Appendix SWP

Stormwater Control Plan

STORMWATER CONTROL PLAN

For

PITTSBURG RV/BOAT STORAGE

3468 Pittsburg-Antioch Highway
Pittsburg, CA

August 3, 2021

Updated October 7, 2021

Prepared For:

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Project #A21011

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Stormwater Control Plan

I. PROJECT DATA

Table 1. Project Data

Project Name/Number	Pittsburg RV/Boat Storage
Application Submittal Date	
Project Location	3468 Pittsburg-Antioch Highway, Pittsburg
Name of Developer	
Project Phase No.	N/A
Project Type and Description	RV/Boat Storage
Project Watershed	
Total Project Site Area (acres)	12.51 Acres
Total Area of Land Disturbed (acres)	9.2 Acres
Total New Impervious Surface Area (sq. ft.)	334,420 SF
Total Replaced Impervious Surface Area	0 SF
Total Pre-Project Impervious Surface Area	0 SF
Total Post-Project Impervious Surface Area	334,420 SF
50% Rule[*]	Does Not Apply
Applicable Special Project Categories	None
Percent LID and non LID treatment	100% LID treatment.
HMP Compliance [†]	Yes

[*50% rule applies if: Total Replaced Impervious Surface Area > 0.5 x Pre-Project Impervious Surface Area]

[†HMP applies if: (Total New Impervious Area + Total Replaced Impervious Area) ≥ 1 acre]

II. SETTING

II.A. Project Location and Description

The project area is located at 3468 Pittsburg-Antioch Highway, Pittsburg, in the unincorporated area of Contra Costa County, California. The 9.2-acre project site is located on the south side of Pittsburg-Antioch Highway, just west of the Contra Costa Canal Spillway. The project entails construction of a Boat/RV Storage facility comprised of 9 buildings.

