Preliminary Grading and Drainage Study
Pt. Molate Mixed-Use Tribal Destination
Resort and Casino
Richmond, California

PRELIMINARY DRAINAGE AND GRADING STUDY

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INTRODUCTION

1. Purpose of Study

This Preliminary Drainage and Grading Study provides an analysis of the proposed drainage system and the site grading for the Point Molate Resort and Casino Project, located in Richmond, California. The Study is intended as an engineering analysis support document for the Project Environmental Document. Five alternative layouts are proposed, Alternates A, B, C, D, and E.

For each of the four build alternatives a preliminary storm drain system (layout and sizes) is presented. For each of the four build alternatives, site grading is proposed for all developed building pads, parking areas, open spaces and roadways; and total excavation and fill is identified.

2 STUDY AREA

2.1 Site Description

The NFD Point Molate is located on the western shoreline of San Pablo Peninsula along the San Francisco Bay, in the northwest corner of the City of Richmond in Contra Costa County, California. NFD Point Molate consists of 25 buildings and 29 housing units on approximately 420 acres of land adjacent to San Francisco Bay and San Pablo Bay. The land is made up of 280 acres of dry land and 140 acres of submerged lands. The near-shore area is relatively flat, but the majority of the property slopes upward, away from Bay waters and east toward Potrero Ridge to elevations of up to 350 to 420 feet.

Originally developed in 1907 as a large winery and company town, NFD Point Molate is home to Winehaven, a winery that is on the National Registry of Historic Places, which was closed in approximately 1920. The Department of the Navy acquired the Winehaven property in 1942 and developed it for the storage and distribution of fuel for the Pacific Fleet. NFD Point Molate ceased its fuel storage and distribution mission in 1995 in preparation for closure and transfer to the Local Reuse Authority, the City of Richmond, and operationally closed in 1998. The property is currently in caretaker status.

This Preliminary Drainage and grading Study addresses four proposed alternative development scenarios (Alternatives A, B, C, and D) being considered in the project EIR/EIS being prepared for the City of Richmond and the Bureau of Indian Affairs. Site uses under consideration range from the redevelopment of the site for a major resort including hotels, convention and performance centers, casino, retail, restaurants, and public plazas, to the redevelopment of the site for residential and commercial uses. All development alternatives include the preservation of much of the hillside open space, and the creation of a shoreline park including extension of the Bay Trail. The existing site conditions include roads, existing facilities, open-space areas, and formerly developed areas where building demolition and/or utility capping has occurred (the majority of which is currently composed of degraded, generally impervious, paved areas).
2.2 Hydrologic Setting

Surface water at NFD Point Molate flows westward from the upland areas toward the Bay. Runoff flows overland into a system of natural channels and ravines that drain the property. Water that falls on impermeable surfaces, such as roads and parking lots, travels downslope by surface flow.

Two independent systems were previously installed at the NFD Point Molate property to control surface water runoff and to prevent erosion and flooding. One system serves the developed areas (primarily roads and parking lots). It consists of catch basins and stormwater sewers that collect and direct water to the Bay at outfalls. The other system (oil recovery system) served the UST area on the hillside. Formerly, this system collected and treated surface and shallow subsurface waters (some of which might have been contaminated with hydrocarbons) before discharge to the treatment plant or the Bay. Stormwater from the UST areas was most recently directed to the treatment ponds. Currently, the UST area is no longer operational and the treatment ponds have been closed.

The NFD Point Molate property is not subject to flooding from streams. The waterfront portion of the property would be subject to tides of 6.2 feet (1.9 m) National Geodetic Vertical Datum (NGVD), which could be 3 to 4 feet (0.9 to 1.2 m) higher during storm events due to wind-driven wave runup (U.S. ACE 1984). Therefore, structures below about 10 feet (3.1 m) NGVD could be affected by storm waves at high tides. With the possible exception of the sewage treatment plant, no existing buildings on the property are below this elevation (City of Richmond 1997a).

The waterfront portion of the Site could be subject to tsunami runup of up to 3.5 feet (1 m) in addition to the current tidal elevation.

The U.S. EPA has estimated potential sea level rise as 4 inches (10 cm) by 2036 (U.S. EPA 1995). If this predicted rise in sea level occurs, it would raise the wave and tide heights described above accordingly.

2.3 Existing Drainage Facilities

Surface runoff from lands within the project area and lands tributary to the project area originates from the ridge located ¼ to ½ mile east from the coastline along the project. Elevation changes from about 400 feet at the top of the ridge to sea level. The existing landform in the eastern portions of the watersheds includes natural slopes in excess of 35% slope. Near the western portion of the property, generally west of Western Drive, there is flatter land with medium density industrial structures. As presented in the separate Stormwater Management Plan prepared by LFR, Inc, and Drainage Figures 1, 2, and 3 attached, there are 7 natural watersheds defined, varying in size from 20.4 acres to 62.5 acres. Each watershed has a separate discharge point to San Francisco Bay.
The eastern portion of each watershed is the steeper upland area consisting of steep ravines and natural waterways. Nearer to the existing structures and roads along the western portion of each watershed, there are paved areas served by drainage inlets and storm drains, and roads with drainage inlets and cross culverts. The existing storm drains discharge to existing natural or manmade waterways west of Western Drive that discharge to the Bay.

The existing storm drain system on the property was designed to collect water through French drains, and inlets in streets and landscaped areas. The drain system was installed in the 1940s and upgraded in 1983. The system consists of the French drains, 6 concrete catch basins, pipe inlet headwalls, and underground concrete culverts that convey stormwater to 11 outfalls to the Bay. A map of the existing drainage facilities is shown on Figure 2 of the separate Stormwater Management Plan.

2.4 Soil Characteristics

The soils on the site are generally characterized as clayey by data available from the Contra Costa County Clean Water Program and the project geotechnical report. These soils are characterized by Hydrologic Soil group D, representing the least permeable soils and creating the highest surface runoff flows. A figure presenting the soil groups is available from Contra Costa County and presented in the project Conceptual Stormwater Management Plan, prepared by LFR Inc. In the steep terrain there are also noted, rock outcrops; also considered Hydrologic Soil Group D. The project Geotechnical Exploration, prepared by ENGEO Incorporated also identifies specific soil properties.

2.5 Land Uses

The existing land use consists of substantial hilly open space areas, flat open space areas, roads and parking areas, housing, industrial structures, former military buildings, and sites where building, railway, and dock facility demolition has occurred (currently impervious, degraded, paved pads). Significant amounts of impervious areas (formerly used to support rail and shipping operations) are present on the project site.

The proposed development includes a hotel, entertainment buildings, parking garages, paved parking areas, roadways, paths and trails, commercial buildings, single family and high density residential, landscaping and open space. Each alternative presents a mixture of some or all of these uses.

Most of the existing paved areas will be removed (replaced by landscaping or open space) or replaced by proposed project improvements. Most of the proposed project land uses will provide a more pervious land surface than these existing paved areas.
3 HYDROLOGY AND HYDRAULICS

3.1 Hydrology Methodology

Based on the Contra Costa County Hydrology handouts (dated 1977), the Rational Method was chosen to perform the hydrologic calculations for the on-site improvements. Analyses were performed using Contra Costa County guidelines.

The method is described in the following sections and applies to watersheds less than 120 acres. Though the overall Pt. Molate development site is larger than 120 acres, each individual watershed with an individual discharge to San Pablo Bay totals less than 120 acres.

Method of computing runoff. The rational method equation is:

\[ Q = C \times f \times i \times A, \text{ where:} \]

- \( Q \) = Peak flow rate in cubic feet per second (cfs),
- \( C \) = Runoff coefficient (unitless),
- \( f \) = Adjustment factor for 25-, 50-, and 100-year storms,
- \( i \) = Rainfall intensity in inches per hour (in/hr),
- \( A \) = Watershed area (acres)

Runoff Coefficient, \( C \). The runoff coefficient takes into account the ground slope, the soil’s capacity to absorb water, the amount of vegetation covering and surface storage in determining the peak flow rate. The following generally accepted runoff coefficient values were used for each surface type:

<table>
<thead>
<tr>
<th>Surface Type</th>
<th>Runoff Coefficient, ( C )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings</td>
<td>1.0</td>
</tr>
<tr>
<td>Asphalt and Concrete Pavement</td>
<td>0.9</td>
</tr>
<tr>
<td>Gravel</td>
<td>0.5</td>
</tr>
<tr>
<td>Landscaping</td>
<td>0.4</td>
</tr>
</tbody>
</table>

Adjustment Factor, \( f \). This is an adjustment factor to the runoff coefficient that takes into account the magnitude of the design storm: \( f = 1.0 \) for \( Q_{10} \), \( f = 1.1 \) for \( Q_{25} \), \( f = 1.2 \) for \( Q_{50} \), \( f = 1.25 \) for \( Q_{100} \).

Rainfall Intensity, \( i \). Rainfall intensity is based on the County’s isohyetal map (Drawing B-166) and the time of concentration. The County’s isohyetal map is used to determine a mean seasonal precipitation value (in inches) for the project area. From this map, a value of 20.0 inches has been determined. Once the mean seasonal precipitation has been determined, the precipitation depth is found using the time of concentration on the County’s Precipitation Intensity-Frequency-Depth curves (Drawing B-159). The time of concentration is the time required for the runoff to travel from the most remote location of the watershed to the watershed’s outlet.
point. The "precipitation depth" value taken from Drawing B-159 is the "I_{MSP}" value in the runoff calculation spreadsheets in Appendix 1 of this preliminary study.

The time of concentration for the initial drainage area is calculated using the Caltrans equation, which is:

\[
\frac{3.3 \times (1.1 - C) \times (L^{1/3})}{(S \times 100)^{0.33}}
\]

where \(C\) is the runoff coefficient, \(L\) is the length of the runoff flowpath within the drainage area and \(S\) is the slope in percent. The initial time of concentration from the downstream drainage areas is computed in the same manner. The initial time of concentration from the upstream area plus the travel time is compared to the initial time of concentration of the downstream areas. The larger number is used as the time of concentration for the sum of the areas.

3.2 Design Storm

The 10-year design storm was used as the principal design storm for analyzing and sizing the proposed storm drain system. Each of the eight identified existing watersheds are less than 65 acres each. Per County design guidelines the design runoff for each drainage system can be sized using the Rational Formula and the 10-year runoff event. In addition to the drainage facilities designed for the 10-year event, overland flow routes will be analyzed to safely convey the 100-year runoff from the site to proper downstream facilities. For all the Pt. Molate project alternatives, it is anticipated that the new network of streets will safely convey 100-runoff to discharge points adjacent to the Bay.

Because no detention facilities are necessary (see discussion in Section 3.5) to attenuate peak runoff events, no runoff hydrographs have been prepared. When runoff hydrographs are prepared for the design of detention basins, other frequency events (10-, 50-, or 100-year) and other duration events (3-, 6-, 12-, and 24-hours) are typically prepared.

3.3 Hydrology Results

Peak 10-year runoff flows were determined for several subwatershed concentration points on the proposed storm drains within each watershed, and for each of the four site alternatives. Storm drain elements of one proposed alternative may be similar to elements of another alternative, in that case each runoff calculation is presented only once on the attached calculation spreadsheets.

