000
3.0667	0.011	0.033	3.018	0.000
3.1333	0.011	0.034	3.111	0.000
3.2000	0.011	0.035	3.200	0.000
3.2667	0.011	0.036	3.286	0.000
3.3333	0.011	0.036	3.369	0.000
3.4000	0.011	0.037	3.449	0.000
3.4667	0.011	0.038	3.526	0.000
3.5333	0.011	0.038	3.601	0.000
3.6000	0.011	0.039	3.675	0.000
3.6667	0.011	0.040	3.746	0.000
3.7333	0.011	0.041	3.816	0.000
3.8000	0.011	0.041	3.884	0.000
3.8667	0.011	0.042	3.951	0.000
3.9333	0.011	0.043	4.016	0.000
4.0000	0.011	0.044	4.080	0.000
4.0667	0.011	0.044	4.143	0.000
4.1333	0.011	0.045	4.205	0.000
4.2000	0.011	0.046	4.266	0.000
4.2667	0.011	0.047	4.326	0.000
4.3333	0.011	0.047	4.385	0.000
4.4000	0.011	0.048	4.443	0.000
4.4667	0.011	0.049	4.500	0.000
4.5333	0.011	0.050	4.873	0.000
4.6000	0.011	0.050	5.161	0.000
4.6667	0.011	0.051	5.375	0.000
4.7333	0.011	0.052	5.559	0.000
4.8000	0.011	0.052	5.725	0.000
4.8667	0.011	0.053	5.878	0.000
4.9333	0.011	0.054	6.022	0.000
5.0000	0.011	0.055	6.158	0.000
5.0667	0.011	0.055	6.288	0.000
5.1333	0.011	0.056	6.413	0.000
5.2000	0.011	0.057	6.534	0.000
5.2667	0.011	0.058	6.651	0.000
5.3333	0.011	0.058	6.764	0.000
5.4000	0.011	0.059	6.875	0.000
5.4667	0.011	0.060	6.983	0.000
5.5333	0.011	0.061	7.152	0.000
5.6000	0.011	0.061	7.524	0.000
5.6667	0.011	0.062	7.995	0.000
5.7333	0.011	0.063	8.505	0.000
5.8000	0.011	0.063	8.997	0.000
5.8667	0.011	0.064	9.417	0.000
5.9333	0.011	0.065	9.737	0.000
6.0000	0.011	0.066	9.972	0.000
6.0667	0.011	0.066	10.23	0.000
6.1333	0.000	0.000	10.45	0.000

Vault 1

Width:	6 ft.	
Length:	50 ft.	
Depth:	6 ft.	
Discharge Structure		
Riser Height:	5.5 ft.	
Riser Diameter:	24 in.	
Notch Type :	V-notch	
Notch Angle:	45.000	
Notch Height:	0.250 ft.	
Orifice 1 Diameter:	3.5 in.	Elevation:0 ft.
Orifice 2 Diameter:	8 in.	Elevation:2.25 ft.
Orifice 3 Diameter:	4 in.	Elevation:4.75 ft.
Element Flows To:		
Outlet 1	Outlet 2	

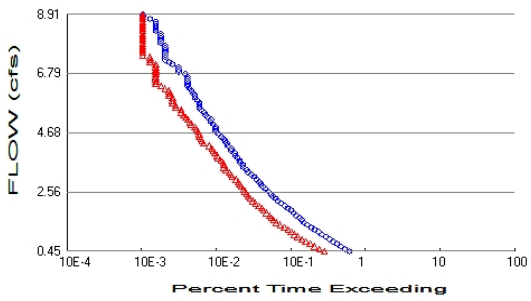
Vault Hydraulic Table

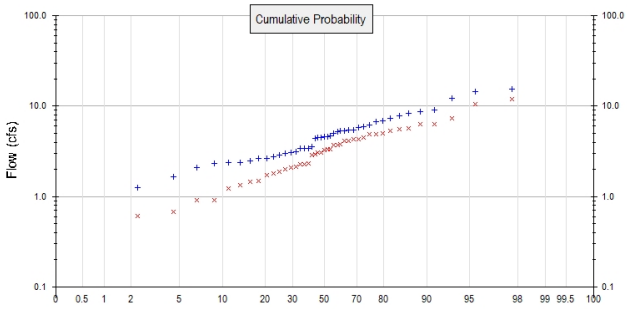
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.006	0.000	0.000	0.000
0.0667	0.006	0.000	0.085	0.000
0.1333	0.006	0.000	0.121	0.000
0.2000	0.006	0.001	0.148	0.000
0.2667	0.006	0.001	0.171	0.000
0.3333	0.006	0.002	0.191	0.000
0.4000	0.006	0.002	0.210	0.000
0.4667	0.006	0.003	0.227	0.000
0.5333	0.006	0.003	0.242	0.000
0.6000	0.006	0.004	0.257	0.000
0.6667	0.006	0.004	0.271	0.000
0.7333	0.006	0.005	0.284	0.000
0.8000	0.006	0.005	0.297	0.000
0.8667	0.006	0.006	0.309	0.000
0.9333	0.006	0.006	0.321	0.000
1.0000	0.006	0.006	0.332	0.000
1.0667	0.006	0.007	0.343	0.000
1.1333	0.006	0.007	0.353	0.000
1.2000	0.006	0.008	0.364	0.000
1.2667	0.006	0.008	0.374	0.000
1.3333	0.006	0.009	0.383	0.000
1.4000	0.006	0.009	0.393	0.000
1.4667	0.006	0.010	0.402	0.000
1.5333	0.006	0.010	0.411	0.000
1.6000	0.006	0.011	0.420	0.000
1.6667	0.006	0.011	0.429	0.000
1.7333	0.006	0.011	0.437	0.000
1.8000	0.006	0.012	0.446	0.000
1.8667	0.006	0.012	0.454	0.000
1.9333	0.006	0.013	0.462	0.000
2.0000	0.006	0.013	0.470	0.000
2.0667	0.006	0.014	0.477	0.000
2.1333	0.006	0.014	0.485	0.000
2.2000	0.006	0.015	0.493	0.000
2.2667	0.006	0.015	0.724	0.000
2.3333	0.006	0.016	1.009	0.000
2.4000	0.006	0.016	1.187	0.000

2.4667	0.006	0.017	1.330	0.000
2.5333	0.006	0.017	1.453	0.000
2.6000	0.006	0.017	1.563	0.000
2.6667	0.006	0.018	1.663	0.000
2.7333	0.006	0.018	1.757	0.000
2.8000	0.006	0.019	1.844	0.000
2.8667	0.006	0.019	1.926	0.000
2.9333	0.006	0.020	2.005	0.000
3.0000	0.006	0.020	2.079	0.000
3.0667	0.006	0.021	2.151	0.000
3.1333	0.006	0.021	2.220	0.000
3.2000	0.006	0.022	2.287	0.000
3.2667	0.006	0.022	2.352	0.000
3.3333	0.006	0.023	2.414	0.000
3.4000	0.006	0.023	2.475	0.000
3.4667	0.006	0.023	2.534	0.000
3.5333	0.006	0.024	2.592	0.000
3.6000	0.006	0.024	2.648	0.000
3.6667	0.006	0.025	2.703	0.000
3.7333	0.006	0.025	2.757	0.000
3.8000	0.006	0.026	2.810	0.000
3.8667	0.006	0.026	2.861	0.000
3.9333	0.006	0.027	2.912	0.000
4.0000	0.006	0.027	2.962	0.000
4.0667	0.006	0.028	3.011	0.000
4.1333	0.006	0.028	3.059	0.000
4.2000	0.006	0.028	3.106	0.000
4.2667	0.006	0.029	3.153	0.000
4.3333	0.006	0.029	3.198	0.000
4.4000	0.006	0.030	3.243	0.000
4.4667	0.006	0.030	3.288	0.000
4.5333	0.006	0.031	3.332	0.000
4.6000	0.006	0.031	3.375	0.000
4.6667	0.006	0.032	3.418	0.000
4.7333	0.006	0.032	3.460	0.000
4.8000	0.006	0.033	3.598	0.000
4.8667	0.006	0.033	3.691	0.000
4.9333	0.006	0.034	3.769	0.000
5.0000	0.006	0.034	3.840	0.000
5.0667	0.006	0.034	3.907	0.000
5.1333	0.006	0.035	3.971	0.000
5.2000	0.006	0.035	4.032	0.000
5.2667	0.006	0.036	4.091	0.000
5.3333	0.006	0.036	4.151	0.000
5.4000	0.006	0.037	4.214	0.000
5.4667	0.006	0.037	4.283	0.000
5.5333	0.006	0.038	4.476	0.000
5.6000	0.006	0.038	5.070	0.000
5.6667	0.006	0.039	5.890	0.000
5.7333	0.006	0.039	6.872	0.000
5.8000	0.006	0.039	7.973	0.000
5.8667	0.006	0.040	9.153	0.000
5.9333	0.006	0.040	10.37	0.000
6.0000	0.006	0.041	11.58	0.000
6.0667	0.006	0.041	12.75	0.000
6.1333	0.000	0.000	13.83	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 8.1
Total Impervious Area: 0.4

Mitigated Landuse Totals for POC #1
Total Pervious Area: 4.74
Total Impervious Area: 3.17

Flow Frequency Method: Weibull

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	4.476709
5 year	6.81656
10 year	8.908836
25 year	14.667444

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	3.061702
5 year	5.0157
10 year	6.349536
25 year	10.712011

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1960	5.876	4.266
1961	6.246	5.550
1962	8.252	5.371
1963	12.236	12.027
1964	6.807	5.016
1965	2.864	1.218
1966	5.447	2.286
1967	14.575	7.371
1968	4.477	3.326
1969	7.265	6.318
1970	3.106	2.341
1971	5.342	4.932
1972	1.658	0.602
1973	8.738	6.388

1974	4.569	3.765
1975	7.867	3.064
1976	0.588	0.332
1977	1.256	0.916
1978	5.421	4.876
1979	5.837	4.340
1980	4.364	3.312
1981	2.315	1.887
1982	9.123	5.696
1983	4.717	4.133
1984	5.314	3.286
1985	3.062	1.486
1986	3.397	2.020
1987	2.658	2.283
1988	3.434	1.809
1989	2.387	0.682
1990	2.450	2.913
1991	3.530	2.077
1992	6.817	4.149
1993	4.604	3.059
1994	2.085	1.734
1995	15.411	10.548
1996	3.396	2.154
1997	4.476	3.679
1998	5.180	4.506
1999	2.776	1.450
2000	3.002	2.880
2001	2.649	0.909
2002	2.359	1.345
2003	5.050	3.719