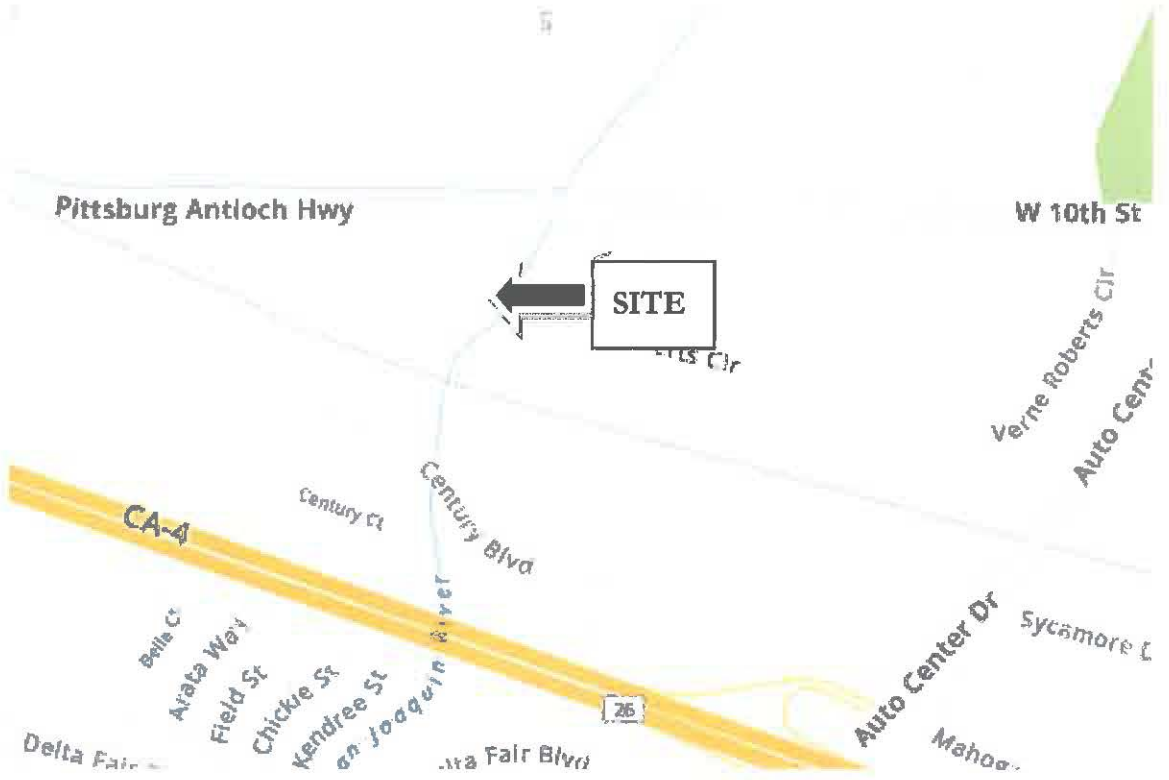


Figure 1: Vicinity Map

II.B. Existing Site Features and Conditions

The site is mainly undeveloped, covered in natural grasses and weeds. The property has been vacant for an unknown period of time and currently contains no existing structures. The site contains no frontage improvements along the frontage. The site topography indicates a mild slope ranging from 510 feet to 476 feet, averaging 1%-2% northeasterly towards Pittsburg-Antioch Highway. Storm runoff currently dissipates into the site soils with excess runoff draining towards the spillway and/or the roadway. Existing ground cover will be stripped in accordance with the geotechnical investigation. The mean annual precipitation is approximately 13 inches.

Figure 2: Existing Conditions Map

II.C. Opportunities and Constraints for Stormwater Control

Treatment of stormwater runoff from the site is to be provided, consistent with methods described in the Contra Costa Clean Water Program's Stormwater C.3 Guidebook. Threshold for including flow control in treatment device design is when total impervious area being created or replaced is over 1 acre. Since the total impervious area being created or replaced is greater than 1 acre, this project requires compliance with hydrograph modification management (flow control) requirements. Storm water will be treated on site via bio-retention basins on the property. The bio-retention areas (BR-A&B) have been sized in accordance with the Contra Costa C.3 sizing tool and detailed in this report.

The proposed project may be required to construct frontage improvements along Pittsburg-Antioch Highway, including but not limited to: curb, gutter, monolithic sidewalk, streetlights, and drainage improvements as necessary.

III. Low Impact Development Design Strategies

III.A. Optimization of Site Layout

III.A.1. Limitation of development envelope

The project is being constructed in conformance with the Zoning Ordinance. Stormwater treatment is being achieved by constructing bio-retention areas and planters onsite to meet C.3 requirements.

III.A.2 Preservation of natural drainage features

No existing natural drainage features will be disturbed or removed with the construction of the project. Proposed drainage features will contain elements of vegetation for both function and aesthetics.

III.A.3. Setbacks from creeks, wetlands, and riparian habitats

No creeks, wetlands and riparian habitats are present on the project site.

III.A.4. Minimization of imperviousness

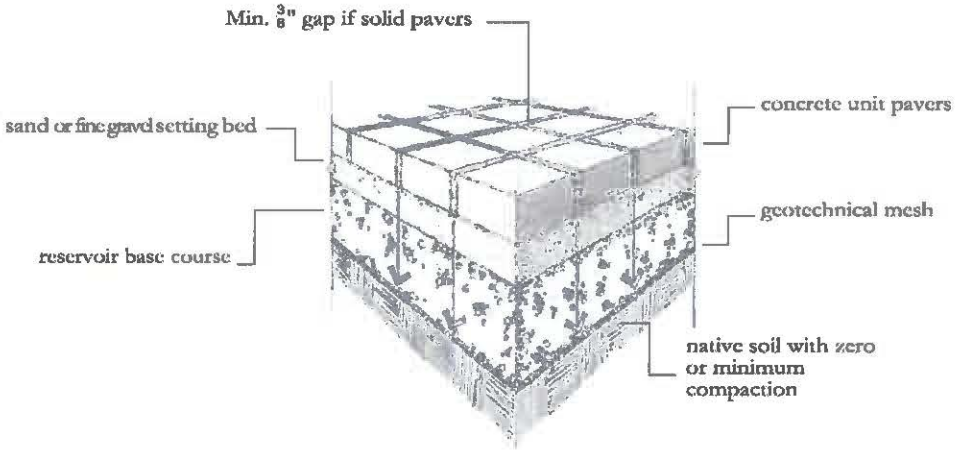
There is sufficient pervious area onsite to allow all stormwater treatment to occur by constructing bio-retention facilities to meet C.3 requirements.