Presented in the tables below are the 10-year peak flows at the downstream end of each storm drain system for each alternative. Hydrology and hydraulic calculations are presented in the appendix for many intermediate points within each storm drain system.
### Alternative A

<table>
<thead>
<tr>
<th>Storm Drain System</th>
<th>Total System $Q_{10}$ cfs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13.3</td>
</tr>
<tr>
<td>2</td>
<td>16.7</td>
</tr>
<tr>
<td>3</td>
<td>35.1</td>
</tr>
<tr>
<td>8</td>
<td>10.3</td>
</tr>
</tbody>
</table>

### Alternative B

<table>
<thead>
<tr>
<th>Storm Drain System</th>
<th>Total System $Q_{10}$ cfs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13.3</td>
</tr>
<tr>
<td>2</td>
<td>16.7</td>
</tr>
<tr>
<td>3</td>
<td>35.1</td>
</tr>
<tr>
<td>5</td>
<td>41.1</td>
</tr>
<tr>
<td>7</td>
<td>41.0</td>
</tr>
<tr>
<td>8</td>
<td>10.3</td>
</tr>
</tbody>
</table>

### Alternative C

<table>
<thead>
<tr>
<th>Storm Drain System</th>
<th>Total System $Q_{10}$ cfs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13.3</td>
</tr>
<tr>
<td>2</td>
<td>16.7</td>
</tr>
<tr>
<td>3</td>
<td>32.2</td>
</tr>
<tr>
<td>8</td>
<td>12.4</td>
</tr>
</tbody>
</table>

### Alternative D

<table>
<thead>
<tr>
<th>Storm Drain System</th>
<th>Total System $Q_{10}$ cfs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>13.3</td>
</tr>
<tr>
<td>2</td>
<td>30.4</td>
</tr>
<tr>
<td>3</td>
<td>23.8</td>
</tr>
<tr>
<td>5</td>
<td>41.1</td>
</tr>
<tr>
<td>7</td>
<td>41.0</td>
</tr>
<tr>
<td>8</td>
<td>11.1</td>
</tr>
</tbody>
</table>

### Alternative E

<table>
<thead>
<tr>
<th>Storm Drain System</th>
<th>Total System $Q_{10}$ cfs</th>
</tr>
</thead>
<tbody>
<tr>
<td>No significant change from existing conditions.</td>
<td>Short local drainage facilities or extensions may be added.</td>
</tr>
</tbody>
</table>

### 3.4 Proposed Storm Drain Layout

The four alternative developments for the site include removal or abandonment of most of the existing drainage system, while retaining the downstream discharge points. Wherever possible, the boundary or size of each existing watershed is retained. With the introduction of new structures, roadways, paved and graded areas, the necessary new drainage systems will provide, new flow paths, and new catchment points for natural waterways, paved areas and low points. The new drainage facilities include storm drains, drainage inlets, storm drain manholes, culvert
headwalls, flared end sections, swales and ditches (lined and unlined), rock slope protection, stormwater detention basins, and outlet structures. Each of these proposed drainage facilities are designed in accordance with requirements of the County of Contra Costa.

With the significant structural and grading development planned for some of the alternatives, the existing flow paths are altered. The route of the proposed storm drains is intended to follow the general preexisting flow paths and retain existing discharge points. The attached Figures 1, 2 and 3 present the proposed drainage system for each of the alternatives. Figure 1 includes the proposed drainage system for Alternative A, which is the same as the main resort area for Alternative B. Figure 2 includes the proposed drainage system for Alternative C. Figure 3 includes the proposed drainage system for Alternative D. The southern residential area presented in Figure 3 also applies to Alternative B. Each of the proposed drainage figures includes proposed grading for those alternatives. The grading plans and cut/fill estimates are presented in greater detail on separate figures.

Below is a description of the proposed drainage facilities and stormwater treatment facilities for each of the watersheds, starting from the north end of the site to the south end, for each of the improvement alternatives. The figures that reflect the storm drain and stormwater treatment schemes are presented on the attached Figures 1, 2 and 3, and the separate Stormwater Management Plan prepared by LFR, Inc.

3.4.1 Alternative A

Existing Watershed 1 is a total of 20.4 acres. Minor roadway improvements are planned along Western Drive, maintain the existing vertical profile. Small storm drain improvements are planned to convey the existing runoff flow paths from the eastern upland area across Western Drive to a proposed 11,900sf bioretention basin, then discharge to a swale leading to the Bay.

Existing Watershed 2 is a total of 25.7 acres. This watershed includes the existing Winehaven building west of western Drive that will be retained. Existing former Navy housing east of Western Drive will be retained. The proposed improvements include improvements to Western Drive (maintaining the vertical profile) and new parking area north of the existing Winehaven Building. The proposed storm drain system will collect runoff from the upland areas east of the historic housing, the area around the Winehaven Building and a portion of Watershed 3 that includes the main casino area. Runoff is then directed to a 15,600sf below ground stormwater treatment vault with discharge from the vault leading to a swale leading to the Bay. The slight redirection of runoff from the main casino building is an option, to better follow the proposed street layout. The casino area could be drained to the existing watershed as presented in the plan presented in the LFR report.

Existing Watershed 3 is a total of 62.5 acres. Development in this watershed has the greatest impact to the existing condition. Within this watershed is the main parking structure, located east of Western Drive, and the main casino and conference buildings. The project improvements also include new access and service roads, and paved areas. The main parking structure is located within a natural valley; however the size of the structure requires significant grading of the natural side slopes. The project grading is a combination cut grading retained by new...
retaining walls, and cut grading shaped to provide a stable slope. The proposed storm drains start at the east side of the new parking structure with an open swale collecting and directing runoff around the south side of the structure. Along the south side of the structure runoff is conveyed down a steep slope in a concrete lined ditch, to a drainage inlet at the bottom of the slope. At that point storm drains carry the runoff across Western Drive, between the casino and conference buildings to a 37,500 sf below ground stormwater treatment vault with discharge from the vault leading to a swale leading to the Bay. Also tributary to this treatment basin are the access road to the hotel and grading tributary to this access road.

Existing Watershed 4 is a total of 45.1 acres. Except for the proposed improvements to Western Drive and minor bike trail parkland improvements along the waterfront, this watershed will remain relatively unchanged. Storm drain improvements will be made to collect runoff from the east side of Western drive, convey the runoff to a 6100 sf bioretention basin, and discharge to a swale leading to the Bay.

Existing Watershed 5 is a total of 48.4 acres. Except for the proposed improvements to Western Drive and minor bike trail parkland improvements along the waterfront, this watershed will remain relatively unchanged. Storm drain improvements will be made to collect runoff from the east side of Western drive, convey the runoff to a 3000 sf bioretention basin, and discharge to a swale leading to the Bay.

Existing Watershed 6 is a total of 26.6 acres. Except for the proposed improvements to Western Drive and minor bike trail parkland improvements along the waterfront, this watershed will remain relatively unchanged. Storm drain improvements will be made to collect runoff from the east side of Western drive, convey the runoff to a 2100 sf bioretention basin, and discharge to a swale leading to the Bay.

Existing Watershed 7 is a total of 46.9 acres. Except for the proposed improvements to Western Drive and minor bike trail parkland improvements along the waterfront, this watershed will remain relatively unchanged. Storm drain improvements will be made to collect runoff from the east side of Western drive, convey the runoff to a 1400 sf bioretention basin, and discharge to a swale leading to the Bay.

Existing Watershed 8 is a total of 23.8 acres. This watershed includes the planned hotel and improvements and to the coastal and trail and access road. Runoff is from the roof of the hotel parking structure, the hotel, the cottages and cottage access road, and the coastal access road. All of the proposed storm drains convey runoff to a point below the hotel bluff, discharging to a 13,700 sf bioretention basin, and then discharge to a swale leading to the Bay.

**Alternative A - Storm System Quantities**

<table>
<thead>
<tr>
<th>Storm Drain Element</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>18” Dia.</td>
<td>7220 feet</td>
</tr>
<tr>
<td>24” Dia.</td>
<td>840 feet</td>
</tr>
<tr>
<td>30” Dia.</td>
<td>20 feet</td>
</tr>
<tr>
<td>Manholes</td>
<td>27</td>
</tr>
<tr>
<td>Inlets</td>
<td>26</td>
</tr>
</tbody>
</table>
3.4.2 Alternative B

Alternative B is similar to Alternative A with the addition of the residential area at the south end of the project site.

Existing Watershed 1 is a total of 20.4 acres. Minor roadway improvements are planned along Western Drive, maintain the existing vertical profile. Small storm drain improvements are planned to convey the existing runoff flow paths from the eastern upland area across Western Drive to a proposed 11,900sf bioretention basin, then discharge to a swale leading to the Bay.

Existing Watershed 2 is a total of 25.7 acres. This watershed includes the existing Winehaven building west of western Drive that will be retained. Existing former Navy housing east of Western Drive will be retained. The proposed improvements include improvements to Western Drive (maintaining the vertical profile) and new parking area north of the existing Winehaven Building. The proposed storm drain system will collect runoff from the upland areas east of the historic housing, the area around the Winehaven Building and a portion of Watershed 3 that includes the main casino area. Runoff is then directed to a 15,600sf below ground stormwater treatment vault with discharge from the vault leading to a swale leading to the Bay. The slight redirection of runoff from the main casino building is an option, to better follow the proposed street layout. The casino area could be drained to the existing watershed as presented in the plan presented in the LFR report.

Existing Watershed 3 is a total of 62.5 acres. Development in this watershed has the greatest impact to the existing condition. Within this watershed is the main parking structure, located east of Western Drive, and the main casino and conference buildings. The project improvements also include new access and service roads, and paved areas. The main parking structure is located within a natural valley; however the size of the structure requires significant grading of the natural side slopes. The project grading is a combination cut grading retained by new retaining walls, and cut grading shaped to provide a stable slope. The proposed storm drains start at the east side of the new parking structure with an open swale collecting and directing runoff around the south side of the structure. Along the south side of the structure runoff is conveyed down a steep slope in a concrete lined ditch, to a drainage inlet at the bottom of the slope. At that point storm drains convey the runoff across Western Drive, between the casino and conference buildings to a 37,500sf below ground stormwater treatment vault with the discharge from the vault leading to a swale leading to the Bay. Also tributary to this treatment basin are the access road to the hotel and grading tributary to this access road.

Existing Watersheds 4 through 7 include the proposed residential area at the south end of the project site. This proposed residential area is primarily sited on an abandoned railway siding with the eastern edge of the residential and street footprint against the base of the coastal hills. The natural watersheds from the hills will remain unchanged. At the most uphill street, runoff from the uplands will be collected into new storm drains and conveyed along the streets, collect storm runoff from the residential areas and streets and discharge to the treatment areas located west of Western Drive. The storm drain plan identifies 2 treatment areas, one for Watersheds 4 and 5, and one for Watersheds 6 and 7. These 2 treatment basins could be configured for 4 locations as presented in the Stormwater Management Plan prepared by LFR, Inc.
Existing Watershed 4 is a total of 45.1 acres. Most of this watershed remains in a natural state except for a small portion within the proposed residential footprint. Improvements within the watershed include widening and realigning Western Drive, new residential streets and high density residential structures. Storm drain improvements will be made to collect runoff from the natural upslope areas, and the new residential areas on the east side of Western drive, convey the runoff to a 8800sf bioretention basin, and discharge to a swale leading to the Bay. This 8800sf bioretention basin can also be combined with the Watershed 5 basin with a total size of 30,900sf.

Existing Watershed 5 is a total of 48.4 acres. Just over half of this watershed remains in a natural state. Improvements within the watershed include widening and realigning Western Drive, new residential streets and high density residential structures. Storm drain improvements will be made to collect runoff from the natural upslope areas, and the new residential areas on the east side of Western drive, convey the runoff to a 22,100sf bioretention basin, and discharge to a swale leading to the Bay. This 22,100sf bioretention basin can also be combined with the Watershed 4 basin with a total size of 30,900sf.

Existing Watershed 6 is a total of 26.6 acres. Half of this watershed remains in a natural state. Improvements within the watershed include widening and realigning Western Drive, new residential streets and high density residential structures. Storm drain improvements will be made to collect runoff from the natural upslope areas, and the new residential areas on the east side of Western drive, convey the runoff to a 14,400sf bioretention basin, and discharge to a swale leading to the Bay. This 14,400sf bioretention basin can also be combined with the Watershed 7 basin with a total size of 23,900sf.