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	15.4110	12.0273
2	14.5745	10.5476
3	12.2359	7.3708
4	9.1229	6.3884
5	8.7376	6.3185
6	8.2523	5.6964
7	7.8665	5.5504
8	7.2648	5.3710
9	6.8166	5.0157
10	6.8068	4.9322
11	6.2456	4.8759
12	5.8760	4.5056
13	5.8366	4.3401
14	5.4472	4.2661
15	5.4214	4.1489
16	5.3424	4.1333
17	5.3139	3.7645
18	5.1804	3.7189
19	5.0505	3.6793
20	4.7174	3.3258
21	4.6036	3.3119
22	4.5690	3.2864
23	4.4770	3.0644
24	4.4765	3.0592

25	4.3639	2.9130
26	3.5302	2.8801
27	3.4335	2.3407
28	3.3966	2.2858
29	3.3964	2.2828
30	3.1062	2.1537
31	3.0615	2.0770
32	3.0021	2.0202
33	2.8642	1.8875
34	2.7764	1.8094
35	2.6576	1.7338
36	2.6492	1.4856
37	2.4499	1.4500
38	2.3870	1.3451
39	2.3586	1.2179
40	2.3152	0.9165
41	2.0845	0.9090
42	1.6583	0.6820
43	1.2556	0.6020
44	0.5879	0.3315

Duration Flows

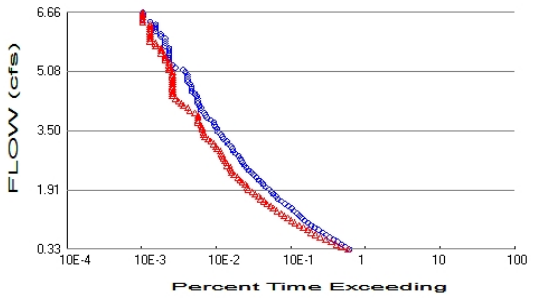
The Facility PASSED

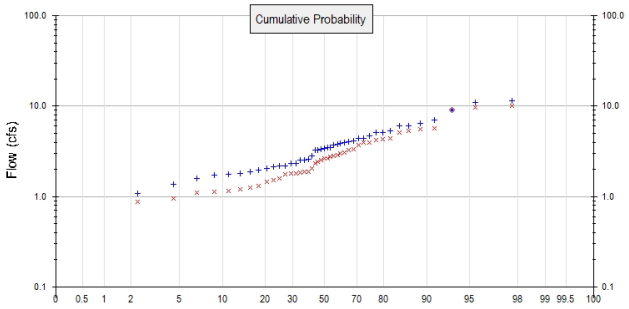
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.4477	2351	1092	46	Pass
0.5331	2057	936	45	Pass
0.6186	1824	807	44	Pass
0.7041	1616	698	43	Pass
0.7895	1426	608	42	Pass
0.8750	1277	546	42	Pass
0.9605	1139	481	42	Pass
1.0459	1018	431	42	Pass
1.1314	902	390	43	Pass
1.2169	808	357	44	Pass
1.3023	723	317	43	Pass
1.3878	645	280	43	Pass
1.4733	584	247	42	Pass
1.5587	539	227	42	Pass
1.6442	505	212	41	Pass
1.7297	460	199	43	Pass
1.8151	427	183	42	Pass
1.9006	390	166	42	Pass
1.9861	353	157	44	Pass
2.0715	320	143	44	Pass
2.1570	286	131	45	Pass
2.2425	258	119	46	Pass
2.3279	241	110	45	Pass
2.4134	221	104	47	Pass
2.4989	210	99	47	Pass
2.5843	193	95	49	Pass
2.6698	179	89	49	Pass
2.7553	163	83	50	Pass
2.8407	153	80	52	Pass
2.9262	145	76	52	Pass
3.0117	133	71	53	Pass
3.0971	125	63	50	Pass
3.1826	114	61	53	Pass
3.2681	104	58	55	Pass
3.3535	100	52	52	Pass
3.4390	90	49	54	Pass
3.5245	88	49	55	Pass
3.6099	81	48	59	Pass
3.6954	80	45	56	Pass
3.7809	74	41	55	Pass
3.8663	69	40	57	Pass
3.9518	68	37	54	Pass
4.0373	62	35	56	Pass
4.1227	61	34	55	Pass
4.2082	56	31	55	Pass
4.2937	53	26	49	Pass
4.3791	51	25	49	Pass
4.4646	48	24	50	Pass
4.5501	45	23	51	Pass
4.6355	42	23	54	Pass
4.7210	38	22	57	Pass
4.8065	38	21	55	Pass
4.8919	38	20	52	Pass

4.9774	35	18	51	Pass
5.0629	33	17	51	Pass
5.1483	33	16	48	Pass
5.2338	30	15	50	Pass
5.3193	28	14	50	Pass
5.4047	27	13	48	Pass
5.4902	24	13	54	Pass
5.5756	23	11	47	Pass
5.6611	23	11	47	Pass
5.7466	23	10	43	Pass
5.8320	22	10	45	Pass
5.9175	20	10	50	Pass
6.0030	20	9	45	Pass
6.0884	19	9	47	Pass
6.1739	18	9	50	Pass
6.2594	17	8	47	Pass
6.3448	16	7	43	Pass
6.4303	16	6	37	Pass
6.5158	16	6	37	Pass
6.6012	16	6	37	Pass
6.6867	16	6	37	Pass
6.7722	15	6	40	Pass
6.8576	12	6	50	Pass
6.9431	12	6	50	Pass
7.0286	12	6	50	Pass
7.1140	10	6	60	Pass
7.1995	9	5	55	Pass
7.2850	8	5	62	Pass
7.3704	8	5	62	Pass
7.4559	8	4	50	Pass
7.5414	8	4	50	Pass
7.6268	8	4	50	Pass
7.7123	8	4	50	Pass
7.7978	8	4	50	Pass
7.8832	7	4	57	Pass
7.9687	7	4	57	Pass
8.0542	7	4	57	Pass
8.1396	7	4	57	Pass
8.2251	7	4	57	Pass
8.3106	6	4	66	Pass
8.3960	6	4	66	Pass
8.4815	6	4	66	Pass
8.5670	6	4	66	Pass
8.6524	6	4	66	Pass
8.7379	5	4	80	Pass
8.8234	4	4	100	Pass
8.9088	4	4	100	Pass

Water Quality

POC 2





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #2
Total Pervious Area: 6.2
Total Impervious Area: 0

Mitigated Landuse Totals for POC #2
Total Pervious Area: 4.1
Total Impervious Area: 2.11

Flow Frequency Method: Weibull

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	**Flow(cfs)**
2 year	3.320455
5 year	5.13822
10 year	6.659993
25 year	11.045422

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	**Flow(cfs)**
2 year	2.471905
5 year	4.35244
10 year	5.628189
25 year	9.680002

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #2

Year	**Predeveloped**	**Mitigated**
1960	4.428	2.978
1961	4.737	4.198
1962	6.108	5.077
1963	9.087	9.627
1964	5.128	4.352
1965	2.164	1.301
1966	4.144	2.667
1967	11.004	9.077
1968	3.364	2.422
1969	5.302	5.379
1970	2.305	1.794
1971	3.909	3.987
1972	1.356	0.878
1973	6.415	5.745
1974	3.410	2.893

1975	6.016	4.374
1976	0.579	0.474
1977	1.085	0.944
1978	3.987	3.947
1979	4.404	2.846
1980	3.278	2.331
1981	1.741	1.514
1982	6.966	5.535
1983	3.456	3.245
1984	4.007	2.644
1985	2.329	1.767
1986	2.591	1.574
1987	1.965	1.800
1988	2.555	1.892
1989	1.756	1.114
1990	1.872	1.146
1991	2.828	1.878
1992	5.138	3.322
1993	3.470	2.525
1994	1.568	1.194
1995	11.375	10.102
1996	2.552	1.824
1997	3.271	2.732
1998	3.802	3.718
1999	2.124	1.451
2000	2.199	2.057
2001	2.064	1.259
2002	1.805	1.117
2003	3.721	3.050

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #2

Rank	Predeveloped	Mitigated
1	11.3752	10.1021
2	11.0042	9.6272
3	9.0868	9.0774
4	6.9658	5.7447
5	6.4153	5.5350
6	6.1084	5.3786
7	6.0158	5.0767
8	5.3019	4.3738
9	5.1382	4.3524
10	5.1282	4.1981
11	4.7371	3.9867
12	4.4284	3.9468
13	4.4042	3.7182
14	4.1439	3.3218
15	4.0070	3.2452
16	3.9875	3.0496
17	3.9089	2.9783
18	3.8021	2.8932
19	3.7211	2.8460
20	3.4695	2.7318
21	3.4563	2.6667
22	3.4097	2.6436
23	3.3644	2.5246
24	3.2785	2.4215
25	3.2709	2.3308

26	2.8277	2.0567
27	2.5909	1.8922
28	2.5549	1.8781
29	2.5520	1.8245
30	2.3286	1.8001
31	2.3055	1.7941
32	2.1989	1.7669
33	2.1645	1.5743
34	2.1236	1.5136
35	2.0642	1.4506
36	1.9655	1.3010
37	1.8719	1.2587
38	1.8048	1.1938
39	1.7560	1.1457
40	1.7411	1.1172
41	1.5685	1.1138
42	1.3558	0.9443
43	1.0851	0.8781
44	0.5787	0.4736

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.3320	2357	2250	95	Pass
0.3960	2079	1853	89	Pass
0.4599	1852	1572	84	Pass
0.5238	1640	1338	81	Pass
0.5877	1457	1128	77	Pass
0.6516	1296	954	73	Pass
0.7156	1152	827	71	Pass
0.7795	1038	725	69	Pass
0.8434	914	650	71	Pass
0.9073	804	569	70	Pass
0.9712	725	500	68	Pass
1.0352	655	438	66	Pass
1.0991	589	394	66	Pass
1.1630	545	351	64	Pass
1.2269	502	314	62	Pass
1.2908	468	289	61	Pass
1.3547	430	253	58	Pass
1.4187	393	225	57	Pass
1.4826	356	206	57	Pass
1.5465	323	185	57	Pass
1.6104	290	169	58	Pass
1.6743	258	154	59	Pass
1.7383	242	144	59	Pass
1.8022	224	128	57	Pass
1.8661	211	118	55	Pass
1.9300	197	104	52	Pass
1.9939	180	100	55	Pass
2.0578	164	95	57	Pass
2.1218	156	86	55	Pass
2.1857	143	81	56	Pass
2.2496	133	75	56	Pass
2.3135	124	67	54	Pass
2.3774	114	62	54	Pass
2.4414	105	61	58	Pass
2.5053	98	60	61	Pass
2.5692	93	54	58	Pass
2.6331	86	53	61	Pass
2.6970	83	50	60	Pass
2.7610	81	48	59	Pass
2.8249	77	47	61	Pass
2.8888	71	46	64	Pass
2.9527	65	44	67	Pass
3.0166	63	40	63	Pass
3.0805	61	38	62	Pass
3.1445	56	36	64	Pass
3.2084	53	33	62	Pass
3.2723	48	30	62	Pass
3.3362	47	27	57	Pass
3.4001	45	26	57	Pass
3.4641	41	26	63	Pass
3.5280	40	25	62	Pass
3.5919	38	25	65	Pass
3.6558	37	24	64	Pass