III.A.5 Use of drainage as a design element

Stormwater treatment is being achieved by constructing bio-retention facilities onsite to meet C.3 requirements.

III.B Use of Permeable Pavements

Permeable pavers may be used at various locations in walkways on the project. To be installed per detail in Contra Costa Clean Water Program Stormwater C.3 Guidebook. 7th Edition.



III.C. Dispersal of Runoff to Pervious Areas

The site's impervious development area is directed into bio-retention facilities for treatment. See Figure 3 for the bio-retention facility detail. See landscape plans specific planting materials within the bio-retention areas. Planting materials are per Appendix B of the Contra Costa County Stormwater C.3 Guidebook.

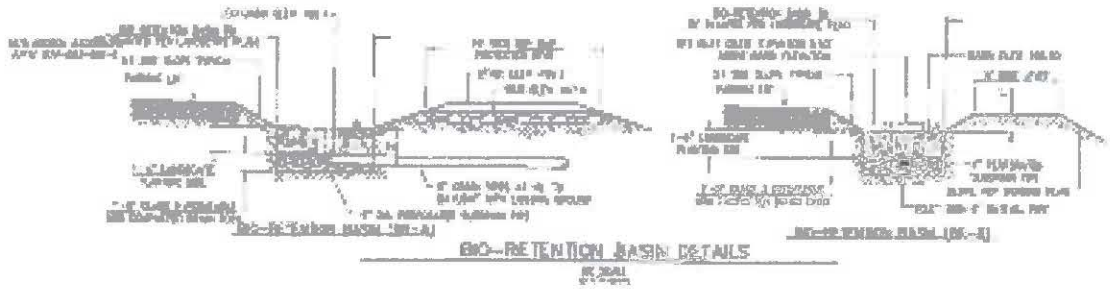


Figure 3: Bio-Retention Details

III.D. Bioretention or other Integrated Management Practices

Bioretention facilities will be integrated with the site layout to treat runoff, and infiltrate some runoff, before discharging to the municipal storm drain.

IV. DOCUMENTATION OF DRAINAGE DESIGN

IV.A. Descriptions of each Drainage Management Area

IV.A.1. Table of Drainage Management Areas

DMA Name	*Surface Type*	*Area (square feet)*
PAVE-1	*Asphalt/Concrete*	*135,490*
PAVE-2	*Asphalt/Concrete*	*3,860*
PAVE-3	*Asphalt/Concrete*	*11,710*
ROOF-1	*Conventional Roof*	*182,050*
ROOF-2	*Conventional Roof*	*1,310*
LAND-1	*Landscaping*	*19,090*
LAND-2	*Landscaping*	*4,910*
LAND-3	*Landscaping*	*25,300*

IV.A.2. Drainage Management Area Descriptions

PAVE-1, totaling 135,490 square feet, drains a parking lot into BR-A, a bio-retention basin.

PAVE-2, totaling 3,860 square feet, drains a parking lot into BR-B, a bio-retention basin.

PAVE-3, totaling 11,710 square feet, drains the site frontage, is untreated.

ROOF-1, totaling 182,050 square feet, drains the building roof into BR-A, a bio-retention basin.

ROOF-2, totaling 1,310 square feet, drains the building roof into BR-B, a bio-retention basin.

LAND-1, totaling 19,090 square feet, drains a landscaped area into BR-A, a bio-retention basin.

LAND-2, totaling 4,910 square feet, drains a landscaped area into BR-B, a bio-retention basin.

LAND-3, totaling 25,300 square feet, drains a landscaped area, is self-treating.

IV.B. Integrated Management Practices

Runoff from impervious area onsite, including roofs and paved areas, will be routed to two bio-retention basins. Each facility will be designed and constructed to the criteria in the latest edition of the Stormwater C.3 Guidebook, including the following features:

- Each layer built flat, level, and to the elevations specified in the plans.
- 18 inches of a sand/compost mix meeting the specifications approved by the RWQCB.
- A Class 2 permeable layer meeting Caltrans specification 68-2.02F(3). The depth of each layer to be designed to provide the necessary V2 flow control volume, consistent with Table 3-6, Stormwater C.3 Guidebook.
- Perforated pipe underdrain, made of PVC SDR 35, installed with the invert at the top of the Class 2 permeable layer with holes facing down, and connected to the overflow structure at that same elevation. The size of the underdrain shall be designed consistent with the Stormwater C.3 Guidebook.
- Reservoir between the top of soil elevation and the overflow grate elevation. The depth to be calculated based on the required V1 volume for flow control, consistent with Table 3-6, Stormwater C.3 Guidebook.
- Concrete drop inlet with frame overflow structure, with grate set to specified elevation, connected to the public storm drain system.
- Vertical cutoff walls to protect adjacent pavement and concrete areas.
- Plantings selected for suitability to climate and location, well-drained & low fertility bio-retention soil media, and for water conservation.
- Irrigation system on a separate zone, with drip emitters and "smart" irrigation controllers.

IV.C. Tabulation and Sizing Calculations

IV.C.1. Information Summary for IMP Design

Total Project Area (Square Feet)	400,752 SF (9.2 Acres)
Mean Annual Precipitation	13.0 inches/year
IMPs Designed For:	Treatment & Flow Control

IV.C.2. Self-Treating Areas

Table 2.

DMA Name	Area (SF)
LAND-3	25,300

IV.C.3. Untreated Areas

Table 3.

DMA Name	Area (SF)
PAVE-3	11,710

IV.C.4. Areas Draining to Self-Retaining Areas

Table 4. None

IV.C.5. Areas Draining to IMPs

Table 5.

Project Name: **Pittsburg RV/Boat Storage, 3468 Pittsburg-Antioch Highway, Pittsburg**

Type: **Treatment & Flow Control** Drainage Area: **9.2 Acres**

Mean Annual Precipitation: **13.0 inches** Soil Group: **C**

Porosity Factor (for V2- Gravel Layer): **0.40**

IMP Name: IMP1 (BR-A)

IMP Type: Bioretention Basin

DMA Name	DMA Area (SF)	Post-Project Surface Type	DMA Runoff Factor	DMA Area X Runoff Factor
ROOF-1	182,050	Roof	1	182,050
PAVE-1	135,490	Asphalt/Concrete	1	135,490
LAND-1	19,090	Landscaping	0.1	1,909
			Total	319,449

IMP Sizing Factor	Rain Adjust. Factor	Minimum Area or Vol/Depth	Proposed Area or Depth
A: 0.06	1.264	24,227	24,550 SF
V1: 0.05	1.264	20,158/10"	10"
V2: 0.066	1.264	26,608/13"	13"

IMP Name: IMP2 (BR-B)

IMP Type: Bioretention Basin

DMA Name	DMA Area (SF)	Post-Project Surface Type	DMA Runoff Factor	DMA Area X Runoff Factor
ROOF-2	1,310	Roof	1	1,310
PAVE-2	3,860	Asphalt/Concrete	1	3,860
LAND-2	4,910	Landscaping	0.1	491
			Total	5,661

IMP Sizing Factor	Rain Adjust. Factor	Minimum Area or Vol/Depth	Proposed Area or Depth
A: 0.06	1.264	429	3,860 SF
V1: 0.05	1.264	358/1"	6"
V2: 0.066	1.264	472/1"	12"

SIZING OF ORIFICE:

Use Eqn 3-11 to find UnderdrainMaxFlow (UMF): [0.122 x (MAP-20.2) + 1.85]/1,000,000, where MAP = 13 inches

Use Eqn 3-18 to find Orifice Area (in feet): UMF/[0.6 x $(64.4H)^{0.5}$], where H is the storage height above the orifice

Use Eqn 3-19 to find Orifice Diameter (in inches): 12 x [(4 x Orifice Area)/3.1416]$^{0.5}$

For **IMP-1**, UMF= 0.9; Orifice Area= 0.125 feet; and **Orifice Diameter = 4.8 inches (use 4 inches)**

For **IMP-2**, UMF= 0.03; Orifice Area= 0.004 feet; and **Orifice Diameter = 0.9 inches (use 1 inch)**

IV.C.6. Areas Draining to Non-LID Treatment

Table 6. None

V. SOURCE CONTROL MEASURES

V.A. Site activities and potential sources of pollutants

The following activities planned have the potential to allow pollutants to enter runoff:

Potential dumping of wash water or other liquids into storm drain inlets.
Landscape maintenance.
Trash refuse areas

All areas where these activities occur will drain to a stormwater treatment bioretention area. To further reduce the potential to enter runoff, permanent and operational source control BMPs will be implemented as described in Table 8 below.