Existing Watershed 7 is a total of 46.9 acres. Most of this watershed remains in a natural state except for a small portion within the proposed residential footprint. Improvements within the watershed include widening and realigning Western Drive, new residential streets and high density residential structures. Storm drain improvements will be made to collect runoff from the natural upslope areas, and the new residential areas on the east side of Western drive, convey the runoff to a 9500sf bioretention basin, and discharge to a swale leading to the Bay. This 9500sf bioretention basin can also be combined with the Watershed 5 basin with a total size of 23,900sf.

Existing Watershed 8 is a total of 23 8 acres. This watershed includes the planned hotel and improvements and to the coastal and trail and access road. Runoff is from the roof of the hotel parking structure, the hotel, the cottages and cottage access road, and the coastal access road. All of the proposed storm drains convey runoff to a point below the hotel bluff, discharging to a 13,700sf bioretention basin, and then discharge to a swale leading to the Bay.

**Alternative B - Storm System Quantities**

<table>
<thead>
<tr>
<th>Storm Drain Element</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>18” Dia.</td>
<td>13,590 feet</td>
</tr>
<tr>
<td>24” Dia.</td>
<td>1490 feet</td>
</tr>
<tr>
<td>30” Dia.</td>
<td>750 feet</td>
</tr>
<tr>
<td>Manholes</td>
<td>53</td>
</tr>
<tr>
<td>Inlets</td>
<td>80</td>
</tr>
</tbody>
</table>
3.4.3 Alternative C

Alternative C is similar to Alternative A with the removal of the hotel, hotel parking, hotel access road and the cottages.

Existing Watershed 1 is a total of 20.4 acres. Minor roadway improvements are planned along Western Drive, maintain the existing vertical profile. Small storm drain improvements are planned to convey the existing runoff flow paths from the eastern upland area across Western Drive to a proposed 11,900sf bioretention basin, then discharge to a swale leading to the Bay.

Existing Watershed 2 is a total of 25.7 acres. This watershed includes the existing Winehaven building west of western Drive that will be retained. Existing former Navy housing east of Western Drive will be retained. The proposed improvements include improvements to Western Drive (maintaining the vertical profile) and new parking area north of the existing Winehaven Building. The proposed storm drain system will collect runoff from the upland areas east of the historic housing, the area around the Winehaven Building and a portion of Watershed 3 that includes the main casino area. Runoff is then directed to a 17,400sf below ground stormwater treatment vault with discharge from the vault leading to a swale leading to the Bay. The slight redirection of runoff from the main casino building is an option, to better follow the proposed street layout. The casino area could be drained to the existing watershed as presented in the plan presented in the LFR report.

Existing Watershed 3 is a total of 62.5 acres. Development in this watershed has the greatest impact to the existing condition. Within this watershed is the main parking structure, located east of Western Drive, and the main casino and conference buildings. The project improvements also include new access and service roads, and paved areas. The main parking structure is located within a natural valley; however the size of the structure requires significant grading of the natural side slopes. The project grading is a combination cut grading retained by new retaining walls, and cut grading shaped to provide a stable slope. The proposed storm drains start at the east side of the new parking structure with an open swale collecting and directing runoff around the south side of the structure. Along the south side of the structure runoff is conveyed down a steep slope in a concrete lined ditch, to a drainage inlet at the bottom of the slope. At that point storm drains convey the runoff across Western Drive, between the casino and conference buildings to a 30,800sf below ground stormwater treatment vault with the discharge from the vault leading to a swale leading to the Bay. Also tributary to this treatment basin are newly graded slopes to the south of the casino building.

Existing Watershed 4 is a total of 45.1 acres. Except for the proposed improvements to Western Drive, this watershed will remain relatively unchanged. Storm drain improvements will be made to collect runoff from the east side of Western drive, convey the runoff to a 4200sf bioretention basin, and discharge to a swale leading to the Bay.

Existing Watershed 5 is a total of 48.4 acres. Except for the proposed improvements to Western Drive and minor bike trail parkland improvements along the waterfront, this watershed will remain relatively unchanged. Storm drain improvements will be made to collect runoff from the
east side of Western drive, convey the runoff to a 3000sf bioretention basin, and discharge to a swale leading to the Bay.

Existing Watershed 6 is a total of 26.6 acres. Except for the proposed improvements to Western Drive and minor bike trail parkland improvements along the waterfront, this watershed will remain relatively unchanged. Storm drain improvements will be made to collect runoff from the east side of Western drive, convey the runoff to a 2100sf bioretention basin, and discharge to a swale leading to the Bay.

Existing Watershed 7 is a total of 46.9 acres. Except for the proposed improvements to Western Drive and minor bike trail parkland improvements along the waterfront, this watershed will remain relatively unchanged. Storm drain improvements will be made to collect runoff from the east side of Western drive, convey the runoff to a 1400sf bioretention basin, and discharge to a swale leading to the Bay.

Existing Watershed 8 is a total of 23.8 acres. Except for small improvements proposed near the foot of the dock and access are improvements, this watershed will remain relatively unchanged. Storm drain improvements will be made to collect runoff along the foot of the tall coastal bluff, convey the runoff to an 1800sf bioretention basin, and discharge to a swale leading to the Bay.

### Alternative C - Storm System Quantities

<table>
<thead>
<tr>
<th>Storm Drain Element</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>18&quot; Dia.</td>
<td>5515 feet</td>
</tr>
<tr>
<td>24&quot; Dia.</td>
<td>420 feet</td>
</tr>
<tr>
<td>30&quot; Dia.</td>
<td>0 feet</td>
</tr>
<tr>
<td>Manholes</td>
<td>20</td>
</tr>
<tr>
<td>Inlets</td>
<td>23</td>
</tr>
</tbody>
</table>

#### 3.4.4 Alternative D

Alternative D includes the same proposed residential improvements at the southern end of the project site as Alternative B. In addition, there is single family residential located along the top of a bluff, and a significant area of proposed commercial development with some additional high density residential.

Existing Watershed 1 is a total of 20.4 acres. Minor roadway improvements are planned along Western Drive, maintain the existing vertical profile. Small storm drain improvements are planned to convey the existing runoff flow paths from the eastern upland area across Western Drive to a proposed 11,400sf bioretention basin, then discharge to a swale leading to the Bay.

Existing Watershed 2 is a total of 25.7 acres. This watershed includes the existing Winchaven building west of Western Drive that will be retained. Existing former Navy housing east of Western Drive will be retained. The proposed improvements include improvements to Western Drive (maintaining the vertical profile) and a portion the main proposed commercial area. The proposed storm drain system will collect runoff from the upland areas east of the historic housing, the area around the Winchaven Building and a portion of the commercial development.
in Watershed 3. Runoff is then directed to a 14,700sf below ground stormwater treatment vault with discharge from the vault leading to a swale leading to the Bay. The slight redirection of runoff from a portion of the commercial area is an option, to better follow the proposed street layout. This redirected commercial area could be drained to the existing watershed as presented in the plan presented in the LFR report.

Existing Watershed 3 is a total of 62.5 acres. Development in this watershed has the greatest impact to the existing condition. Within this watershed is the main area of commercial development with a network of streets parallel and perpendicular to Western Drive. The project improvements also include off street parking areas, landscaped areas and service roads. A portion of the main commercial area is placed up against the natural slopes; however the size of the commercial footprint requires significant grading of the natural side slopes. The project grading is a combination cut grading retained by new retaining walls, and cut grading shaped to provide a stable slope. The proposed storm drains start at the east side of the new commercial area with connections to the new storm drains located in the streets, conveyed west in the streets to a 31,500sf below ground stormwater treatment vault. The discharge from the vault connects to a swale leading to the Bay.

Existing Watersheds 4 through 7 include the proposed residential area at the south end of the project site. This proposed residential area is primarily sited on an abandoned railway siding with the eastern edge of the residential and street footprint up against the base of the coastal hills. The natural watersheds from the hills will remain unchanged. At the most uphill street, runoff from the uplands will be collected into new storm drains and conveyed along the streets, collect storm runoff from the residential areas and streets and discharge to the treatment areas located west of Western Drive. The storm drain plan identifies 2 treatment areas, one for Watersheds 4 and 5, and one for Watersheds 6 and 7. These 2 treatment basins could also be configured for 4 locations as presented in the Stormwater Management Plan prepared by LFR, Inc.

Existing Watershed 4 is a total of 45.1 acres. Most of this watershed remains in a natural state except for a small portion within the proposed residential footprint. Improvements within the watershed include widening and realigning Western Drive, new residential streets and high density residential structures. Storm drain improvements will be made to collect runoff from the natural upslope areas, and the new residential areas on the east side of Western drive, convey the runoff to a 8800sf bioretention basin, and discharge to a swale leading to the Bay. This 8800sf bioretention basin can also be combined with the Watershed 5 basin with a total size of 30,900sf.

Existing Watershed 5 is a total of 48.4 acres. Just over half of this watershed remains in a natural state. Improvements within the watershed include widening and realigning Western Drive, new residential streets and high density residential structures. Storm drain improvements will be made to collect runoff from the natural upslope areas, and the new residential areas on the east side of Western drive, convey the runoff to a 22,100sf bioretention basin, and discharge to a swale leading to the Bay. This 22,100sf bioretention basin can also be combined with the Watershed 4 basin with a total size of 30,900sf.

Existing Watershed 6 is a total of 26.6 acres. Half of this watershed remains in a natural state. Improvements within the watershed include widening and realigning Western Drive,
residential streets and high density residential structures. Storm drain improvements will be made to collect runoff from the natural upslope areas, and the new residential areas on the east side of Western drive, convey the runoff to a 14,400sf bioretention basin, and discharge to a swale leading to the Bay. This 14,400sf bioretention basin can also be combined with the Watershed 7 basin with a total size of 23,900sf.

Existing Watershed 7 is a total of 46.9 acres. Most of this watershed remains in a natural state except for a small portion within the proposed residential footprint. Improvements within the watershed include widening and realigning Western Drive, new residential streets and high density residential structures. Storm drain improvements will be made to collect runoff from the natural upslope areas, and the new residential areas on the east side of Western drive, convey the runoff to a 9500sf bioretention basin, and discharge to a swale leading to the Bay. This 9500sf bioretention basin can also be combined with the Watershed 5 basin with a total size of 23,900sf.

Existing Watershed 8 is a total of 23.8 acres. This watershed includes the planned single family residential lots and access street on the top of an existing bluff, combined commercial and residential along the western toe of the bluff, and improvements to the access road and trail at the toe of the bluff. Runoff the residential can be directed to either of the treatment areas for Watershed 8 or 3. The storm drain plan identified the residential lots and cul-de-sac as draining to the Watershed 3 treatment basin, but the location presented in the Stormwater Management Plan is also viable. Runoff from the natural areas of the bluff, the costal access road, the residential areas the top of the bluff, and the commercial structures along the foot of the bluff will be positively drained with storm drains and open ditches to the 17,900sf bioretention basin at the western toe of the bluff, and then discharge to a swale leading to the Bay.

**Alternative D - Storm System Quantities**

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<thead>
<tr>
<th>Storm Drain Element</th>
<th>Quantity</th>
</tr>
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<tbody>
<tr>
<td>18&quot; Dia.</td>
<td>13,745 feet</td>
</tr>
<tr>
<td>24&quot; Dia.</td>
<td>1375 feet</td>
</tr>
<tr>
<td>30&quot; Dia.</td>
<td>940 feet</td>
</tr>
<tr>
<td>Manholes</td>
<td>55</td>
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<tr>
<td>Inlets</td>
<td>85</td>
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</table>

3.4.5 Alternative E

Alternative E, the total parkland alternative, would include minimal infrastructure improvements necessary to provide basic amenities such as public restrooms and would not include any major new construction within the project site. Such amenities would be provided within existing structures located on-site. Unlike Alternatives A – D, Western Drive would not be widened or otherwise altered beyond what is required as a matter of routine maintenance.