3.7197	36	22	61	Pass
3.7837	33	22	66	Pass
3.8476	29	22	75	Pass
3.9115	28	22	78	Pass
3.9754	27	20	74	Pass
4.0393	24	17	70	Pass
4.1032	24	16	66	Pass
4.1672	23	14	60	Pass
4.2311	22	13	59	Pass
4.2950	22	12	54	Pass
4.3589	22	11	50	Pass
4.4228	21	10	47	Pass
4.4868	20	10	50	Pass
4.5507	18	10	55	Pass
4.6146	18	10	55	Pass
4.6785	18	10	55	Pass
4.7424	17	10	58	Pass
4.8064	16	10	62	Pass
4.8703	16	10	62	Pass
4.9342	16	10	62	Pass
4.9981	16	10	62	Pass
5.0620	15	10	66	Pass
5.1259	14	9	64	Pass
5.1899	11	9	81	Pass
5.2538	10	9	90	Pass
5.3177	9	9	100	Pass
5.3816	9	8	88	Pass
5.4455	9	8	88	Pass
5.5095	9	8	88	Pass
5.5734	9	7	77	Pass
5.6373	9	7	77	Pass
5.7012	9	7	77	Pass
5.7651	8	6	75	Pass
5.8291	8	6	75	Pass
5.8930	8	5	62	Pass
5.9569	8	5	62	Pass
6.0208	7	5	71	Pass
6.0847	7	5	71	Pass
6.1486	6	5	83	Pass
6.2126	6	5	83	Pass
6.2765	6	5	83	Pass
6.3404	6	5	83	Pass
6.4043	5	4	80	Pass
6.4682	4	4	100	Pass
6.5322	4	4	100	Pass
6.5961	4	4	100	Pass
6.6600	4	4	100	Pass

Water Quality

POC 3

POC #3 was not reported because POC must exist in both scenarios and both scenarios must have been run.

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

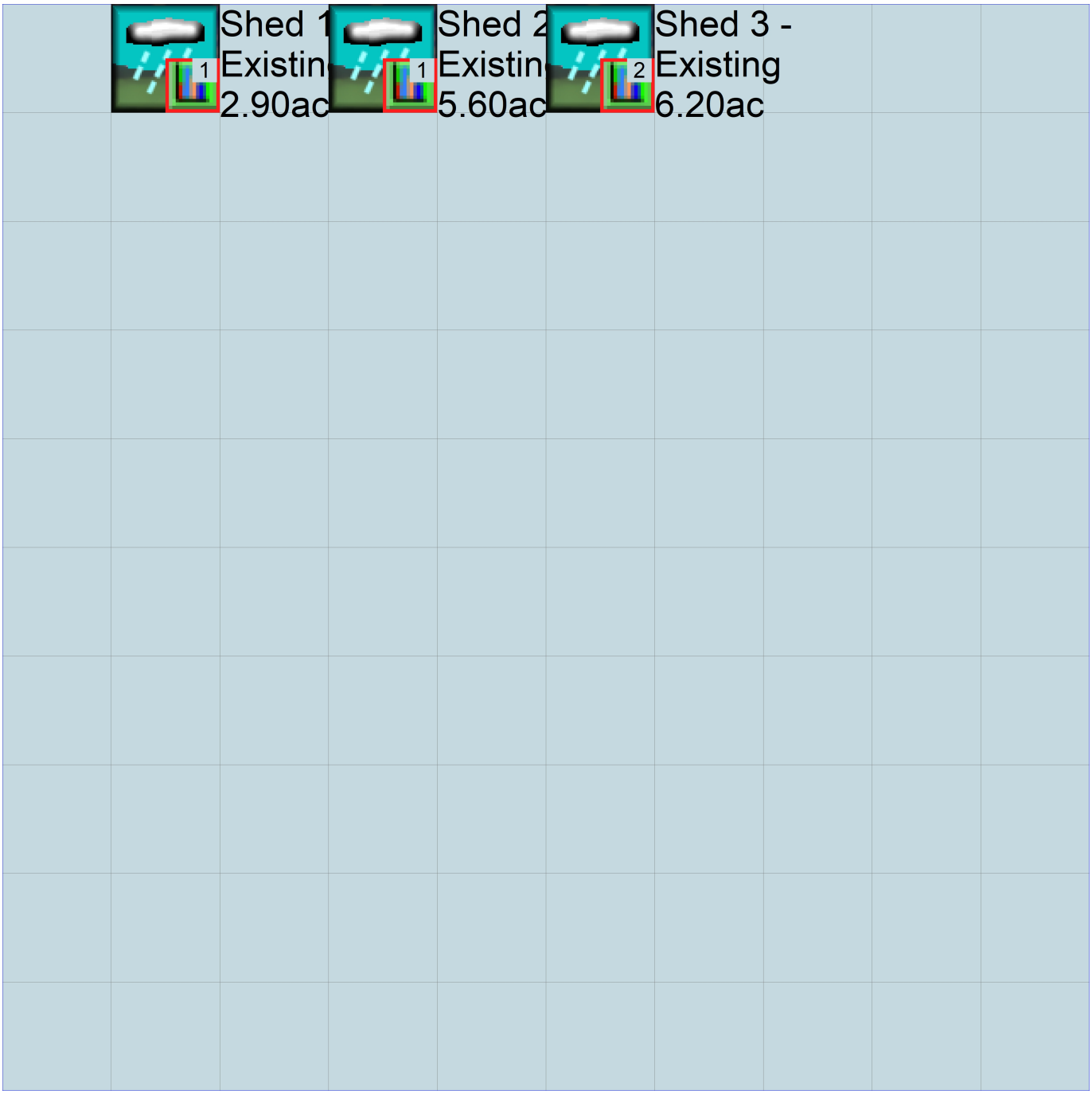
No PERLND changes have been made.

IMPLND Changes

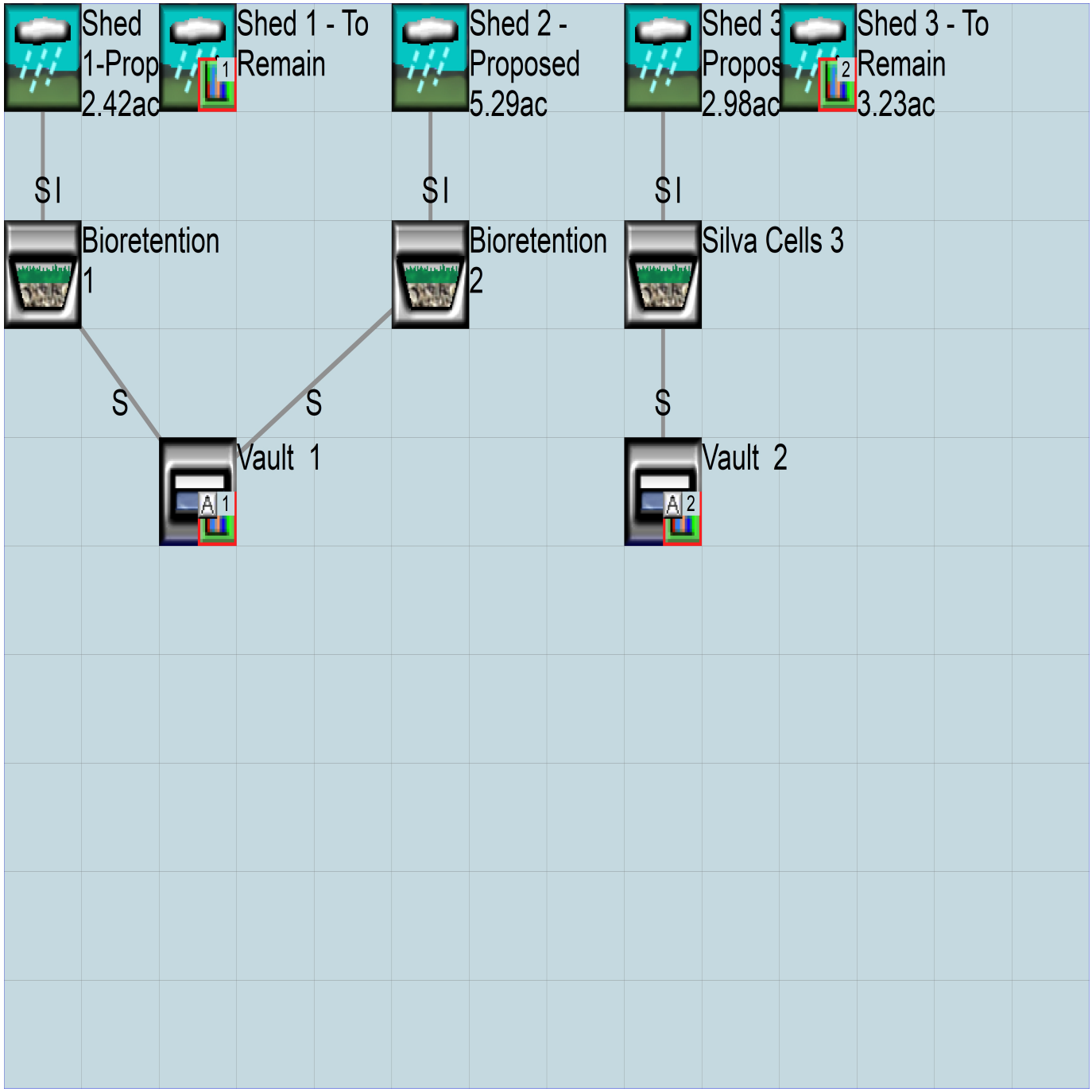
No IMPLND changes have been made.