Trash Load Reduction

In compliance with **Provision C.10- Trash Load Reduction**, full trash capture will be handled through the proposed bio-retention basins, which are designed to capture any trash accumulated prior to discharging into the public storm drain system(s). Periodic removal of trash from each bio-retention planter and basin will be required.

V.B. Source Control Table

Table 7. Source and Source Control BMPs

Potential Source of Runoff Pollutants	Permanent Source Control BMPs	Operational Source Control BMPs
On-site storm drain inlets	Mark inlets that could be easily accessed with a "No Dumping-Drains to Creek" or similar message.	• Maintain and periodically repaint or replace inlet markings. • Distribute stormwater pollution prevention information to Owner.

Potential Source of Runoff Pollutants	Permanent Source Control BMPs	Operational Source Control BMPs
Landscape/outdoor pesticide use	• Any native trees, shrubs, and ground cover on the site will be preserved to the maximum extent possible. • Landscaping will be designed to minimize required irrigation and runoff, to promote surface infiltration, and to minimize the use of fertilizers and pesticides that can contribute to storm water pollution. • Plantings for bioretention areas will be selected to be appropriate to anticipated soil and moisture conditions. • Where possible, pest resistant plants will be selected, especially for locations adjacent to hardscape. Plants will be selected appropriate to site soils, slopes, climates, sun, wind, rain, land use, air movement, ecological consistency, and plant interactions.	• Owner will receive integrated pest management information. • All site landscaping is to be maintained with minimal or no use of pesticides
Vehicle washing	• Driveways and parking areas drain to bioretention areas.	Distribute stormwater pollution prevention information to Owner.
Trash Refuse Area	• Provide adequate number of receptacles. • Inspect receptacles regularly; repair or replace leaky receptacles. • Prohibit/prevent dumping of liquid or hazardous wastes. • Post "no hazardous materials" signs. • Inspect and pick up litter daily and clean up spills immediately. • Keep spill control materials available on-site. See fact Sheet SC-34, "Waste Handling and Disposal" in the CASQA Stormwater Quality Handbooks. • Trash enclosure will connect to the sanitary sewer system.	Distribute stormwater pollution prevention information to Owner. Post "Do Not Dump Hazardous Materials Here" signs near receptacles.

V.C. Features, Materials, and Methods of Construction of Source Control BMPs

The bio-retention areas will be planted with plants suitable for the climate, location, and consistent with the Stormwater C.3 Guidebook.

VI. STORMWATER FACILITY MAINTENANCE

VI.A. Ownership and Responsibility for Maintenance in Perpetuity

All storm water treatment facilities in this plan will be owned and maintained in perpetuity by the private owner of the subject property. The applicant accepts responsibility for operation and maintenance of the facilities until such time as this responsibility is formally transferred to a subsequent owner.

The applicant will execute, prior to completion of project construction, a Stormwater Facilities Operation and Management Agreement. Such an agreement will "run with the land" and be enforceable on subsequent property owners. The applicant will provide the City access to stormwater treatment devices for inspection.

VII. CONSTRUCTION PLAN C.3 CHECKLIST

Table 8.

The below documents will be provided as part of the construction documents.