The park would include a newly constructed segment of the San Francisco Bay Trail, which would conform to the Bay Trail Plan design policies and guidelines as published by the Association of Bay Area Governments (ABAG) (1999). The Bay Trail would be sited in a manner consistent with that of the development alternatives. As with Alternatives A – D, the
Bay Trail would be situated along the western margin of the site, providing unobstructed views of San Francisco Bay.

A secondary trail system would be established east of Western Drive in the hillside area. The trail system would make use of the existing road network within the hillside area and would not require any new construction, with the exception of limited resurfacing within the trail right-of-way. Existing roads within the hillside areas that would not be incorporated into the trail system would be closed.

Visitor parking would be provided in the large paved lot known as Drum Lot 2, located in the southern portion of the project site. The lot is situated on the east-side of Western Drive, adjacent to the existing shoreline park. The lot is currently paved and would require minor upgrades such as demarcation of parking stalls and resurfacing as needed.

Drainage improvements would be minimal with no significant changes from the existing condition. Short local drainage facilities or extensions to existing facilities may be desired to provide minimal safe conditions, or as required to maintain existing facilities.

3.5 Storm Drain Detention Facilities

Detention facilities for this project, either for flood control or hydromodification purposes is unnecessary due to the proximity of the project discharge points to tidal waters of San Pablo Bay. The discharge points for each of the separate storm facilities will be located within 100 feet of the bay front. Between the culvert or storm drain discharge point and the bay front waterline, properly designed stable ditches will be constructed. Though not designed as a peak runoff detention basin, the proposed storm water treatment BMPs (bioretention basins or underground vaults) located at the discharge point of each drainage system will act to attenuate the peak runoff due to the volume of the BMP.
4 GRADING PLAN

The grading plan is presented to provide finished surface elevations for pad, roadway, slope, and other areas that require grading, to meet the proposed development layout of each of the four alternatives while complying with the recommendations of the Geotechnical Exploration prepared by ENGEO Incorporated, standard design practice for graded sites, and local requirements for roadway design.

4.1 Grading Constraints
Because the proposed project is located adjacent to steep native terrain, the most significant grading constraint is the maximum stable slope limits for cut or fill slopes. The geotechnical report by ENGEO Incorporated makes these grading recommendations:

- 2:1 max slope for slope heights less than 20 feet,
- 3:1 max slope for slope heights greater than 20 feet,
- Drainage benches at 30-foot vertical spacing for slopes steeper than 3:1,
- Debris benches at toe of 2:1 cut slopes.

Other significant grading constraints are:

- Provide a maximum new street grade of 10%. (Result: some sidewalks are not ADA compliant)
- Provide a 20 foot flat clear area adjacent to residential structures.

4.2 Grading Plan

The basis of the grading plan for each alternative is the plan layout, and building footprints and elevations presented by the project architect, and the street elevations presented by LFR, Inc. Using the grading constraints defined above, the street profiles and pad elevations were adjusted as necessary. The primary modifications made to the preliminary information received were to create street profiles that did not exceed a slope of 10%. This required that elevations for the pads adjacent to the adjusted streets also required adjustment. In one area the plan footprint of the

Grading plans for each project alternative are presented in the Appendix.

The proposed street profiles for the grading plan are presented in the Appendix.

The total grading for each alternative is presented in the table below: the total cut for each alternative, the total fill for each alternative, and the difference between the totals. All four alternatives require net export from the developed footprints. Whether all or a portion of the volume of export material can be placed with the project R/W, or on a nearby site, or on a remote site, has not yet been determined by the project team. The volumes in the table below are a summation of the grading estimates presented on the grading figures. For instance, the total
grading for Alternative B is the sum of the grading for Alternative A plus the grading for the southern residential area depicted on the “Alternative B & D Residential Grading” figure.

<table>
<thead>
<tr>
<th>Total Grading Volumes (cubic yards)</th>
<th>Cut</th>
<th>Fill</th>
<th>Net (export)</th>
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<tr>
<td>A</td>
<td>1,552,000</td>
<td>167,000</td>
<td>1,385,000</td>
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<tr>
<td>B</td>
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<td>498,000</td>
<td>1,585,000</td>
</tr>
<tr>
<td>C</td>
<td>886,000</td>
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</tr>
<tr>
<td>D</td>
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</tr>
<tr>
<td>E</td>
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<td>minor</td>
<td>minor</td>
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</table>

The above estimates do not account for possible expansion or shrinkage of the material during excavation, handling, or placement of the material. The volumes are estimated for in-situ conditions.

There is no estimate of volume of possible non-engineered fill, or unconsolidated materials, or undesirable material present within the grading areas. The project geotechnical exploration makes note of the presence of undocumented fill. These materials should be identified, tested as necessary, and removed as necessary.
Appendix 1
Appendix 2
### Alternative A

<table>
<thead>
<tr>
<th>Storm Drain No.</th>
<th>Node ID</th>
<th>Sub-Area to node (ac)</th>
<th>Tributary Nodes</th>
<th>Total Area to SD (ac)</th>
<th>Length L (ft)</th>
<th>Slope (min)</th>
<th>C</th>
<th>I_{wsp} (in/hr)</th>
<th>Q_{in} (cfs)</th>
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| A-8.1          | A-8.a    | 20.75                  | A-8.a, A-8.b, A-8.c | 20.75                | 150           | 0.0200      | 29.0| 0.40           | 0.60        | 1.24           | 10.3         | 18            | 14.9         |
| A-8.2          | A-8.b    | 8.00                   | A-8.b           | 8.00                 | 160           | 0.0050      | 28.4| 0.40           | 0.58        | 1.23           | 3.9          | 18            | 7.4          |
| A-8.2          | A-8.c    | 8.00                   | A-8.c           | 12.75                | 370           | 0.0270      | 28.4| 0.40           | 0.58        | 1.23           | 6.3          | 18            | 17.3         |
# Systems Common to Alternatives A & D

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<th>Storm Drain No.</th>
<th>Node ID</th>
<th>Sub-Area to node (ac)</th>
<th>Tributary Nodes</th>
<th>Total Area to SD (ac)</th>
<th>Length L (ft)</th>
<th>Slope</th>
<th>tc (min)</th>
<th>C</th>
<th>Iin (in/hr)</th>
<th>I (cfs)</th>
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Appendix 3
ALTERNATIVE 'B' AND 'D' RESIDENTIAL SITE
CUT = 878,000 YARDS
FILL = 329,000 YARDS
NET = 549,000 YARDS CUT

NOTES
1. IN CERTAIN INSTANCES PAD GRADES HAVE CONSIDERABLY NOT BEEN DEFINED AS THE PROPOSED GRADES WILL MATCH EXISTING TOPOGRAPHY.
ALTERNATIVE 'B' AND 'D' RESIDENTIAL SITE
CUT = 531,000 YARDS
FILL = 331,000 YARDS
NET = 200,000 YARDS CUT
ALTERNATIVE D
CUT = 866,000 YARDS
FILL = 645,000 YARDS
NET = 221,000 YARDS CUT
CONCEPTUAL STORMWATER MANAGEMENT PLAN
DRAFT
Conceptual Stormwater Management Plan
Point Molate Redevelopment
Richmond, California

July 6, 2007
P01-02444-07

Prepared for
Upstream Point Molate LLC and
the Guidiville Band of Pomo Indians
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1.0 INTRODUCTION

LFR Inc. (LFR) has prepared this Conceptual Post-Construction Stormwater Management Plan (SWMP) to be used as a management tool to mitigate potential impacts to stormwater runoff quality during construction and following completion of the proposed redevelopment of the Naval Fuel Depot (NFD) Point Molate ("the Site") located in Richmond, California (Figure 1). The initial temporary stormwater management measures to be implemented during construction at the Site will also be included in the Stormwater Pollution Prevention Plan (SWPPP) that will be developed later to support construction activities.

The SWMP has been designed to meet the National Pollutant Discharge Elimination System (NPDES) stormwater quality standards, as required by the San Francisco Regional Water Quality Control Board (RWQCB) for controlling post-construction stormwater discharge from the Site. The SWMP has been designed in general accordance with the Contra Costa Clean Water Program (CCCWP) Stormwater C.3 Guidebook. This plan provides requirements that tenants/future owners must abide by to maintain compliance with the NPDES stormwater discharge permit. This plan does not provide stipulations to address specific activities related to tenants' business activities. The future tenants for each building area must provide addenda to this plan that comply with above regulations and address potential stormwater impacts from their business activities.

1.1 Site Description

The NFD Point Molate is located on the western shoreline of San Pablo Peninsula along the San Francisco Bay, in the northwest corner of the City of Richmond in Contra Costa County, California (see Figure 1). NFD Point Molate consists of 25 buildings and 29 housing units on approximately 413 acres of land adjacent to San Francisco Bay and San Pablo Bay. The land is made up of 313 acres of dry land and 100 acres of submerged lands. The near-shore area is relatively flat, but the majority of the property slopes upward, away from Bay waters and east toward Potrero Ridge to elevations of up to about 420 feet.

Originally developed in 1907 as a large winery and company town, NFD Point Molate is home to Winehaven, a winery that is on the National Registry of Historic Places, which was closed in approximately 1920. The Department of the Navy acquired the Winehaven property in 1942 and developed it for the storage and distribution of fuel for the Pacific Fleet. NFD Point Molate ceased its fuel storage and distribution mission in 1995 in preparation for closure and transfer to the Local Reuse Authority, the City of Richmond, and operationally closed in 1998. The property is currently in caretaker status.

This conceptual SWMP addresses four proposed alternative development scenarios (Alternatives A, B, C, and D) being considered in the project EIR/EIS being prepared for the City of Richmond and the Bureau of Indian Affairs. Site uses under
consideration range from the redevelopment of the site for a major resort including hotels, convention and performance centers, casino, retail, restaurants, and public plazas, to the redevelopment of the site for residential and commercial uses. All development alternatives include the preservation of much of the hillside open space, and the creation of a shoreline park including extension of the Bay Trail. The existing site conditions include roads, existing facilities, open-space areas, and formerly developed areas where building demolition and/or utility capping has occurred (the majority of which is currently composed of degraded, generally impervious, paved areas).

1.2 Hydrologic Setting

Surface water at NFD Point Molate flows westward from the upland areas toward the Bay. Runoff flows overland into a system of natural channels and ravines that drain the property. Water that falls on impermeable surfaces, such as roads and parking lots, travels downslope by surface flow.

Two independent systems were previously installed at the NFD Point Molate property to control surface water runoff and to prevent erosion and flooding. One system serves the developed areas (primarily roads and parking lots). It consists of catch basins and stormwater sewers that collect and direct water to the Bay at outfalls. The other system (oil recovery system) served the UST area on the hillside. Formerly, this system collected and treated surface and shallow subsurface waters (some of which might have been contaminated with hydrocarbons) before discharge to the treatment plant or the Bay. Stormwater from the UST areas was most recently directed to the treatment ponds. Currently, the UST area is no longer operational and the treatment ponds have been closed.

The pre-existing stormwater treatment system was operated under the Industrial Activities Stormwater General Permit No CAS000001. In compliance with the CWA and National Pollutant Discharge Elimination System (NPDES) permitting requirements, the Navy maintained a Stormwater Pollution Prevention Plan (SWPPP) identifying BMPs implemented to control stormwater runoff, and a SWMP which includes procedures for conducting wet-and dry-weather observations and collecting stormwater samples from discharge locations (U.S. Navy 1992a).

The Navy is currently responsible for environmental compliance activities associated with stormwater discharge, including management permits, monitoring, reporting, and liaison with regulatory agencies. After property conveyance, responsibility for NPDES compliance would be the responsibility of the future reuse entity.

The treatment ponds operated under NPDES Permit No. CA0030074, which specified effluent limitations (water quality standards) required prior to discharge to the Bay. The treatment ponds have now been closed prior to transfer of the property.