Appendix

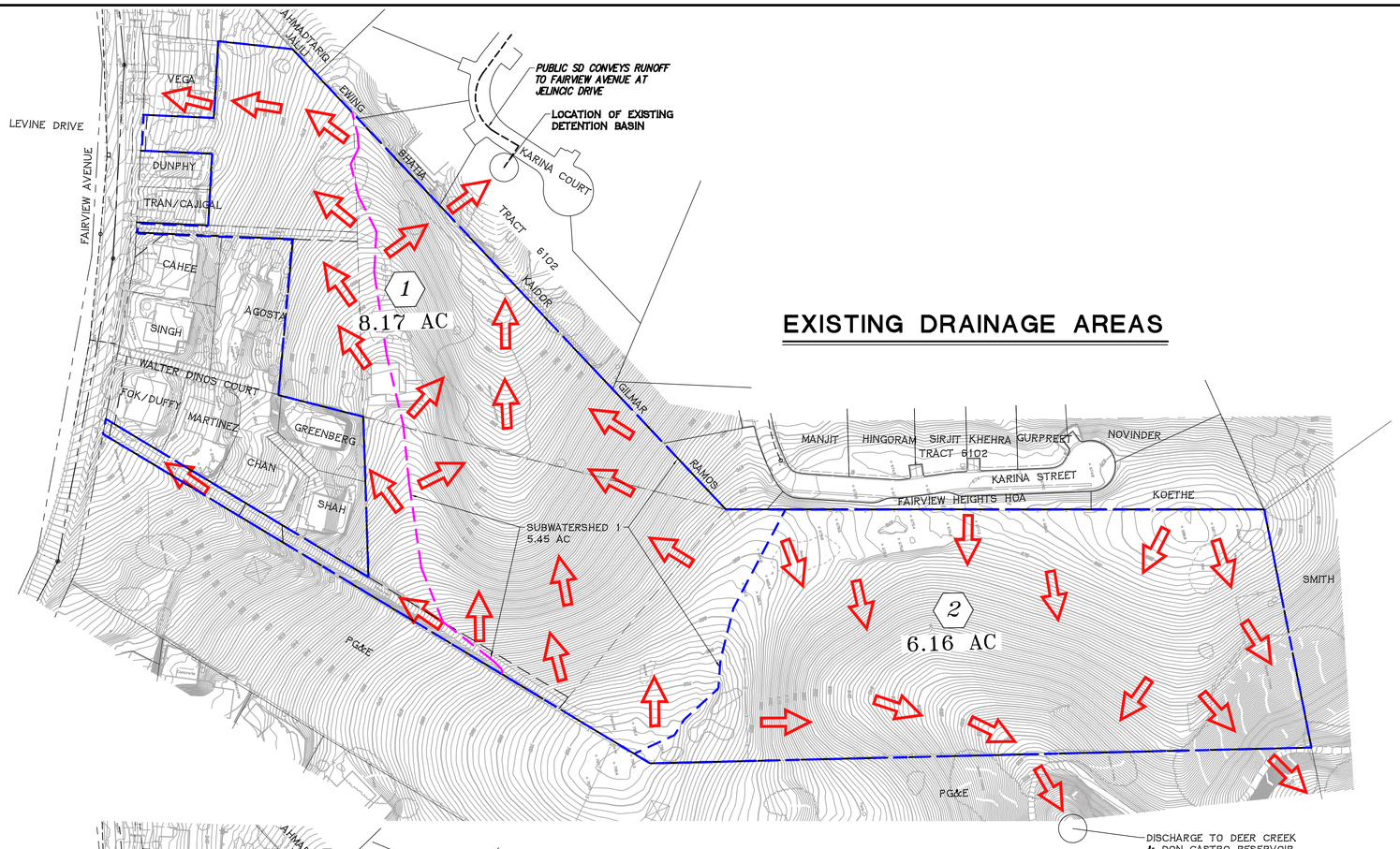
Predeveloped Schematic



Mitigated Schematic

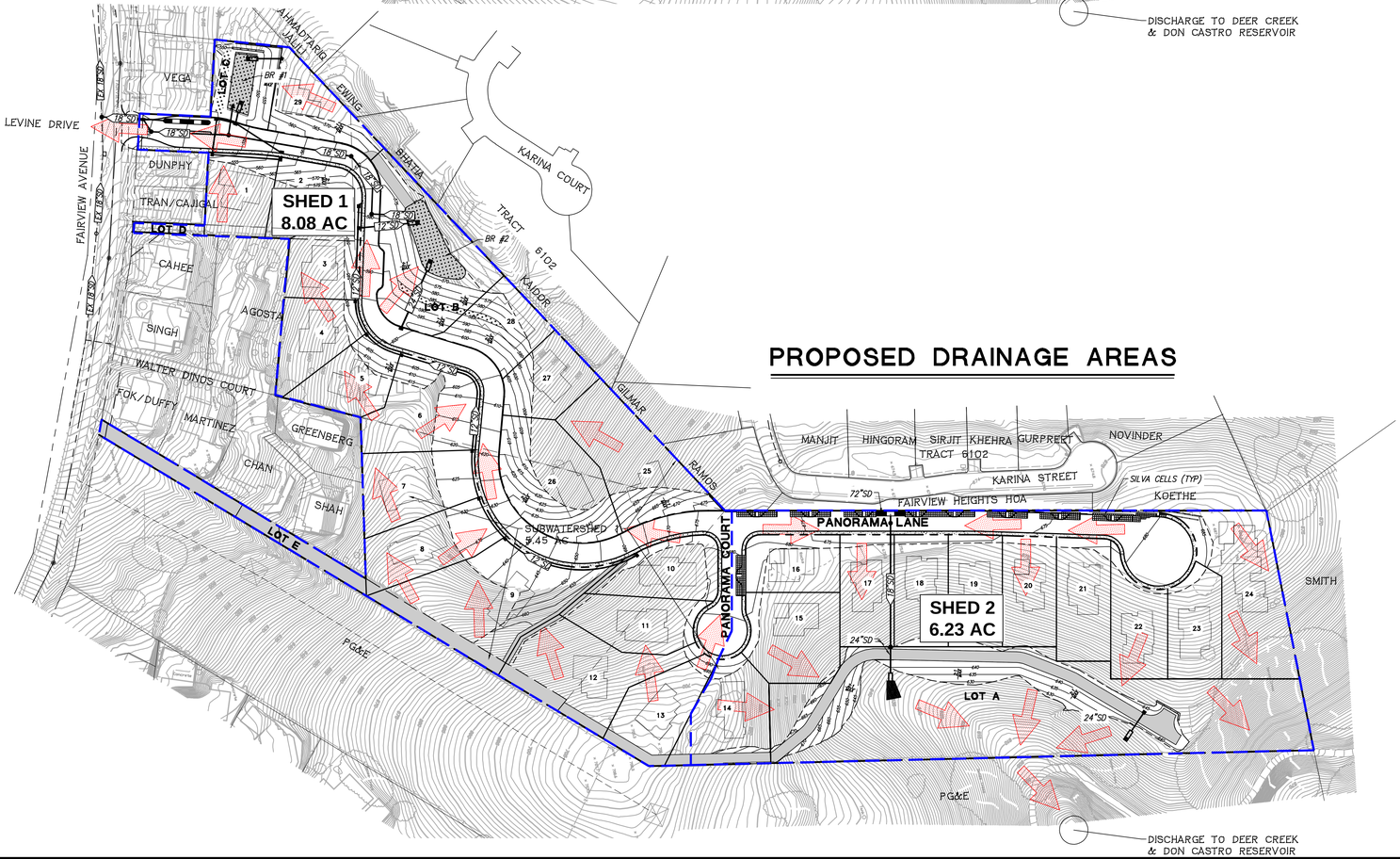


Appendix B
Existing and Proposed Drainage Exhibit



EXISTING DRAINAGE AREAS

PROPOSED DRAINAGE AREAS



LEGEND

PROPOSED	DESCRIPTION	EXISTING
SHED 2	SHED NUMBER	2
	SHED BOUNDARY	
	SUB SHED BOUNDARY	
	DRAINAGE FLOW	
	BIORETENTION AREA (BR)	

N

0 80 160 240

1 inch = 80 ft.

PROPOSED DRAINAGE AREA	DESTINATION
SHED 1	DRAINS TO FAIRVIEW AVENUE STORM DRAIN SYSTEM
SUB SHED 1	DRAINS TO ADJACENT TRACT 6102 DETENTION BASIN
SHED 3	DRAINS TO DEER CREEK AND THEN TO DON CASTRO RESERVOIR