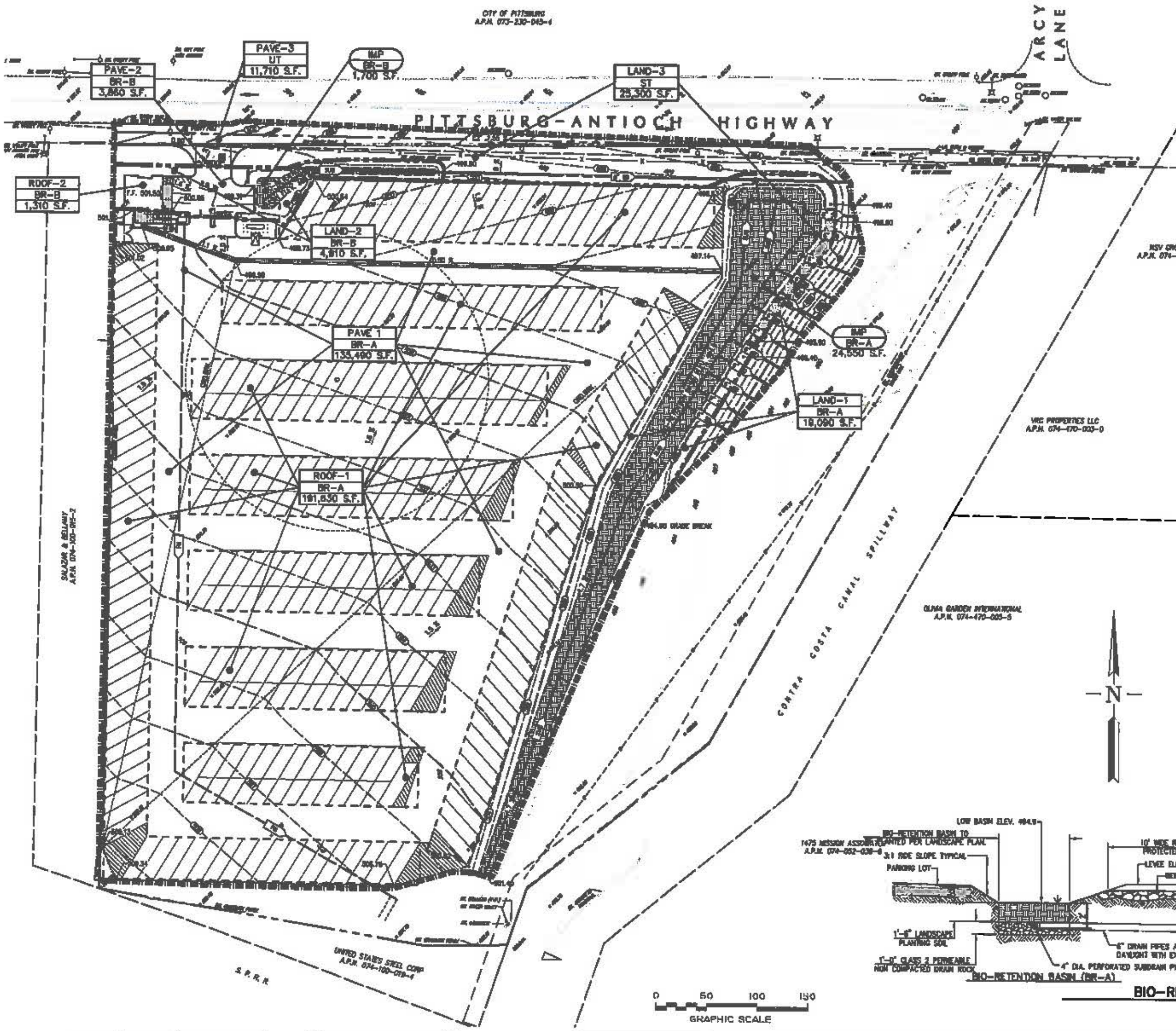
Stormwater Control Plan Reference	BMP Description	Plan Sheet Number
Exhibit & Table 6	Bioretention Areas sized as specified and designed to capture and route drainage from areas delineated on Exhibit.	C2
Table 8	On-site drain inlets (if any) to be marked with "no dumping" message.	SWPPP
Table 8	Plant selection to minimize irrigation, minimize use of fertilizers and pesticides, and for pest assistance.	L1
Table 8	Trash refuse areas to be protected to prevent pollutant runoff	SWPPP

VIII. CERTIFICATIONS

The selection, sizing, and preliminary design of stormwater treatment and other control measures in this plan meet the requirements of Regional Water Quality Control Board Order R2-2009-0074 and Order R2-2011-0083.