The NFD Point Molate property is not subject to flooding from streams. The waterfront portion of the property would be subject to tides of 6.2 feet (1.9 m) National
Geodetic Vertical Datum (NGVD), which could be 3 to 4 feet (0.9 to 1.2 m) higher during storm events due to wind-driven wave runup (U.S. ACE 1984). Therefore, structures below about 10 feet (3.1 m) NGVD could be affected by storm waves at high tides. With the possible exception of the sewage treatment plant, no existing buildings on the property are below this elevation (City of Richmond 1997a).

The waterfront portion of the Site could be subject to tsunami runups of up to 3.5 feet (1 m) above tidal conditions at the time.

The U.S. EPA has estimated that sea level rise associated with global warming would be approximately 4 to 6 inches (10 to 15 cm) by 2006 and up to 10 inches (25 cm) by 2036 (U.S. EPA 1995). If this predicted rise in sea level occurs, it would raise the wave and tide heights described above accordingly.

The stormwater system at the NFD Point Molate property is shown on Figure 2. The stormwater collection system was designed to collect water through French drains around the USTs and discharge from streets and landscaped areas. The system was installed in the 1940s and upgraded in 1983. The system consists of concrete catch basins and underground concrete conduits that transport stormwater from 6 catch basins to 11 outfalls discharging to the Bay (U.S. Navy 1998c).

1.3 Regulatory Setting

In recent years, regulatory emphasis at the national level has been directed toward the management of water pollution resulting from municipal storm drain systems, constructions sites, and industrial activities. Following the 1987 amendments to the CWA, 33 U.S.C. §§ 1251-1387, and subsequent 1989 Federal stormwater regulations promulgated by U.S. EPA, discharges of stormwater runoff from such sources have been brought under the NPDES permitting process. In California, U.S. EPA has delegated administration of the Federal NPDES program to the state.

The State Water Resources Control Board issues statewide General NPDES permits for construction sites and industrial activities. The RWQCBs issue and enforce individual municipal permits and take the lead in enforcing the General Permits within their respective regions. Locally, the Contra Costa Clean Water Program (CCCWP) administers Contra Costa County’s Municipal NPDES Permit that is applicable to significant development projects.

Through the CCCWP, Contra Costa County municipalities have prepared a Stormwater C.3 Guidebook to assist developers through the process of submittals and reviews. The C.3 Guidebook provides engineering design and the associated narrative plan description requirements for the site-specific Stormwater Control Plan submittal that will be included with the final project application to the local municipality.

Contra Costa County C.3 planning guidelines state that in order to meet post-development stormwater management goals, peak rates/volumes and pollutant loading to receiving waters should be maintained at or below pre-development values. Best
Management Practices (BMPs) for new development should be implemented to achieve the following objectives: flow control, pollutant removal and pollutant source reduction. The three basic strategies to achieving this are as follows: (1) reduce or eliminate post-project runoff; (2) control sources of pollutants; and (3) treat contaminated storm water runoff before discharging it to natural water bodies. This can be accomplished by maximizing the percentage of pervious surfaces to allow percolation of stormwater into the ground; minimizing the quantity of stormwater directed to impervious surfaces and to the storm sewer system; and minimizing potential pollutant loads from developed impervious areas through the use of appropriate treatment control BMPs and good housekeeping practices.

The goal of this SWMP is to develop BMPs and stormwater treatment facilities that control contaminant sources in stormwater runoff and provide structural controls to treat run-off generated from developed portions of the Site. Stormwater treatment facilities will be designed to address the Contra Costa County C.3 stormwater treatment criteria and at a minimum to accommodate runoff from the ten-year design storm event. Requirements to manage increases in runoff peak flows and durations (hydrograph modification management) will not apply, as those requirements do not apply to the Site because the existing and proposed discharge points (outfalls) are subject to tidal flow fluctuations.

For construction projects that involve more than 1 acre, developers or their contractors are required to apply for an NPDES General Construction Permit to control stormwater runoff from construction sites. Compliance with the permit requires filing a Notice of Intent and the preparation of a SWPPP, which must include BMPs to prevent erosion, trap pollutants before they migrate off site, and prevent pollutants from mixing with stormwater.

In the San Francisco Bay RWQCB Water Quality Control Plan for the San Francisco Bay Basin (WQCP) (RWQCB 1995), NPD Point Molate is in the “San Francisco Bay Central” zone of the San Francisco Bay Basin. The following beneficial uses for San Francisco Bay Central are listed:

- Ocean, Commercial and Sport Fishing
- Estuary Habitat
- Industrial Service Supply
- Fish Migration
- Navigation
- Industrial Process Supply
- Preservation of Rare and Endangered Species
- Water Contact Recreation
- Non-Contact Water Recreation
- Shellfish Harvesting
• Fish Spawning
• Wildlife Habitat

Although NFD Point Molate has no true aquifers and supports no groundwater uses, it is defined in the WQCP as being on the “East Bay Plain” groundwater basin. Beneficial uses for the East Bay Plain are listed as follows:

• Municipal and Domestic Water Supply
• Industrial Process Supply
• Industrial Service Supply
• Agricultural Supply

The WQCP establishes objectives for beneficial uses that guide the RWQCB in implementing the WQCP implementation measures. Objectives are “narrative” and “numerical.” The WQCP defines the narrative objectives as general descriptions of water quality that must be obtained through pollutant control measures and watershed management. Narrative objectives also serve as the basis for the development of detailed numerical objectives. The numerical objectives typically describe the pollutant concentrations, physical/chemical conditions of the water itself, and the toxicity of the water to aquatic organisms. These objectives are designed to represent the maximum amount of pollutants that can remain in the water column without causing adverse effects on organisms using the aquatic system as habitat, on people consuming those organisms or water, and on other current or potential beneficial uses.

The Open Space and Conservation Element of the General Plan provides policy direction for the management of water resources. The following policies are applicable to the NFD Point Molate property.

• Adopt flood control systems which maintain the natural qualities of the creeks as much as possible (Policy OSC-1.1).
• Preserve stream beds, water courses, and channels in their natural state except where needed for flood or erosion control (Policy OSC-1.2).
• Control soil erosion to prevent flooding and destruction of natural waterways, to maintain water quality, to reduce public costs for flood control works, and to prevent damage to construction site (Policy OSC-1.3).
• Reject any development proposal which would deplete or degrade the groundwater supply (Policy OSC-K.1).
• Restrict construction of impervious surfaces in stream beds, which are essential to groundwater recharge (Policy OSC-K.2).
• Provide for the monitoring and protection of groundwater through environmental review (Policy OSC-K.5).
• Prevent deterioration of water quality and danger to public health by requiring all new developments to hook up to existing sewage systems (Policy OSC-L.1).
Section 12.44.030 of the City’s Building Department Excavation, Grading and Earthwork Construction Ordinance requires that an interim and final Erosion and Sediment Control Plan be prepared by a registered civil engineer. The interim plan defines measures to minimize erosion, sedimentation, and fugitive dust during project construction. The final plan includes permanent control features to minimize soil erosion, maximize sediment interception, and control runoff from the completed project.

1.4 Drainage Control

A preliminary drainage study was conducted for the Site to determine the size (contributing area) of separate drainage areas on the Site and to develop appropriate and effective stormwater treatment control measures for the Site as a whole. The drainage areas and associated hydrologic surface conditions are detailed in Table 1 and are also shown graphically on Figures 2-6. Each drainage area was considered with regard to the potential hydraulic loading and potential contaminants of concern associated with the proposed land cover and land use for that area. Preliminary sizing and placement of proposed stormwater management facilities were considered with regard to Site constraints and construction feasibility.

The various post-construction treatment control measures were evaluated based on their reported suitability, removal efficiency and specific physical constraints. Stormwater management practices for the Site have been integrated into a physical layout of the Site, which include storage practices, bio-retention/infiltration practices and vegetative practices. Based on the site topography, drainage area, soils, slopes, interaction with groundwater and relation to environmentally sensitive features, the source control and treatment control measures for the Site include:

1. Source Control Measures:
   - Non Stormwater Management
   - Spill Prevention, Control and Cleanup
   - Vehicle and Equipment Management
   - Materials and Waste Management
   - Building and Grounds Management
   - Erosion and Sediment Control
   - Street Sweeping

2. Treatment Control Measures:
   - Bio-retention Basins
   - Vegetated Swales
   - Detention/Retention Basins
• Subsurface Storage Vaults
• In-line Stormwater Treatment Control/Filter Unit(s) located on primary outfall(s)

The various post-construction treatment control measures will provide pre-treatment within each respective drainage area and treatment as runoff leaves the Site. The combined treatment measures allow final treatment of runoff as it leaves the Site at the primary outfalls (see Figures 3-6). A detailed description and design for combination usage of each of these treatment control measures is included in Section 4.0 of this report.

2.0 CONSTRUCTION ACTIVITY STORMWATER POLLUTION PREVENTION PLAN

The Construction Activity Stormwater Pollution Prevention Plan (SWPPP) will be prepared by the selected construction contractor and/or engineer of record for major construction activities at the Site. This SWPPP and accompanying erosion control plan will include the applicable Notice of Intent (NOI) and the elements necessary to comply with the State General Permit for Stormwater Discharge Associated with Construction Activities administered by the State Water Resources Control Board (SWRCB) and the San Francisco RWQCB under the NPDES Program as well as all local governing agency requirements.

The final SWPPP will be prepared and implemented during project construction to control soil and pollutants that originate on the Site and prevent them from flowing to the surface waters. It will primarily address the impact of rainfall and runoff on areas of the ground surface disturbed during the construction process.

2.1 Best Management Practices

A variety of BMPs will be used, as needed, for sediment and pollutant control during the construction period. These include sediment barriers, storm retention sediment traps, and permanent stabilization for disturbed areas. This will also be accomplished by covering the soil with pavement, buildings and/or vegetation.

Soil Stabilization BMPs include:
• Temporary Seeding
• Permanent Seeding and Planting.

Structural Controls BMPs include:
• Sediment Basins
• Sediment Traps
• Straw Wattles
• Stabilized Construction Entrance/Exit
• Storm Sewer Inlet Protection
• Diversion Ditch/Berm

Pollutant Control BMPs include:

• Dust Control
• Solid Waste Disposal and Management
• Sanitary Facilities Provision
• Water Source Management
• Concrete Waste From Concrete Ready-Mix Trucks Management
• Fuel Tank Management

Other Construction Phase BMPs to be implemented by the contractor during the construction activities include:

• Manage stockpiles of excavation materials
• Designate areas to be provided for equipment cleaning, maintenance and repair and protect the area with a temporary perimeter berm
• Prohibit use of detergents for large scale washing
• Store chemicals, paints, solvents, fertilizers, and other toxic materials in weatherproof containers; runoff containing such materials should also be collected, removed from the Site, treated, and disposed of at an approved disposal facility

The SWPPP will be implemented at the start of construction activities at the Site. The SWPPP will terminate when disturbed areas are stabilized, permanent erosion and sediment controls have been installed, temporary erosion and sedimentation controls have been removed, the construction activities covered within the SWPPP have ceased, and a completed Notice of Termination (NOT) is submitted to the governing agency.

3.0 DESCRIPTION OF SOURCE CONTROL BEST MANAGEMENT PRACTICES

Source Control BMPs to reduce pollutants in storm-water discharges after all construction phases have been completed (post-construction source control BMPs) are presented in this section. These stormwater management BMPs will be implemented by the developer until the Site use has been transferred to future owners and tenants.
3.1 Non-Stormwater Management

Proper measures will be implemented to effectively eliminate discharge of all non-stormwater flows that may or may not contain pollutants to the storm drain system. All storm drain inlets will be marked with a stencil or affixed sign which contains a brief statement prohibiting dumping of improper materials into the storm drain (see Appendix B, BMP # SD-13). This will help the City of Richmond comply with requirements of the CCCWP including requirements that 90% of the storm drain inlets have stencils prohibiting the disposal of materials down storm drains.