EXISTING AND PROPOSED DRAINAGE EXHIBIT

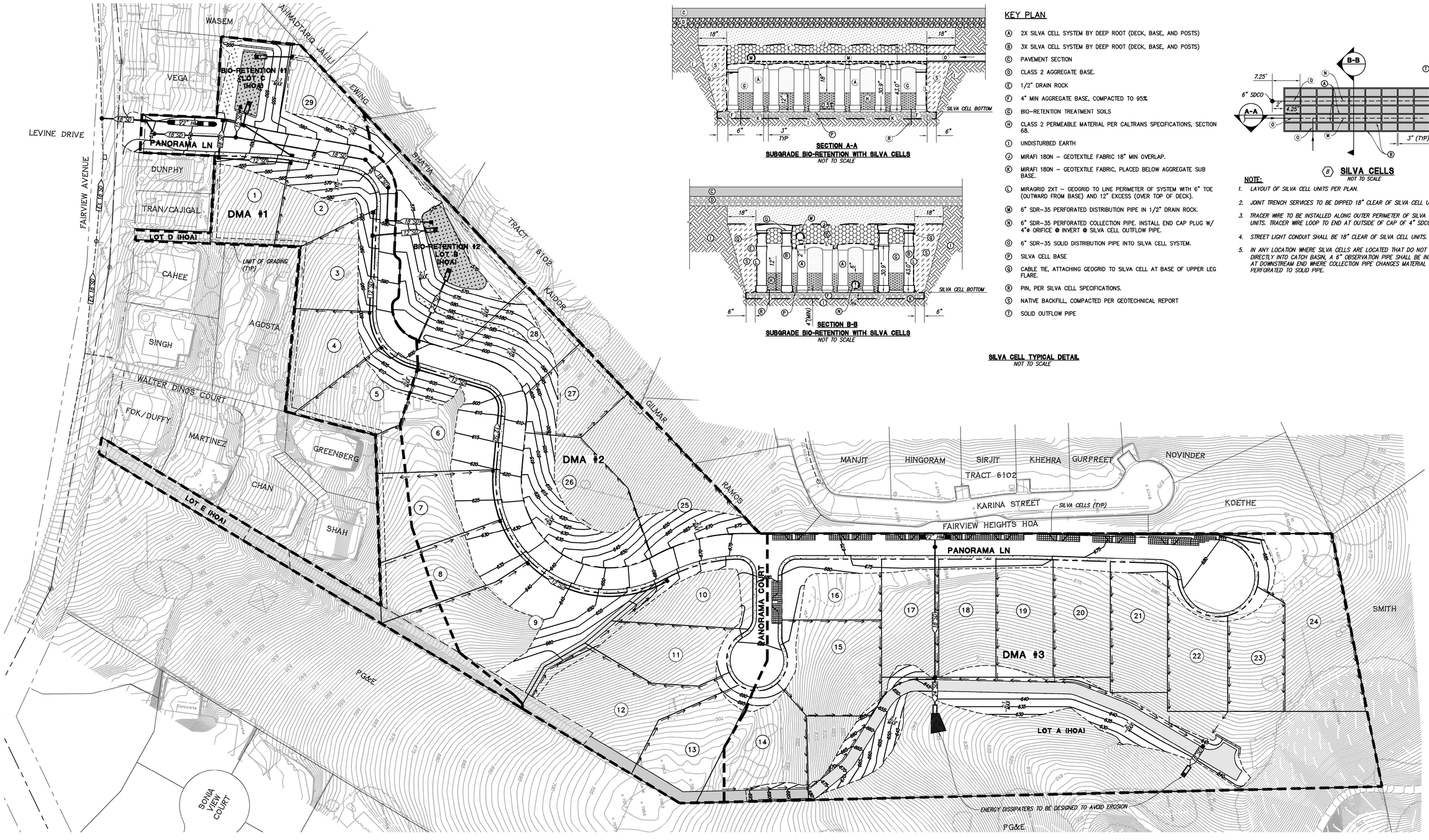
TRACT 8720 PANORAMA HEIGHTS

ALAMEDA COUNTY, CALIFORNIA
FOR: GREENVIEW BUILDERS

RUGGERI-JENSEN-AZAR
ENGINEERS ▪ PLANNERS ▪ SURVEYORS
4690 CHABOT DRIVE, SUITE 200 PLEASANTON, CA 94588
PHONE: (925) 227-9100 FAX: (925) 227-9300

DATE: AUGUST 1, 2024 JOB NO. 091093A SHEET 1 OF 1

Appendix C
Preliminary Stormwater Control Plan



SECTION A-A
SUBGRADE BIO-RETENTION WITH SILVA CELLS
NOT TO SCALE

SECTION B-B
SUBGRADE BIO-RETENTION WITH SILVA CELLS
NOT TO SCALE

SILVA CELL TYPICAL DETAIL
NOT TO SCALE

KEY PLAN

- (A) 2X SILVA CELL SYSTEM BY DEEP ROOT (DECK, BASE, AND POSTS)
- (B) 3X SILVA CELL SYSTEM BY DEEP ROOT (DECK, BASE, AND POSTS)
- (C) PAVEMENT SECTION
- (D) CLASS 2 AGGREGATE BASE.
- (E) 1/2" DRAIN ROCK
- (F) 4" MIN AGGREGATE BASE, COMPACTED TO 95%
- (G) BIO-RETENTION TREATMENT SOILS
- (H) CLASS 2 PERMEABLE MATERIAL PER CALTRANS SPECIFICATIONS, SECTION 68.
- (I) UNDISTURBED EARTH
- (J) MIRAFI 180N – GEOTEXTILE FABRIC 18" MIN OVERLAP.
- (K) MIRAFI 180N – GEOTEXTILE FABRIC, PLACED BELOW AGGREGATE SUB BASE.
- (L) MIRAGRID 2XT – GEOGRID TO LINE PERIMETER OF SYSTEM WITH 6" TOE (OUTWARD FROM BASE) AND 12" EXCESS (OVER TOP OF DECK).
- (M) 6" SDR-35 PERFORATED DISTRIBUTION PIPE IN 1/2" DRAIN ROCK.
- (N) 6" SDR-35 PERFORATED COLLECTION PIPE. INSTALL END CAP PLUG W/ 4"ø ORIFICE @ INVERT @ SILVA CELL OUTFLOW PIPE.
- (O) 6" SDR-35 SOLID DISTRIBUTION PIPE INTO SILVA CELL SYSTEM.
- (P) SILVA CELL BASE
- (Q) CABLE TIE, ATTACHING GEOGRID TO SILVA CELL AT BASE OF UPPER LEG FLARE.
- (R) PIN, PER SILVA CELL SPECIFICATIONS.
- (S) NATIVE BACKFILL, COMPACTED PER GEOTECHNICAL REPORT
- (T) SOLID OUTFLOW PIPE

(B) SILVA CELLS
NOT TO SCALE

NOTE:
1. *LAYOUT OF SILVA CELL UNITS PER PLAN.*
2. *JOINT TRENCH SERVICES TO BE DIPPED 18" CLEAR OF SILVA CELL UNITS.*
3. *TRACER WIRE TO BE INSTALLED ALONG OUTER PERIMETER OF SILVA CELL UNITS. TRACER WIRE LOOP TO END AT OUTSIDE OF CAP OF 4" SDCO.*
4. *STREET LIGHT CONDUIT SHALL BE 18" CLEAR OF SILVA CELL UNITS.*
5. *IN ANY LOCATION WHERE SILVA CELLS ARE LOCATED THAT DO NOT TIE DIRECTLY INTO CATCH BASIN, A 6" OBSERVATION PIPE SHALL BE INSTALLED AT DOWNSTREAM END WHERE COLLECTION PIPE CHANGES MATERIAL FROM PERFORATED TO SOLID PIPE.*

LEGEND
- DRAINAGE MANAGEMENT AREA (DMA)
- 18"SD STORMDRAIN PIPE
- BIO-RETENTION AREA
- SILVA CELLS

N

0 50 100 150
1 inch = 50 ft.

PRELIMINARY STORMWATER TREATMENT CALCULATIONS

DMA #	TOTAL DMA AREA	SURFACE	IMPERVIOUS AREA (SF)	EFFECTIVE IMPERVIOUS AREA (SF)	TREATMENT AREA REQUIRED (SF)	TREATMENT AREA PROVIDED (SF)
1	118,887	ROOF/HARDSCAPE/LANDSCAPE/STREET	50,219	57,086	2,283	2,667
2	233,187	ROOF/HARDSCAPE/LANDSCAPE/STREET	79,048	94,462	3,778	4,301
3	271,432	ROOF/HARDSCAPE/LANDSCAPE/STREET	79,726	98,897	3,956	4,361

NOTES:
1. THE CALCULATIONS ARE BASED ON THE ALAMEDA COUNTYWIDE CLEAN WATER PROGRAM, C.3 STORMWATER TECHNICAL GUIDANCE, DATED OCTOBER 31, 2017, AND THE FOLLOWING CRITERIA:
   a. 0.2 INCHES/HOUR RAINFALL INTENSITY ON 100% IMPERVIOUS AREA.
   b. SOIL FOR TREATMENT MEDIUM WITH A 5 INCHES/HOUR INFILTRATION RATE.
   c. A TREATMENT MEDIUM OF 0.04 SIZING FACTOR FOR BIO-RETENTION AREAS.
2. SIZING FACTOR OF 0.04 NOTED ABOVE IS CALCULATED BASED ON THE FOLLOWING CRITERIA:
   a. SIZING FACTOR=(0.2 IN/HR)/(5 IN/HR)=0.04
   b. PERVIOUS AREAS DRAINING TO THE TREATMENT MEASURE ARE MULTIPLIED BY A FACTOR OF 0.1 TO OBTAIN THE AMOUNT OF "EFFECTIVE IMPERVIOUS AREA".
3. SEE SHEET TM9.0 FOR BIO-RETENTION AND SILVA CELL SECTIONS.
4. IMPERVIOUS AREA INCLUDES ALL ROAD AND SIDEWALK AREA PLUS ASSUMED MAX HOUSE SIZE PER MAX ALLOWABLE LOT COVERAGE (NOT TO EXCEED 4,100 SF PER LOT).

PRELIMINARY STORMWATER CONTROL PLAN

TRACT 8720 PANORAMA HEIGHTS

ALAMEDA COUNTY, CALIFORNIA
FOR: FRASER BUILDERS LLC

RJA
RUGGERI-JENSEN-AZAR
ENGINEERS ▪ PLANNERS ▪ SURVEYORS
4690 CHABOT DRIVE, SUITE 200 PLEASANTON, CA 94588
PHONE: (925) 227-9100 FAX: (925) 227-9300

NO.	DATE	DESCRIPTION	BY

DATE: AUGUST 2, 2024
JOB NO.: 091093D

SHEET NO.
TM8.0
SHEET 10 OF 14

Appendix D
Preliminary On-site Stormwater Runoff Detention Plan

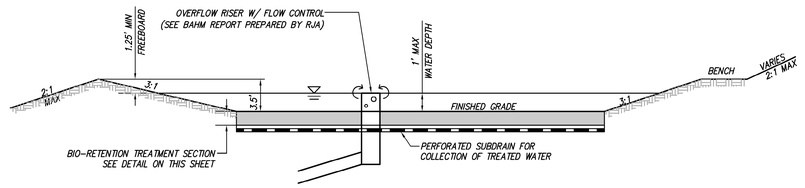
HYDROMODIFICATION STORAGE FOR AREA 1
2,000 CF STORAGE

BIO-RETENTION AREA #1

BIO-RETENTION AREA #2

HYDROMODIFICATION STORAGE FOR AREA 2
2,900 CF STORAGE

SILVA CELLS (TYP)



TYPICAL BIO-RETENTION SECTION (BR #1 & BR #2)
NOT TO SCALE

0 50 100 150
1 inch = 50 ft.

PRELIMINARY ON-SITE STORMWATER RUNOFF DETENTION (HYDROMODIFICATION) PLAN

TRACT 8720 PANORAMA HEIGHTS

ALAMEDA COUNTY, CALIFORNIA
FOR: FRASER BUILDERS LLC

RUGGERI-JENSEN-AZAR
ENGINEERS ▪ PLANNERS ▪ SURVEYORS
4690 CHABOT DRIVE, SUITE 200 PLEASANTON, CA 94588
PHONE: (925) 227-9100 FAX: (925) 227-9300

NO.	DATE	DESCRIPTION	BY

DATE: AUGUST 2, 2024
JOB NO.: 091093D
SHEET NO. TM9.0
SHEET 11 OF 14

Appendix E
Stormwater Requirements Checklist

Stormwater Requirements Checklist

Municipal Regional Stormwater Permit (MRP 2.0)
Stormwater Controls for Development Projects

CITY OF HAYWARD, Engineering
777 B Street, Hayward, CA 94541
PHONE: (510)583-4730
FAX: (510)583-3620

I. Applicability of C.3 and C.6 Stormwater Requirements

I.A. Enter Project Data *(For "C.3 Regulated Projects," data will be reported in the municipality's stormwater Annual Report.)*

I.A.1 Project Name: Panorama Heights

I.A.2 Project Address (include cross street): 24830 Fairview Avenue, Hayward, CA 94542
Cross street- Levine Drive, Hayward, CA

I.A.3 Project APN: 417-0260-004, 417-0270-009, 417-270-003, 417-0270-006

I.A.4 Project Watershed[1]: San Lorenzo Creek

I.A.5 Applicant Name: Nicolas Chahine

I.A.6 Date Submitted: 8/2/2024

I.A.7 Applicant Address: 15495 Los Gatos Blvd, Suite 4, Los Gatos, CA 95032

I.A.8 Applicant Phone: 510-770-4817

I.A.9 Applicant Email Address: nick@gvbuild.com

I.A.10 Development type: (check all that apply)

☒ Residential ☐ Commercial ☐ Industrial ☐ Mixed-Use ☐ Streets, Roads, etc.