Robert A. Karn

Robert A. Karn & Associates



LEGEND:

	PROPOSED	EXISTING
LIMIT OF IMPROVEMENTS		
DRAINAGE AREA BOUNDARY		
BIO-RETENTION TREATMENT AREA		
DRAINAGE MANAGEMENT AREA (DMA) ID / TREATMENT DEVICE ID: BIO-RETENTION BASIN (BR), UNTREATED (UT)	PAVE 1 / BR-A / sq.ft.	
INTEGRATED MANAGEMENT PRACTICE (IMP) / BIO-RETENTION BASIN (BR)	IMP / BR-A / sq.ft.	
BOUNDARY LINE		
STORM DRAIN PIPE		
BIO-RETENTION SUBDRAIN		
DRAINAGE INLET		
VERTICAL CURB		
VALLEY GUTTER		
EDGE OF PAVEMENT		
CONTOUR		
GRADE BREAK		
STORAGE CANOPY		

Project Name: Pittsburg RV/Boat Storage, 3468 Pittsburg-Antioch Highway, Pittsburg
Type: Treatment & Flow Control Drainage Area: 9.2 Acres
Mean Annual Precipitation: 13.0 inches
Porosity Factor (for V2- Gravel Layer): 0.40 Soil Group: C

Un-treated Areas

DMA Name	Area (SF)
PAVE-3	11,710

Self-Treating Areas

DMA Name	Area (SF)
LAND-3	25,300

IMP Name: IMP-1 (BR-A)- Bio-Retention Basin

DMA Name	DMA Area (SF)	Post-Project Surface Type	DMA Runoff Factor	DMA Area X Runoff Factor
ROOF-1	182,050	Roof	1	182,050
PAVE-1	135,490	Asphalt	1	135,490
LAND-1	19,090	Landscaping	0.1	1909
			Total	319,449

IMP Sizing Factor	Rain Adjust. Factor	Minimum Area or Vol/Depth	Proposed Area or Depth
A: 0.06	1.264	24,227	24,550
V1: 0.05	1.264	20,158/10"	10"
V2: 0.066	[illegible]	26,608/13"	13"

IMP Name: IMP-2 (BR-2)- Bio-Retention Facility

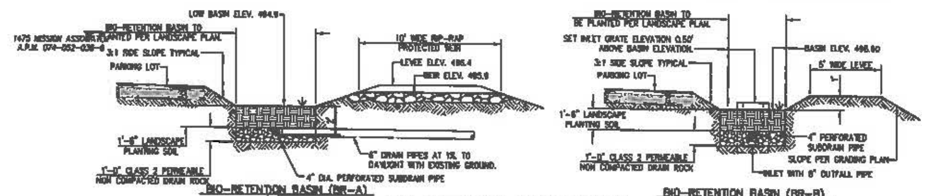
DMA Name	DMA Area (SF)	Post-Project Surface Type	DMA Runoff Factor	DMA Area X Runoff Factor
ROOF-2	1,310	Roof	1	1,310
PAVE-2	3,860	Asphalt	1	3,860
LAND-2	4,310	Landscaping	0.1	431
			Total	5,601

IMP Sizing Factor	Rain Adjust. Factor	Minimum Area or Vol/Depth	Proposed Area or Depth
A: 0.06	1.264	419	1,480 SF
V1: 0.05	1.264	350/1'	6"
V2: 0.066	1.264	472/1'	12"

SIZING OF ORIFICE:

Use Eqn 3-11 to find Underdrain Max Flow (UMF): [0.122 x (MAP-20.2) + 1.85]/1,000,000, where MAP = 13 inches
Use Eqn 3-18 to find Orifice Area (in feet): UMF/[0.6 x (64.4H)^0.5], where H is the storage height above the orifice
Use Eqn 3-19 to find Orifice Diameter (in inches): 12 x [(4 x Orifice Area)/3.1416]^0.5

For IMP-1, UMF = 0.9; Orifice Area = 0.125 feet; and Orifice Diameter = 4.8 inches (use 4 inches)
For IMP-2, UMF = 0.03; Orifice Area = 0.004 feet; and Orifice Diameter = 0.9 inches (use 1 inch)



BIO-RETENTION BASIN DETAILS
NO SCALE

RAK
ROBERT A. KARN & ASSOCIATES, INC.
CIVIL ENGINEERS
707 BEST AVENUE
FAIRFIELD, CALIFORNIA 94533

PITTSBURG RV/BOAT STORAGE
3468 PITTSBURG/ ANTIOCH HIGHWAY
PITTSBURG, CA

PRELIMINARY STORM WATER CONTROL PLAN

C2
10.07.2021