3.2 Spill Prevention, Control and Cleanup

An effective spill response and control plan including spill prevention, response, cleanup procedures, reporting, and training for spills, will be prepared to prevent any pollutants from entering the storm drainage system (see Appendix B, BMP # SC-11). This plan will be dependent on the types of uses proposed by the Site tenants/occupants. These plans will be prepared and updated on a regular basis by the Site tenants/occupants to address particular chemicals or wastes that could potentially be spilled at their facilities and impact stormwater runoff. This plan must include the following provisions.

- If the spill is suspected to be toxic or hazardous materials, maintenance staff will call the public safety dispatcher, 911, and/or the local illicit discharge coordinator.
- If non-hazardous materials are spilled, maintenance staff will contain the spill area immediately to prevent additional discharge of pollutants into the storm drain system and clean as soon as practicable.
- Maintenance staff will report spills to, and work with, the agency’s illicit discharge coordinator, or appropriate party, to determine the appropriate follow up response to the spill (e.g., track the source of the spill and identify product labels that have a bar code identifying the originating agency, contact Building and Planning Departments, send a clean-up bill to the responsible party, etc.).

3.3 Vehicle and Equipment Management

If equipment or vehicles are regularly washed at the Site, wash water from vehicle and equipment cleaning activities performed outdoors or in areas where wash water flows onto the ground could contribute hydrocarbons and other organic compounds, oils and greases, nutrients, phosphates, heavy metals, and suspended solids to stormwater runoff. These activities will only be conducted in designated paved wash areas and these areas will be bermed to collect the wash water and will be graded to direct the wash water to a drain that is plumbed to a sanitary sewer (See Appendix B, BMP # SD-33). These measures will be implemented as necessary by the tenants and will be updated as site uses change. It is recommended that wash areas also be in covered areas so that stormwater is not unnecessarily directed to the sanitary sewer.
3.4 Materials and Waste Management

This section discusses required BMPs related to potential harmful materials and wastes at the Site. The measures will be implemented as necessary by the tenants and will be updated as site use changes.

3.4.1 Trash Enclosures

Stormwater runoff from areas where trash is stored or disposed of can be polluted. The waste handling operations, which can be part of stormwater pollution, include dumpsters, litter control and waste piles. Preventative measures such as enclosures, containment structures, and impervious pavements to mitigate spills will be used to reduce the likelihood of contamination (see Appendix B, BMP # SD-32). Measures will be implemented by the tenants including maintaining the Site free of litter and disposing of wastes in appropriate recycling containers or waste dumpsters.

3.4.2 Outdoor Loading/Unloading/Equipment Maintenance

All delivery vehicles will be parked in designated areas so that spills or leaks from delivery vehicles can be easily identified and contained. Site tenants/occupants will keep a check for leaks on all on site equipment in the loading/unloading zone on a regular basis. Site maintenance staff will be trained on proper spill containment and cleanup to avoid any flow into the storm drain system (see Appendix B, BMP# SC-30, SC-32). Staff members responsible for spill cleanup will be trained in the measures included in the spill response and control plan required for each facility.

3.4.3 Waste Handling and Disposal

The Site tenants/occupants will, to the maximum extent possible, reduce the amount of waste generated and a material tracking system will be established to increase the awareness about material usage. This will reduce spills and minimize litter and waste stored at the Site (see Appendix B, BMP# SC-34).

3.4.4 Chemical Storage Areas

Chemical storage areas will be designed to reduce opportunity for toxic compounds, heavy metals, nutrients, suspended solids, and other pollutants to enter the storm drain system. These areas will be contained using enclosures, secondary containment, and impervious surfaces (see Appendix B, BMP # SD-34). The tenants/occupants will be responsible for cleaning and maintenance of these areas.
3.5 Building and Grounds Management

The tenants/occupants will maintain staff persons responsible for maintaining the Site in an orderly manner to minimize the potential for spills and discharges to the storm drain system.

The tenants/occupants will implement good housekeeping measures including:

- Keeping outdoor areas clean and orderly
- Disposing of wash water, sweepings and sediments properly, not in the storm drain
- Establishing a daily checklist of office and landscape areas to confirm cleanliness and adherence to proper storage and security practices and to remedy any problems
- Posting waste disposal charts in appropriate locations detailing the nature of each waste, prohibitions for disposal, and the recommended disposal method
- Summarize the BMPs in the report and post them in appropriate locations of the buildings and property areas for maintenance staff information (see Appendix B, BMP SC-60, SC-41).

3.6 Erosion and Sediment Control

Erosion and sediment control measures will be maintained during construction by implementing best management practices recommended in the SWPPP for construction activities. Post construction measures include maintaining landscaping and vegetative cover in planted areas, maintenance of stormwater management facilities, and minimizing potential for erosion in landscape areas.

3.7 Street Sweeping

The tenants/occupants will make provisions for street sweeping the paved areas including roadways, driveways, and parking lots on a regular basis to collect loose particles, and contamination related to automobile usage of these areas. Wastes generated from street sweeping will be disposed of appropriately. Street sweeping will occur at a time when occupants, customers and employees are not utilizing the majority of the Site’s paved surfaces (see Appendix B, BMP SC-71).

4.0 STRUCTURAL POST-CONSTRUCTION TREATMENT CONTROL BEST MANAGEMENT PRACTICES

Post-construction treatment control measures for the Site have been evaluated based on their suitability, removal efficiency and specific physical constraints. Based on the drainage study for the Site, eight different drainage areas have been identified and the associated acreage of permeable and impermeable surface area have been calculated for each respective drainage area as shown in Table 1.
The various types of post-construction stormwater management facilities proposed for the Site provide a staged treatment approach and coverage for the entire Site area. The system will provide treatment within each respective drainage area and treatment as runoff leaves the Site (see Figures 3-6). The combined control measures allow for treatment of runoff prior to discharge to San Francisco Bay.

Five types of post-construction structural control measures have been initially selected for the Site (see Appendix B, BMP# TC-60). These include:

- Water Quality Drain Inlet Filters
- Retention/Detention Basins
- Bio-retention Basins and Vegetated Swales (Appendix B, BMP# TC-32, TC-30)
- Subsurface Storage Vaults
- In-line Stormwater Treatment Units located at the primary outfall locations (Appendix B, BMP# TC-52).

### 4.1 Water Quality Drain Inlet Filters

Each catch basin/drain inlet filtration device proposed at the Site will treat runoff for sediment, debris, trash, and petroleum hydrocarbons from the water flowing into drainage inlets during low flow (first flush) without impeding the drainage inlet’s maximum design flow. This treatment measure is proposed for runoff from the majority of the Site. The filtration device incorporates a silicate adsorbent filter medium capable of collecting and retaining non-soluble pollutants including, but not limited to, petroleum hydrocarbons. The filter medium shall be contained in separated, removable, and displaced containers that can be easily replaced without removing the filter liner. The filtration device will be designed to separate hydrocarbons from debris, sediment and trash. The filtration device shall not rely on collected sediment, debris, trash or filter liner as the medium for the removal of petroleum hydrocarbons. High capacity filter devices shall incorporate a debris trap, designed to retain floatable pollutants during high flow periods, and both an initial filtering bypass for moderate flows and an ultimate bypass for peak design flows. The installed device shall not impede the drainage inlet’s peak design flow prior to or after the device has reached its pollutant storage capacity. Site tenants/occupants will provide maintenance of these catch basin filters, removing trash and debris on a regular basis. Media filters will be changed on a regular basis at a minimum of once annually. The tenants/occupants will properly dispose of the filters and the waste material removed from the Triton filters properly.

### 4.2 Bio-retention Basins and Vegetated Swales

A portion of the drainage areas on the Site include landscaped bio-retention basins and/or vegetated swale areas for stormwater treatment (see Figures 3-6). More traditional retention/detention basins are also considered as an alternative option for the preliminary locations where bio-retention facilities are identified (see Figure 7a).
However, bio-retention and vegetated swale areas are best at removing suspended solids (sediment), oil and grease, and pollutants that are adsorbed onto suspended solids, including heavy metals and nutrients. They promote infiltration and reduce the flow velocity of the stormwater runoff. These features are incorporated into designated landscaped areas at the Site and, wherever possible, are incorporated into the design of street medians and edges, parking lot medians and edges, and structural drainage elements. Each of the respective locations occupied by vegetated treatments, and each drainage area have been characterized with regard to the type and size of the treatment facility, the slope and size and hydrologic characteristics (i.e. permeable vs. permeable surfaces) of the contributing drainage area.

The design of the bio-retention areas on the Site includes filtration by the vegetation in the basin and through a subsoil matrix. The design of the bio-retention areas on site include a sub-surface underdrain in each treatment unit to collect water after infiltration through the soil. The bio-retention areas include an elevated drain inlet with a water quality drain inlet filter to capture overflow runoff during extended periods of heavy rainfall. The bio-retention areas will be filled with a specified sandy loam material. Typical infiltration rates for this type of soil range from 2–6 in/hr. Standard design for bio-retention facilities assumes an infiltration rate of 4 in/hr (see Figure 7b).

In addition, the stormwater runoff that is treated within these areas and/or treated through the drain inlet filters will be conveyed to stormwater treatment units located at the primary outfalls for the Site.

The design of the bio-retention areas was based on the following design guidelines consistent with the guidance provided in the 1997 Bay Area Stormwater Management Agencies Association (BASMAA) "Start at the Source Design Guidance Manual".

- Ponding depth of a maximum of 6" with an infiltration rate of at least 1.5"/hr
- Ponded water should be drawn down within 4-6 hours after a storm event
- Plants must be able to tolerate; 1) expected pollutant loading, 2) highly variable soil moisture conditions, and 3) ponding water fluctuations
- Native plant species are recommended
- Minimum of 3 plant species is recommended to insure diversity
- Plant species that require regular maintenance should be avoided
- Soil will be a sandy loam and underdrain material should be provided to increase filtration
- Soil will consist of a homogeneous mix of the following approximate proportions: 1) 50% construction sand, 2) 20-30% topsoil with less than 5% maximum clay content, 3) 20-30% organic leaf compost, 4) pH between 5.5 and 6.5
- Recommended minimum depth of 1.5 to 2.5 feet without large tree plantings
- Mulch should be maximum 2 to 3 inches deep, fresh, not aged, applied uniformly without grass clippings
- Groundwater depth below the facility invert should be at least 2'
- Slope should be less than or equal to 15%
- Underdrain should be built with a cleanout well that is accessible, if applicable, and should not be located below the groundwater table
- Underdrain should have a hydraulic capacity greater than the planting soil infiltration rate and may outfall to a suitable location such as a common space area, stream valley, drainage swale, roadside open-section, or existing enclosed drainage system
- Bioretention areas should be constructed entirely within lot boundaries with approximately 2 feet maintained between bioretention areas and property lines, and located near the perimeters and edges of the lot boundary to maintain typical Site uses.

4.3 In-Line Stormwater Treatment Control Units

The in-line stormwater treatment control units located where the storm drains discharge from the Site will be manufactured units installed using precast concrete vaults or manholes designed in accordance with final specifications (manufacturer to be determined). The final piping and manhole configuration will be shown on the civil design/improvement plans for the project. Sizing of the in-line stormwater units shall be determined based on the specific manufacturers’ parameters.