☐ 'Redevelopment' as defined by MRP: creating, adding and/or replacing exterior existing impervious surface on a site where past development has occurred[2]

☐ 'Special land use categories' as defined by MRP: (1) auto service facilities[3], (2) retail gasoline outlets, (3) restaurants[3], (4) uncovered parking area (stand-alone or part of a larger project)

I.A.11 Project Description[4]: (Also note any past or future phases of the project.)

Mostly vacant lot with an existing abandoned structure to be demolished. Proposed to be subdivided into 29 single-family homes.

I.A.12 Total Area of Site: 14.3 acres

I.A.13 Slope on Site: 50 ± %

I.B. Is the project a "C.3 Regulated Project" per MRP Provision C.3.b?

I.B.1 Enter the amount of impervious surface[4] created and/or replaced by the project (if the total amount is 5,000 sq.ft. or more):

Table of Impervious and Pervious Surfaces

Type of Impervious Surface	a Pre-Project Impervious Surface (sq.ft.)	b Existing Impervious Surface to be Replaced[7] (sq.ft.)	C New Impervious Surface to be Created[7] (sq.ft.)	d Post-project pervious surface (sq.ft.)
Roof area(s) – excluding any portion of the roof that is vegetated ("green roof")	2,670	2,670	102,757	
Impervious[5] sidewalks, patios, paths, driveways	6,730	6,730	31,545	
Impervious[5] uncovered parking[6]	0	0	0	N/A
Streets (public)		0	-	
Streets (private)		-	65,291	
Totals:	9,400	9,400	199,593	
Area of Existing Impervious Surface to remain in place	0	N/A		
Total New Impervious Surface *(sum of totals for columns b and c):*	**208,993**			

[1] Watershed is defined by the maps from the Alameda County Flood Control District at http://acfloodcontrol.org/resources/explore-watersheds

[2] Roadway projects that replace existing impervious surface are subject to C.3 requirements only if one or more lanes of travel are added.

[3] Standard Industrial Classification (SIC) codes are in Section 2.3 of the C.3 Technical Guidance (download at www.cleanwaterprogram.org)

[4] Project description examples: 5-story office building, industrial warehouse, residential with five 4-story buildings for 200 condominiums, etc.

[5] Per the MRP, pavement that meets the following definition of pervious pavement is NOT an impervious surface. Pervious pavement is defined as pavement that stores and infiltrates rainfall at a rate equal to immediately surrounding unpaved, landscaped areas, or that stores and infiltrates the rainfall runoff volume described in Provision C.3.d.

[6] Uncovered parking includes top level of a parking structure.

[7] "Replace" means to install new impervious surface where existing impervious surface is removed. "Create" means to install new impervious surface where there is currently no impervious surface.

I.B. Is the project a "C.3 Regulated Project" per MRP 2.0 Provision C.3.b? (continued)

		Yes	No	NA
I.B.2	In Item I.B.1, does the Total New Impervious Surface equal 10,000 sq.ft. or more? *If YES, skip to Item I.B.5 and check "Yes." If NO, continue to Item I.B.3.*	☒	☐	☐
I.B.3	Does the Item I.B.1 Total New Impervious Surface equal 5,000 sq.ft. or more, but less than 10,000 sq.ft? *If YES, continue to Item I.B.4. If NO, skip to Item I.B.5 and check "No."*	☐	☐	☐
I.B.4	Is the project a "Special Land Use Category" per Item I.A.10? For uncovered parking, check YES only if there is 5,000 sq.ft or more uncovered parking. *If NO, go to Item I.B.5 and check "No." If YES, go to Item I.B.5 and check "Yes."*	☐	☐	☐
I.B.5	Is the project a C.3 Regulated Project? *If YES, go to Item I.B.6; if NO, continue to Item I.C.*	☒	☐	☐
I.B.6	Does the total amount of Replaced impervious surface equal 50 percent or more of the Pre-Project Impervious Surface? *If YES, stormwater treatment requirements apply to the whole site; if NO, these requirements apply only to the impervious surface created and/or replaced.*	☒	☐	☐
I.B.7	Is the project installing a total of 3,000 sq.ft. or more (excluding private-use patios in single family homes, townhomes, or condominiums) of new pervious pavement systems? (Pervious pavement systems include pervious concrete, pervious asphalt, pervious pavers and grid pavers etc. and are described in the C3 Technical Guidance at www.cleanwaterprogram.org) If YES, stormwater treatment system inspection requirements (C.3.h) apply; (Municipal staff – add this site to your list of sites needing a final inspection at the end of construction and on-going O&M inspections.) If NO, inspection requirements only apply if there are other treatment systems installed on the project.	☐	☐	☒

I.C. Projects that are NOT C.3 Regulated Projects

If you answered NO to Item I.B.5, or the project creates/replaces less than 5,000 sq. ft. of impervious surface, then the project is NOT a C.3 Regulated Project, and stormwater treatment is not required, BUT the municipality may determine that source controls and site design measures are required. Skip to Section II.

I.D. Projects that ARE C.3 Regulated Projects

If you answered YES to Item I.B.5, then the project is a C.3 Regulated Project. The project must include appropriate site design measures and source controls AND hydraulically-sized stormwater treatment measures. Hydromodification management may also be required; refer to Section II to make this determination. If final discretionary approval was granted on or after **DECEMBER 1, 2011**, Low Impact Development (LID) requirements apply, except for "Special Projects." See Section II.

I.E. Identify C.6 Construction-Phase Stormwater Requirements

		Yes	No
I.E.1	Does the project disturb 1.0 acre (43,560 sq.ft.) or more of land? (See Item I.A.14). *If Yes, obtain coverage under the state's Construction General Permit at https://smarts.waterboards.ca.gov/smarts/faces/SwSmartsLogin.jsp. Submit to the municipality a copy of your Notice of Intent and Storm Water Pollution Prevention Plan (SWPPP) before a grading or building permit is issued.*	☒	☐
I.E.2	Is the site a "High Priority Site" that disturbs less than 1.0 acre (43,560 sq.ft.) of land? (Municipal staff will make the final determination.) "High Priority Sites" are sites having any of the following criteria: ▪ that require a grading permit, ▪ are adjacent to a creek, ▪ or are otherwise high priority for stormwater protection during construction (see MRP 2.0 Provision C.6.e.ii.(2)(c))	☐	☒
I.E.3	Is the site a "Hillside Site" that disturbs 5,000 sq.ft. or more, but less than 1.0 acre (43,560 sq.ft.) of land? (Municipal staff will make the final determination.) ▪ "Hillside Sites" are located on hillsides, as indicated on a jurisdictional map of hillside development areas or as indicated by meeting jurisdictional hillside development criteria. ▪ If no map or criteria exist, then Hillside Sites are sites with a slope of 15% or more (see I.A.13 above and MRP 2.0 Provision C.6.e.ii.(2)(b)).	☐	☒

- NOTE TO APPLICANT: All projects require appropriate stormwater best management practices (BMPs) during construction. Refer to the Section II to identify appropriate construction BMPs.

- NOTE TO MUNICIPAL STAFF: If the answer is "Yes" to I.E.1, I.E.2, OR I.E.3, refer this project to construction site inspection staff to be added to their list of projects that require stormwater inspections at least monthly during the wet season (October 1 through April 30) and other times of the year as appropriate.

II. Implementation of Stormwater Requirements

II.A. Complete the appropriate sections for the project. For non-C.3 Regulated Projects, Sections II.B, II.C, and II.D apply. For C.3 Regulated Projects, all sections of Section II apply.

II.B. Select Appropriate Site Design Measures

- *Required for C.3 Regulated Projects.*
- *Starting December 1, 2012, projects that create and/or replace 2,500 - 10,000 sq.ft. of impervious surface, and stand-alone single family homes that create/replace 2,500 sq.ft. or more of impervious surface, must include one of Site Design Measures a through f.*[8]
- *All other projects are encouraged to implement site design measures, which may be required at municipality discretion.*
- *Consult with municipal staff about requirements for your project.*

II.B.1 Is the site design measure included in the project plans?

Yes	No	Plan Sheet No.	
☐	☒		a. Direct roof runoff into cisterns or rain barrels and use rainwater for irrigation or other non-potable use.
☒	☐		b. Direct roof runoff onto vegetated areas.
☒	☐		c. Direct runoff from sidewalks, walkways, and/or patios onto vegetated areas.
☒	☐		d. Direct runoff from driveways and/or uncovered parking lots onto vegetated areas.
☐	☒		e. Construct sidewalks, walkways, and/or patios with pervious surfaces. Use the specifications in the C3 Technical Guidance (Version 4.1) or for small projects see the BASMAA Pervious Paving Factsheet. For these documents and others go to www.cleanwaterprogram.org and click on "Resources."
☐	☒		f. Construct bike lanes, driveways, and/or uncovered parking lots with pervious surfaces. Use the specifications in the C3 Technical Guidance (Version 4.1) or for small projects see the BASMAA Pervious Paving Factsheet. For these documents and others go to the program website at: www.cleanwaterprogram.org and click on "Resources."
☒	☐		g. Minimize land disturbance and impervious surface (especially parking lots).
☒	☐		h. Maximize permeability by clustering development and preserving open space.
☐	☒		i. Use micro-detention, including distributed landscape-based detention.
☐	☒		j. Protect sensitive areas, including wetland and riparian areas, and minimize changes to the natural topography.
☐	☒		k. Self-treating area (see Section 4.1 of the C.3 Technical Guidance)
☐	☒		l. Self-retaining area (see Section 4.2 of the C.3 Technical Guidance)
☐	☒		m. Plant or preserve interceptor trees (Section 4.5, C.3 Technical Guidance)

[8] See MRP Provision C.3.a.i(6) for non-C.3 Regulated Projects, C.3.c.i(2)(a) for Regulated Projects, C.3.i for projects that create/replace 2,500 to 10,000 sq.ft. of impervious surface and stand-alone single family homes that create/replace 2,500 sq.ft. or more of impervious surface.

II.C. Select appropriate source controls *(Applies to C.3 Regulated Projects; encouraged for other projects. Consult municipal staff.[9])*

Are these features in project?		Features that require source control measures	Source control measures (Refer to Local Source Control List for detailed requirements)	Is source control measure included in project plans?		
Yes	No			Yes	No	Plan Sheet No.
☒	☐	Storm Drain	Mark on-site inlets with the words "No Dumping! Flows to Bay" or equivalent.	☒	☐	To be provided with CDs
☐	☒	Floor Drains	Plumb interior floor drains to sanitary sewer[10] [or prohibit].	☐	☒	
☐	☒	Parking garage	Plumb interior parking garage floor drains to sanitary sewer.[9]	☒	☐	
☒	☐	Landscaping	▪ Retain existing vegetation as practicable. ▪ Select diverse species appropriate to the site. Include plants that are pest- and/or disease-resistant, drought-tolerant, and/or attract beneficial insects. ▪ Minimize use of pesticides and quick-release fertilizers. ▪ Use efficient irrigation system; design to minimize runoff.	☒	☐	Landscape Plans
☐	☒	Pool/Spa/Fountain	Provide connection to the sanitary sewer to facilitate draining.[9]	☐	☒	
☐	☒	Food Service Equipment (non-residential)	Provide sink or other area for equipment cleaning, which is: ▪ Connected to a grease interceptor prior to sanitary sewer discharge. [9] ▪ Large enough for the largest mat or piece of equipment to be cleaned. ▪ Indoors or in an outdoor roofed area designed to prevent stormwater run-on and run-off, and signed to require equipment washing in this area.	☐	☒	
☒	☐	Refuse Areas	▪ Provide a roofed and enclosed area for dumpsters, recycling containers, etc., designed to prevent stormwater run-on and runoff. ▪ Connect any drains in or beneath dumpsters, compactors, and tallow bin areas serving food service facilities to the sanitary sewer.[9]	☐	☒	
☐	☒	Outdoor Process Activities [11]	Perform process activities either indoors or in roofed outdoor area, designed to prevent stormwater run-on and runoff, and to drain to the sanitary sewer.[9]	☐	☒	
☐	☒	Outdoor Equipment/ Materials Storage	▪ Cover the area or design to avoid pollutant contact with stormwater runoff. ▪ Locate area only on paved and contained areas. ▪ Roof storage areas that will contain non-hazardous liquids, drain to sanitary sewer[9], and contain by berms or similar.	☐	☒	
☐	☒	Vehicle/ Equipment Cleaning	▪ Roofed, pave and berm wash area to prevent stormwater run-on and runoff, plumb to the sanitary sewer[9], and sign as a designated wash area. ▪ Commercial car wash facilities shall discharge to the sanitary sewer.[9]	☐	☒	
☐	☒	Vehicle/ Equipment Repair and Maintenance	▪ Designate repair/maintenance area indoors, or an outdoors area designed to prevent stormwater run-on and runoff and provide secondary containment. Do not install drains in the secondary containment areas. ▪ No floor drains unless pretreated prior to discharge to the sanitary sewer. [9] ▪ Connect containers or sinks used for parts cleaning to the sanitary sewer. [9]	☐	☒	
☐	☒	Fuel Dispensing Areas	▪ Fueling areas shall have impermeable surface that is a) minimally graded to prevent ponding and b) separated from the rest of the site by a grade break. ▪ Canopy shall extend at least 10 ft in each direction from each pump and drain away from fueling area.	☐	☒	
☐	☒	Loading Docks	▪ Cover and/or grade to minimize run-on to and runoff from the loading area. ▪ Position downspouts to direct stormwater away from the loading area. ▪ Drain water from loading dock areas to the sanitary sewer.[9] ▪ Install door skirts between the trailers and the building.	☐	☒	
☒	☐	Fire Sprinklers	Design for discharge of fire sprinkler test water to landscape or sanitary sewer.[9]	☒	☐	MEP Plans
☒	☐	Miscellaneous Drain or Wash Water	▪ Drain condensate of air conditioning units to landscaping. Large air conditioning units may connect to the sanitary sewer.[9] ▪ Roof drains shall drain to unpaved area where practicable. ▪ Drain boiler drain lines, roof top equipment, all washwater to sanitary sewer [9].	☒	☐	MEP Plans
☐	☒	Architectural Copper	▪ Discharge rinse water to sanitary sewer [9], or collect and dispose properly offsite. See flyer "Requirements for Architectural Copper."	☐	☒	

[9] See MRP Provision C.3.a.i(7) for non-C.3 Regulated Projects and Provision C.3.c.i(1) for C.3 Regulated Projects.
[10] Any connection to the sanitary sewer system is subject to sanitary district approval.
[11] Businesses that may have outdoor process activities/equipment include machine shops, auto repair, industries with pretreatment facilities.

II.D. Implement Construction Best Management Practices (BMPs) *(Applies to all projects – see Provision C.6 for more details.)*

Yes	No	Best Management Practice (BMP)
☒	☐	Attach the municipality's construction BMP plan sheet to project plans and require contractor to implement the applicable BMPs on the plan sheet.
☒	☐	Temporary erosion controls to stabilize all denuded areas until permanent erosion controls are established.
☒	☐	Delineate with field markers clearing limits, easements, setbacks, sensitive or critical areas, buffer zones, trees, and drainage courses.
☒	☐	Provide notes, specifications, or attachments describing the following: ▪ Construction, operation and maintenance of erosion and sediment controls, include inspection frequency; ▪ Methods and schedule for grading, excavation, filling, clearing of vegetation, and storage and disposal of excavated or cleared material; ▪ Specifications for vegetative cover & mulch, include methods and schedules for planting and fertilization; ▪ Provisions for temporary and/or permanent irrigation.
☒	☐	Perform clearing and earth moving activities only during dry weather.
☒	☐	Use sediment controls or filtration to remove sediment when dewatering and obtain all necessary permits.
☒	☐	Protect all storm drain inlets in vicinity of site using sediment controls such as berms, fiber rolls, or filters.
☒	☐	Trap sediment on-site, using BMPs such as sediment basins or traps, earthen dikes or berms, silt fences, check dams, soil blankets or mats, covers for soil stock piles, etc.
☒	☐	Divert on-site runoff around exposed areas; divert off-site runoff around the site (e.g., swales and dikes).
☒	☐	Protect adjacent properties and undisturbed areas from construction impacts using vegetative buffer strips, sediment barriers or filters, dikes, mulching, or other measures as appropriate.
☒	☐	Limit construction access routes and stabilize designated access points.
☒	☐	No cleaning, fueling, or maintaining vehicles on-site, except in a designated area where washwater is contained and treated.
☒	☐	Store, handle, and dispose of construction materials/wastes properly to prevent contact with stormwater.
☒	☐	Contractor shall train and provide instruction to all employees/subcontractors re: construction BMPs.
☒	☐	Control and prevent the discharge of all potential pollutants, including pavement cutting wastes, paints, concrete, petroleum products, chemicals, washwater or sediments, rinse water from architectural copper, and non-stormwater discharges to storm drains and watercourses.

PROJECTS THAT ARE <u>NOT</u> C.3 REGULATED PROJECTS STOP HERE!

II.E. Biotreatment, Infiltration and Rain Water Harvesting and Use.

MRP 2.0 no longer requires that a feasibility analysis of infiltration and rainwater harvesting be conducted. However, applicants using biotreatment are encouraged to maximize infiltration of stormwater if site conditions allow. If feasible and desired, infiltration and rainwater harvesting may be cost effective solutions depending on the project.

II.F. Stormwater Treatment Measures (Applies to C.3 Regulated Projects)

II.F.1 Check the applicable box and indicate the treatment measures to be included in the project.

Yes	No	
☐	☒	Is the project a Special Project? (See Appendix K of the C.3 Technical Guidance for criteria.) If Yes, complete the Special Projects Worksheet (go to the program website at: www.cleanwaterprogram.org and click on "Resources") and consult with municipal staff about the need to prepare a discussion of the feasibility and infeasibility of 100% LID treatment. Indicate the type of non-LID treatment to be used, the hydraulic sizing method*, and percentage of the amount of runoff specified in Provision C.3.d that is treated: Non-LID Treatment — Hydraulic sizing method* — % of C.3.d amount of runoff treated ☐ Media filter ☐ Tree well filter
☒	☐	Is the project using biotreatment to treat the C.3.d amount of runoff? For more information on infiltration and rainwater harvesting and use of stormwater, refer to the C3 Technical Guidance downloadable at the program website: www.cleanwaterprogram.org If Yes, indicate the biotreatment measures to be used, and the hydraulic sizing method: Biotreatment Measures — Hydraulic sizing method* ☒ Bioretention area — 4% Flow Method ☐ Flow-through planter ☒ Other (specify): Silva Cells
☐	☒	Is the project using infiltration or rainwater harvesting/use? For more information on infiltration and rainwater harvesting and use of stormwater, refer to the C3 Technical Guidance downloadable at the program website: www.cleanwaterprogram.org If Yes, indicate the measures to be used, and hydraulic sizing method: LID Treatment Measure (non-biotreatment) — Hydraulic sizing method* ☐ Rainwater harvesting and use — 4% Flow Method ☐ Bioinfiltration[12] ☐ Infiltration trench ☐ Other (specify):_____

***Hydraulic Sizing Method:** Indicate which of the following Provision C.3.d.i hydraulic sizing methods were used:

1. Volume based approaches – Refer to Provision C.3.d.i.(1):
   1(a) Urban Runoff Quality Management approach, or
   1(b) 80% capture approach (recommended volume-based approach).

2. Flow-based approaches – Refer to Provision C.3.d.i.(2):
   2(a) 10% of 50-year peak flow approach,
   2(b) Percentile rainfall intensity approach, or
   2(c) 0.2-Inch-per-hour intensity approach (this is recommended flow-based approach AND the basis for the 4% rule of thumb described in Section 5.1 of the C.3 Technical Guidance).

3. Combination hydraulic sizing approach -- Refer to Provision C.3.d.i.(3):
   If a combination flow and volume design basis was used, indicate which flow-based and volume-based criteria were used.

[12] See Section 6.1 of the C.3 Technical Guidance for conditions in which bioretention areas provide bioinfiltration.