5.0 POST-CONSTRUCTION OPERATION AND MAINTENANCE

The employees and management personnel of the Site tenants will be responsible for inspection and maintenance of the bio-retention areas, drain inlet filters, and in-line filter system, and will conduct good housekeeping measures for the Site. The funding to support these activities will be provided by the Site owner/tenants. The drain inlet filters will be inspected an average of once per month during the rainy season and once during the dry season. They will be cleaned and maintained or replaced as needed according to the manufacturer recommendations. The landscaped bio-retention areas and grassy swales will be inspected at least 4 times per year and the vegetation will be replaced as needed; vegetation in these areas will not be mowed to less than 3 inches. Irrigation and mowing of the bioretention and grassy swale areas will be conducted to maintain pollutant removal efficiency. Good housekeeping measures will include Site sweeping, avoidance of over-watering, use of slow-release fertilizers, minimal use of pesticides/herbicides, and implementation of appropriate spill control and storage measures. The in-line stormwater treatment unit will be inspected by the tenants on a quarterly basis, maintained as needed according to the manufacturer’s recommendations, and cleaned a minimum of annually immediately before the onset of the rainy season (October 15).
1. The riser and outfall shall be sized to prevent discharge over the emergency spillway under normal operating conditions. The design analysis shall assume that the infiltration storage volume is not available for flood routing.

Conceptual Retention Basin Facility Detail

Point Molate, Richmond, California

Figure 7a
Conceptual Bioretention Facility Detail

Point Molate, Richmond, California

Figure 7b

NOTES:

1. ALL PERFORATED PIPE SHALL HAVE A MINIMUM OF THREE 3/4" DIAMETER HOLES, EQUALLY SPACED ALONG THE CIRCUMFERENCE OF THE PIPE AND NOT LESS THAN THREE HOLES PER LINED FOOT OF PIPE.

2. DETERMINE DIMENSIONS FROM L x W x D = INFILTRATION DESIGN VOLUME.
   * SANDY LOAM/LOAMY SAND; FINES SHOULD BE LIMITED TO TWENTY PERCENT OR LESS PASSING THROUGH A #200 SIEVE.

SOURCE: MODIFIED FROM P&A, 2004
Appendix A

Site-Specific Soil and Stormwater Constraints Data
### APN Query Details
Contra Costa Clean Water Program

<table>
<thead>
<tr>
<th>APN</th>
<th>Slope Percentage Categories (Acres)</th>
<th>Primary Roadways (ADT &gt; 15,000)</th>
<th>Water Supply Wells</th>
<th>Potential GW Vulnerability</th>
<th>Potential Soil and/or Groundwater Contamination</th>
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<td>Business Park</td>
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<td>D</td>
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### GeoHazard Categories

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<tr>
<td>Mostly Landslide</td>
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<td>Surficial Deposits</td>
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<tr>
<td>Water</td>
<td>Unsuitable area for stormwater infiltration</td>
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### Data Sources:
- U.S. Natural Resources Conservation Service
- U.S. Geological Survey

*Applicability of direct infiltration methods depends on actual planned landuse activities (see Table C-3)*

Data Source: Contra Costa County Dept. of Information Technology
Appendix B

BMP Specifications and Guidance
Spill Prevention, Control & Cleanup SC-11

Objectives
- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description
Spills and leaks, if not properly controlled, can adversely impact the storm drain system and receiving waters. Due to the type of work or the materials involved, many activities that occur either at a municipal facility or as a part of municipal field programs have the potential for accidental spills and leaks. Proper spill response planning and preparation can enable municipal employees to effectively respond to problems when they occur and minimize the discharge of pollutants to the environment.

Approach
- An effective spill response and control plan should include:
  - Spill/leak prevention measures;
  - Spill response procedures;
  - Spill cleanup procedures;
  - Reporting; and
  - Training

- A well thought out and implemented plan can prevent pollutants from entering the storm drainage system and can be used as a tool for training personnel to prevent and control future spills as well.

Pollution Prevention
- Develop and implement a Spill Prevention Control and Response Plan. The plan should include:

Targeted Constituents
- Sediment
- Nutrients
- Trash
- Metals
- Bacteria
- Oil and Grease
- Organics
- Oxygen Demanding

CASQA
CALIFORNIA STORMWATER QUALITY ASSOCIATION

January 2003
California Stormwater BMP Handbook
Municipal
www.cabmphphandbooks.com
SC-11 Spill Prevention, Control & Cleanup

- A description of the facility, the address, activities and materials involved
- Identification of key spill response personnel
- Identification of the potential spill areas or operations prone to spills/leaks
- Identification of which areas should be or are berm'd to contain spills/leaks
- Facility map identifying the key locations of areas, activities, materials, structural BMPs, etc.
- Material handling procedures
- Spill response procedures including:
  - Assessment of the site and potential impacts
  - Containment of the material
  - Notification of the proper personnel and evacuation procedures
  - Clean up of the site
  - Disposal of the waste material and
  - Proper record keeping

- Product substitution — use less toxic materials (i.e. use water based paints instead of oil based paints)

- Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of materials that are brought into the facility or into the field.

Suggested Protocols

Spill/Leak Prevention Measures

- If possible, move material handling indoors, under cover, or away from storm drains or sensitive water bodies.

- Properly label all containers so that the contents are easily identifiable.

- Berm storage areas so that if a spill or leak occurs, the material is contained.

- Cover outside storage areas either with a permanent structure or with a seasonal one such as a tarp so that rain can not come into contact with the materials.

- Check containers (and any containment sumps) often for leaks and spills. Replace containers that are leaking, corroded, or otherwise deteriorating with containers in good condition. Collect all spilled liquids and properly dispose of them.
Spill Prevention, Control & Cleanup SC-11

- Store, contain and transfer liquid materials in such a manner that if the container is ruptured or the contents spilled, they will not discharge, flow or be washed into the storm drainage system, surface waters, or groundwater.

- Place drip pans or absorbent materials beneath all mounted taps and at all potential drip and spill locations during the filling and unloading of containers. Any collected liquids or soiled absorbent materials should be reused/recycled or properly disposed of.

- For field programs, only transport the minimum amount of material needed for the daily activities and transfer materials between containers at a municipal yard where leaks and spill are easier to control.

- If paved, sweep and clean storage areas monthly, do not use water to hose down the area unless all of the water will be collected and disposed of properly.

- Install a spill control device (such as a tee section) in any catch basins that collect runoff from any storage areas if the materials stored are oil, gas, or other materials that separate from and float on water. This will allow for easier cleanup if a spill occurs.

- If necessary, protect catch basins while conducting field activities so that if a spill occurs, the material will be contained.

Training

- Educate employees about spill prevention, spill response and cleanup on a routine basis.

- Well-trained employees can reduce human errors that lead to accidental releases or spills:
  - The employees should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.
  - Employees should be familiar with the Spill Prevention Control and Countermeasure Plan if one is available.

- Training of staff from all municipal departments should focus on recognizing and reporting potential or current spills/leaks and who they should contact.

- Employees responsible for aboveground storage tanks and liquid transfers for large bulk containers should be thoroughly familiar with the Spill Prevention Control and Countermeasure Plan and the plan should be readily available.

Spill Response and Prevention

- Identify key spill response personnel and train employees on who they are.

- Store and maintain appropriate spill cleanup materials in a clearly marked location near storage areas; and train employees to ensure familiarity with the site’s spill control plan and/or proper spill cleanup procedures.

- Locate spill cleanup materials, such as absorbents, where they will be readily accessible (e.g. near storage and maintenance areas, on field trucks).
SC-11 Spill Prevention, Control & Cleanup

- Follow the Spill Prevention Control and Countermeasure Plan if one is available.

- If a spill occurs, notify the key spill response personnel immediately. If the material is unknown or hazardous, the local fire department may also need to be contacted.

- If safe to do so, attempt to contain the material and block the nearby storm drains so that the area impacted is minimized. If the material is unknown or hazardous wait for properly trained personnel to contain the materials.

- Perform an assessment of the area where the spill occurred and the downstream area that it could impact. Relay this information to the key spill response and clean up personnel.

Spill Cleanup Procedures

- Small non-hazardous spills
  - Use a rag, damp cloth or absorbent materials for general clean up of liquids
  - Use brooms or shovels for the general clean up of dry materials
  - If water is used, it must be collected and properly disposed of. The wash water can not be allowed to enter the storm drain.
  - Dispose of any waste materials properly
  - Clean or dispose of any equipment used to clean up the spill properly

- Large non-hazardous spills
  - Use absorbent materials for general clean up of liquids
  - Use brooms, shovels or street sweepers for the general clean up of dry materials
  - If water is used, it must be collected and properly disposed of. The wash water can not be allowed to enter the storm drain.
  - Dispose of any waste materials properly
  - Clean or dispose of any equipment used to clean up the spill properly

- For hazardous or very large spills, a private cleanup company or Hazmat team may need to be contacted to assess the situation and conduct the cleanup and disposal of the materials.

- Chemical cleanups of material can be achieved with the use of absorbents, gels, and foams. Remove the absorbent materials promptly and dispose of according to regulations.

- If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.

Reporting

- Report any spills immediately to the identified key municipal spill response personnel.
Spill Prevention, Control & Cleanup SC-11

- Report spills in accordance with applicable reporting laws. Spills that pose an immediate threat to human health or the environment must be reported immediately to the Office of Emergency Service (OES).

- Spills that pose an immediate threat to human health or the environment may also need to be reported within 24 hours to the Regional Water Quality Control Board.

- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour)

- After the spill has been contained and cleaned up, a detailed report about the incident should be generated and kept on file (see the section on Reporting below). The incident may also be used in briefing staff about proper procedures.

Other Considerations

- A Spill Prevention Control and Countermeasure Plan (SPCC) is required for facilities that are subject to the oil pollution regulations specified in Part 112 of Title 40 of the Code of Federal Regulations or if they have a storage capacity of 10,000 gallons or more of petroleum. (Health and Safety Code 6.67)

- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.

- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, if permitted to do so, prohibiting any hard connections to the storm drain.

Requirements

Costs

- Will vary depending on the size of the facility and the necessary controls.

- Prevention of leaks and spills is inexpensive. Treatment and/or disposal of wastes, contaminated soil and water is very expensive.

Maintenance

- This BMP has no major administrative or staffing requirements. However, extra time is needed to properly handle and dispose of spills, which results in increased labor costs.

Supplemental Information

Further Detail of the BMP

Reporting

Record keeping and internal reporting represent good operating practices because they can increase the efficiency of the response and containment of a spill. A good record keeping system helps the municipality minimize incident recurrence, correctly respond with appropriate containment and cleanup activities, and comply with legal requirements.
SC-11 Spill Prevention, Control & Cleanup

A record keeping and reporting system should be set up for documenting spills, leaks, and other discharges, including discharges of hazardous substances in reportable quantities. Incident records describe the quality and quantity of non-stormwater discharges to the storm drain.

These records should contain the following information:

- Date and time of the incident
- Weather conditions
- Duration of the spill/leak/discharge
- Cause of the spill/leak/discharge
- Response procedures implemented
- Persons notified
- Environmental problems associated with the spill/leak/discharge

Separate record keeping systems should be established to document housekeeping and preventive maintenance inspections, and training activities. All housekeeping and preventive maintenance inspections should be documented. Inspection documentation should contain the following information:

- The date and time the inspection was performed
- Name of the inspector
- Items inspected
- Problems noted
- Corrective action required
- Date corrective action was taken

Other means to document and record inspection results are field notes, timed and dated photographs, videotapes, and drawings and maps.

Examples
The City of Palo Alto includes spill prevention and control as a major element of its highly effective program for municipal vehicle maintenance shops.

References and Resources
King County Stormwater Pollution Control Manual - http://dnr.metrokc.gov/wlr/dss/spcm.htm

Orange County Stormwater Program
Spill Prevention, Control & Cleanup SC-11

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP)
Outdoor Loading/Unloading

Objectives
- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description
The loading/unloading of materials usually takes place outside on docks or terminals; therefore, materials spilled, leaked, or lost during loading/unloading may collect in the soil or on other surfaces and have the potential to be carried away by stormwater runoff or when the area is cleaned. Additionally, rainfall may wash pollutants from machinery used to unload or move materials. Loading and unloading of material may include package products, barrels, and bulk products. Implementation of the following protocols will prevent or reduce the discharge of pollutants to stormwater from outdoor loading/unloading of materials.