II.G. Is the project a Hydromodification Management[13] (HM) Project? (Complete this section for C.3 Regulated Projects)

II.G.1 Does the project create and/or replace 1 acre (43,560 sq. ft.) or more of impervious surface? (Refer to Item I.B.1.)

☒ Yes. *Continue to Item II.G.2.*

☐ No. *The project is NOT required to incorporate HM measures. Skip to Item II.G.6 and check "No."*

II.G.2 Is the total impervious area increased over the pre-project condition? (Refer to Item I.B.1.)

☒ Yes. *Continue to Item II.G.3.*

☐ No. *The project is NOT required to incorporate HM measures. Skip to Item II.G.6 and check "No."*

II.G.3 Is the site located in a tidally influenced/depositional area, or in the extreme eastern portion of the county that is not subject to HM requirements? *(See HMP Susceptibility Map in Appendix I of the C.3 Technical Guidance.)*

☐ Yes. *Project is exempt from HM requirements. Attach map indicating project location. Skip to II.G.6 and check "No".*

☒ No. *Continue to II.G.4.*

II.G.4 Is the site located in a high slope zone or special consideration watershed, as shown on the HMP Susceptibility Map?

☒ Yes. *Project is subject to HM requirements. Attach map indicating project location. Skip to II.G.6 and check "Yes."*

☐ No. *Continue to II.G.5.*

II.G.5 For sites located in a white area on the HMP Susceptibility Map, has an engineer or qualified environmental professional determined that runoff from the project flows only through a hardened channel or enclosed pipe along its entire length before emptying into a waterway in the exempt area?

☐ Yes. *Project is exempt from HM requirements. Attach signed statement by qualified professional. Go to II.G.6 and check "No."*

☐ No. *Project is subject to HM requirements. Attach map indicating project location. Go to Item G.6 and check "Yes."*

II.G.6 Is the project a Hydromodification Management Project?

☒ Yes. *The project is subject to HM requirements in Provision C.3.g of the Municipal Regional Stormwater Permit.*

☐ No. *The project is EXEMPT from HM requirements.*

☐ HM requirements are impracticable. *(Attach documentation needed to comply with the impracticability provision in MRP Attachment B.)*

- *If the project is subject to the HM requirements, incorporate in the project flow duration stormwater control measures designed such that post-project stormwater discharge rates and durations match pre-project discharge rates and durations. The Bay Area Hydrology Model (BAHM) has been developed to size flow duration controls. See www.bayareahydrologymodel.org. Guidance is provided in Chapter 7 of the C.3 Technical Guidance.*

II.H Stormwater Treatment Measure and/HM Control Owner or Operator's Information:

Name:_____

Address:_____

Phone:_____ Email:_____

- *Applicant must call for inspection and receive inspection within 45 days of installation of treatment measures and/or hydromodification management controls.*

Name of applicant completing the form: David Terhune

Signature:_____ Date: 8/2/2024

[13] Hydromodification is the modification of a stream's hydrograph, caused in general by increases in flows and durations that result when land is developed (made more impervious). The effects of hydromodification include, but are not limited to, increased bed and bank erosion, loss of habitat, increased sediment transport and deposition, and increased flooding. Hydromodification management control measures are designed to reduce these effects.

III. For Completion By Municipal Staff

III.1 Alternative Certification: Was the treatment system sizing and design reviewed by a qualified third-party professional that is not a member of the project team or agency staff?

☐ Yes ☐ No Name of Reviewer_____

III.2. Confirm Operations and Maintenance (O&M) Submittal:

The following questions apply to C.3 Regulated Projects and Hydromodification Management Projects.

		Yes	No	N/A
III.2.a	Was maintenance plan submitted?	☐	☐	☐
III.2.b	Was maintenance plan approved?	☐	☐	☐
III.2.c	Was maintenance agreement submitted? (Date executed:_____)	☐	☐	☐

- *Attach the executed maintenance agreement as an appendix to this checklist.*

III.3 Incorporate HM Controls (if required)

Are the applicable items for HM compliance included in the plan submittal?

Yes	No	NA	Documentation for HM Compliance
☐	☐	☐	Site plans with pre- and post-project impervious surface areas, surface flow directions of entire site, locations of flow duration controls and site design measures per HM site design requirement
☐	☐	☐	Soils report or other site-specific document showing soil types at all parts of site
☐	☐	☐	If project uses the Bay Area Hydrology Model (BAHM), a list of model inputs.
☐	☐	☐	If project uses custom modeling, a summary of the modeling calculations with corresponding graph showing curve matching (existing, post-project, and post-project with HM controls curves), goodness of fit, and (allowable) low flow rate.
☐	☐	☐	If project uses the Impracticability Provision, a listing of all applicable costs and a brief description of the alternative HM project (name, location, date of start up, entity responsible for maintenance).
☐	☐	☐	If the project uses alternatives to the default BAHM approach or settings, a written description and rationale.

- *Municipal staff: Refer to the "Flow Duration Control Review Worksheet for HM Submittals" to review the documentation submitted for HM compliance.*

III.4 Annual Operations and Maintenance (O&M) Submittals:

For C.3 Regulated Projects and Hydromodification Management Projects, indicate the dates on which the Applicant submitted annual reports for project O&M: _____

_____

III.5 Comments:

_____

_____

_____

_____

III.6 Notes:

Section I Notes:_____

Section II Notes:_____

Section III Notes:_____

III.7 Project Close-Out:

III.7.a	Were final Conditions of Approval met?	☐	☐	
III.7.b	Was initial inspection of the completed treatment/HM measure(s) conducted? (Date of inspection:_____)	☐	☐	☐
III.7.c	Was maintenance plan submitted? (Date executed:_____)	☐	☐	☐
III.7.d	Was project information provided to staff responsible for O&M verification inspections? (Date provided to inspection staff:_____)	☐	☐	☐

Name of staff confirming project is closed out:_____

Signature:_____ Date:_____

Name of O&M staff receiving information:_____

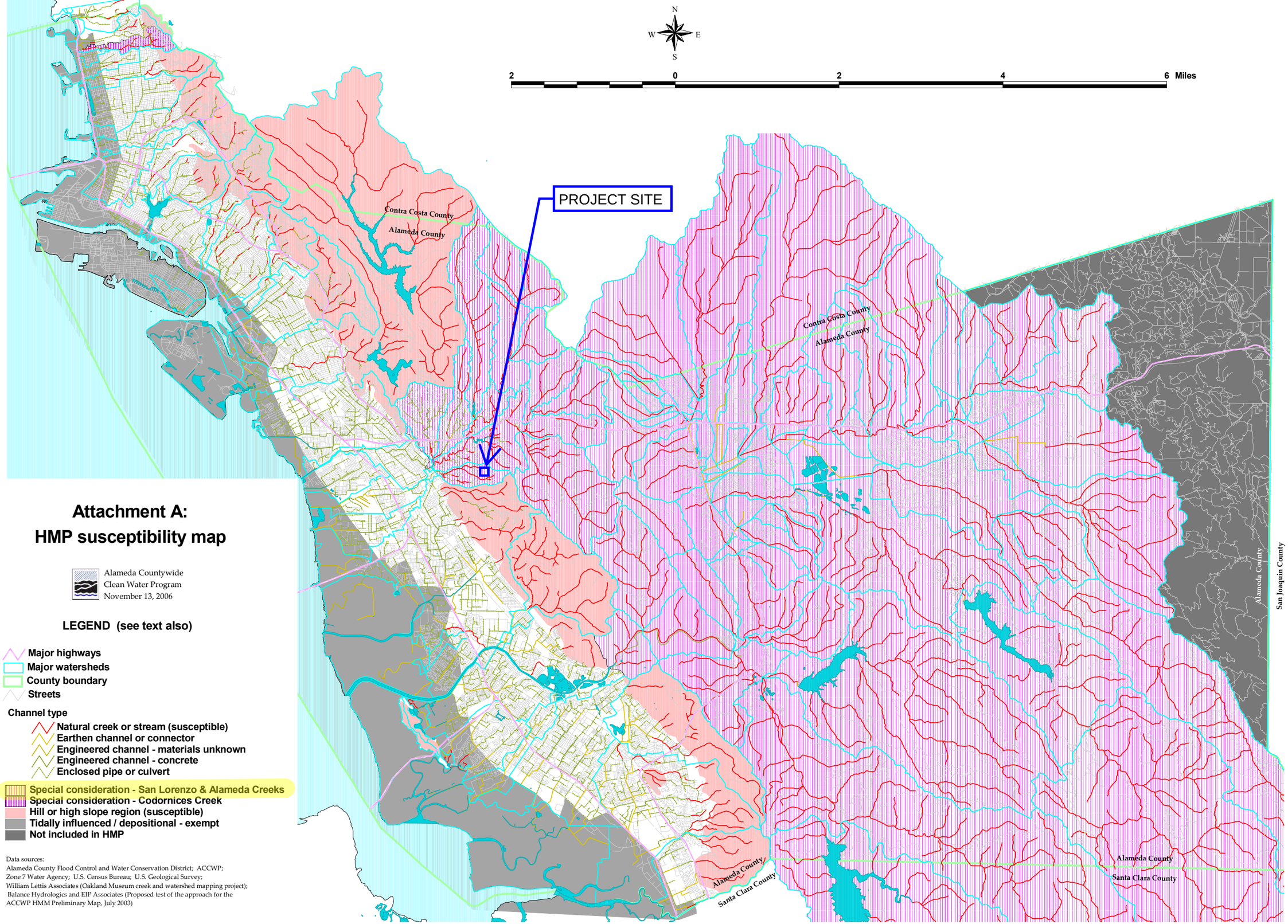
Signature:_____ Date:_____

Appendices

Appendix A: O&M Agreement
Appendix B: O&M Annual Report Form

Attachment A:
HMP susceptibility map

Alameda Countywide
Clean Water Program
November 13, 2006



LEGEND (see text also)

- Major highways
- Major watersheds
- County boundary
- Streets

Channel type

- Natural creek or stream (susceptible)
- Earthen channel or connector
- Engineered channel - materials unknown
- Engineered channel - concrete
- Enclosed pipe or culvert

- Special consideration - San Lorenzo & Alameda Creeks
- Special consideration - Codornices Creek
- Hill or high slope region (susceptible)
- Tidally influenced / depositional - exempt
- Not included in HMP

Data sources:
Alameda County Flood Control and Water Conservation District; ACCWP;
Zone 7 Water Agency; U.S. Census Bureau; U.S. Geological Survey;
William Lettis Associates (Oakland Museum creek and watershed mapping project);
Balance Hydrologics and EIP Associates (Proposed test of the approach for the ACCWP HMM Preliminary Map, July 2003)