Approach
Pollution Prevention
- Keep accurate maintenance logs to evaluate materials removed and improvements made.
- Park tank trucks or delivery vehicles in designated areas so that spills or leaks can be contained.
- Limit exposure of materials with the potential to contaminate stormwater.
- Prevent stormwater runoff.
- Regularly check equipment for leaks.

Targeted Constituents
- Sediment
- Nutrients
- Trash
- Metals
- Bacteria
- Oil and Grease
- Organics
- Oxygen Demanding

CASQA
CALIFORNIA CONSTRUCTION
QUALITY ASSOCIATION

SC-30 Outdoor Loading/Unloading

**Suggested Protocols**

*Loading and Unloading – General Guidelines*

- Develop an operations plan that describes procedures for loading and/or unloading.
- Do not conduct loading and unloading during wet weather, whenever possible.
- Cover designated loading/unloading areas to reduce exposure of materials to rain.
- A seal or door skirt between delivery vehicles and building can reduce or prevent exposure to rain.
- Design loading/unloading area to prevent stormwater runoff which would include grading or berming the area, and positioning roof downspouts so they direct stormwater away from the loading/unloading areas.
- If feasible, load and unload all materials and equipment in covered areas such as building overhangs at loading docks.
- Load/unload only at designated loading areas.
- Use drip pans underneath hose and pipe connections and other leak-prone spots during liquid transfer operations, and when making and breaking connections. Several drip pans should be stored in a covered location near the liquid transfer area so that they are always available, yet protected from precipitation when not in use. Drip pans can be made specifically for railroad tracks. Drip pans must be cleaned periodically, and drip collected materials must be disposed of properly.
- Pave loading areas with concrete instead of asphalt.
- Avoid placing storm drains in the area.
- Grade and/or berm the loading/unloading area to a drain that is connected to a dead-end sump.

*Inspection*

- Check loading and unloading equipment regularly for leaks, including valves, pumps, flanges and connections.
- Look for dust or fumes during loading or unloading operations.

*Training*

- Train employees (e.g. fork lift operators) and contractors on proper spill containment and cleanup.
- Employees trained in spill containment and cleanup should be present during the loading/unloading.
- Train employees in proper handling techniques during liquid transfers to avoid spills.
Outdoor Loading/Unloading

- Make sure forklift operators are properly trained on loading and unloading procedures.

**Spill Response and Prevention**
- Refer to SC-11, Spill Prevention, Control & Cleanup
- Keep your spill prevention Control and countermeasure (SPCC) Plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

**Other Considerations**
- Space, material characteristics and/or time limitations may preclude all transfers from being performed indoors or under cover.

**Requirements**

**Costs**
- Should be low except when covering a large loading/unloading area.

**Maintenance**
- Conduct regular inspections and make repairs as necessary. The frequency of repairs will depend on the age of the facility.
- Check loading and unloading equipment regularly for leaks.
- Regular broom dry-sweeping of area.
- Conduct major clean-out of loading and unloading area and sump prior to October 1 of each year.

**Supplemental Information**

**Further Detail of the BMP**

**Special Circumstances for Indoor Loading/Unloading of Materials**

As appropriate loading or unloading of liquids should occur indoors so that any spills that are not completely retained can be discharged to the sanitary sewer, treatment plant, or treated in a manner consistent with local sewer authorities and permit requirements.

- For loading and unloading tank trucks to above and below ground storage tanks, the following procedures should be used:
  - The area where the transfer takes place should be paved. If the liquid is reactive with the asphalt, Portland cement should be used to pave the area.
  - Transfer area should be designed to prevent runon of stormwater from adjacent areas. Sloping the pad and using a curb, like a speed bump, around the uphill side of the transfer area should reduce run-on.
Transfer area should be designed to prevent runoff of spilled liquids from the area. Sloping the area to a drain should prevent runoff. The drain should be connected to a dead-end sump or to the sanitary sewer (if allowed). A positive control valve should be installed on the drain.

For transfer from rail cars to storage tanks that must occur outside, use the following procedures:

- Drip pans should be placed at locations where spillage may occur, such as hose connections, hose reels, and filler nozzles. Use drip pans when making and breaking connections.

- Drip pan systems should be installed between the rails to collect spillage from tank cars.

**References and Resources**

http://www.stormwatercenter.net/

King County - ftp://dnr.metrokc.gov/wir/dss/spcm/Chapter%203.PDF

Orange County Stormwater Program

San Diego Stormwater Co-permittees Jurisdictional Urban Runoff Management Program (URMP) -
Outdoor Equipment Maintenance  SC-32

Description
Outside process equipment operations and maintenance can contaminate stormwater runoff. Activities, such as grinding, painting, coating, sanding, degreasing or parts cleaning, landfills and waste piles, solid waste treatment and disposal, are examples of process operations that can lead to contamination of stormwater runoff. Source controls for outdoor process equipment operations and maintenance include reducing the amount of waste created, enclosing or covering all or some of the equipment, installing secondary containment, and training employees.

Approach
Pollution Prevention
- Perform the activity during dry periods.
- Use non-toxic chemicals for maintenance and minimize or eliminate the use of solvents.

Suggested Protocols
- Consider enclosing the activity in a building and connecting the floor drains to the sanitary sewer.
- Cover the work area with a permanent roof.
- Minimize contact of stormwater with outside process equipment operations through berming and drainage routing (runoff prevention). If allowed, connect process equipment area to public sewer.
- Dry clean the work area regularly.

Training
- Train employees to perform the activity during dry periods only and to use less or non-toxic materials.
- Train employee and contractors in proper techniques for spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.

Objectives
- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents
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CASQA
CALIFORNIA ASSOCIATION FOR STORMWATER QUALITY ASSURANCE
SC-32 Outdoor Equipment Maintenance

Spill Response and Prevention
- Refer to SC-11, Spill Prevention, Control & Cleanup
- Keep your spill prevention control and countermeasure (SPCC) plan up-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations
- Space limitations may preclude enclosing some equipment.
- Storage sheds often must meet building and fire code requirements.

Requirements

Costs
- Costs vary depending on the complexity of the operation and the amount of control necessary for stormwater pollution control.
- Providing cover may be expensive.

Maintenance
- Conduct routine preventive maintenance, including checking process equipment for leaks.
- Clean the storm drain system regularly.

Supplemental Information

Further Detail of the BMP

Hydraulic/Treatment Modifications

In some cases it may be necessary to capture and treat polluted stormwater. If the municipality does not have its own process wastewater treatment system, consider discharging to the public sewer system. Use of the public sewer might be allowed under the following conditions:

- If the activity area is very small (less than a few hundred square feet), the local sewer authority may be willing to allow the area to remain uncovered with the drain connected to the public sewer.
- It may be possible under unusual circumstances to connect a much larger area to the public sewer, as long as the rate of stormwater discharges does not exceed the capacity of the wastewater treatment plant. The stormwater could be stored during the storm and then transferred to the public sewer when the normal flow is low, such as at night.

References and Resources
California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html
Outdoor Equipment Maintenance  SC-32

Clark County Stormwater Pollution Control Manual  http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Stormwater Pollution Control Manual  http://dnr.metrokc.gov/wlk/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program  http://www.scvurppp.org

The Stormwater Managers Resource Center  http://www.stormwatercenter.net/
Waste Handling & Disposal

Objectives
- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description
Improper storage and handling of solid wastes can allow toxic compounds, oils and greases, heavy metals, nutrients, suspended solids, and other pollutants to enter stormwater runoff. The discharge of pollutants to stormwater from waste handling and disposal can be prevented and reduced by tracking waste generation, storage, and disposal; reducing waste generation and disposal through source reduction, re-use, and recycling; and preventing runoff and runoff.

Approach
Pollution Prevention
- Reduction in the amount of waste generated can be accomplished using the following source controls such as:
  - Production planning and sequencing
  - Process or equipment modification
  - Raw material substitution or elimination
  - Loss prevention and housekeeping
  - Waste segregation and separation
  - Close loop recycling
- Establish a material tracking system to increase awareness about material usage. This may reduce spills and minimize contamination, thus reducing the amount of waste produced.
- Recycle materials whenever possible.

Targeted Constituents

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Suggested Protocols

General

- Cover storage containers with leak proof lids or some other means. If waste is not in containers, cover all waste piles (plastic tarps are acceptable coverage) and prevent stormwater runon and runoff with a berm. The waste containers or piles must be covered except when in use.

- Use drip pans or absorbent materials whenever grease containers are emptied by vacuum trucks or other means. Grease cannot be left on the ground. Collected grease must be properly disposed of as garbage.

- Check storage containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.

- Sweep and clean the storage area regularly. If it is paved, do not hose down the area to a storm drain.

- Dispose of rinse and wash water from cleaning waste containers into a sanitary sewer if allowed by the local sewer authority. Do not discharge wash water to the street or storm drain.

- Transfer waste from damaged containers into safe containers.

- Take special care when loading or unloading wastes to minimize losses. Loading systems can be used to minimize spills and fugitive emission losses such as dust or mist. Vacuum transfer systems can minimize waste loss.

Controlling Litter

- Post “No Littering” signs and enforce anti-litter laws.

- Provide a sufficient number of litter receptacles for the facility.

- Clean out and cover litter receptacles frequently to prevent spillage.

Waste Collection

- Keep waste collection areas clean.

- Inspect solid waste containers for structural damage or leaks regularly. Repair or replace damaged containers as necessary.

- Secure solid waste containers: containers must be closed tightly when not in use.

- Place waste containers under cover if possible.

- Do not fill waste containers with washout water or any other liquid.

- Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc. may not be
Waste Handling & Disposal

- disposed of in solid waste containers (see chemical/hazardous waste collection section below).

- Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal.

**Good Housekeeping**

- Use all of the product before disposing of the container.

- Keep the waste management area clean at all times by sweeping and cleaning up spills immediately.

- Use dry methods when possible (e.g. sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.

- Stencil storm drains on the facility's property with prohibitive message regarding waste disposal.

**Chemical/Hazardous Wastes**

- Select designated hazardous waste collection areas on-site.

- Store hazardous materials and wastes in covered containers protected from vandalism, and in compliance with fire and hazardous waste codes.

- Place hazardous waste containers in secondary containment.

- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.

**Runoff/Runoff Prevention**

- Prevent stormwater runoff from entering the waste management area by enclosing the area or building a berm around the area.

- Prevent the waste materials from directly contacting rain.

- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropylene or hypalon.

- Cover the area with a permanent roof if feasible.

- Cover dumpsters to prevent rain from washing waste out of holes or cracks in the bottom of the dumpster.

- Move the activity indoor after ensuring all safety concerns such as fire hazard and ventilation are addressed.

**Inspection**
Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.

Check waste management areas for leaking containers or spills.

Repair leaking equipment including valves, lines, seals, or pumps promptly.

**Training**

- Train staff pollution prevention measures and proper disposal methods.
- Train employees and contractors proper spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.
- Train employees and subcontractors in proper hazardous waste management.

**Spill Response and Prevention**

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.
- Vehicles transporting waste should have spill prevention equipment that can prevent spills during transport. The spill prevention equipment includes:
  - Vehicles equipped with baffles for liquid waste
  - Trucks with sealed gates and spill guards for solid waste

**Other Considerations**

- Hazardous waste cannot be re-used or recycled; it must be disposed of by a licensed hazardous waste hauler.

**Requirements**

**Costs**

- Capital and operation and maintenance costs will vary substantially depending on the size of the facility and the types of waste handled. Costs should be low if there is an inventory program in place.

**Maintenance**

- None except for maintaining equipment for material tracking program.
Supplemental Information

Further Detail of the BMP

Land Treatment System

- Minimize the runoff of polluted stormwater from land application of municipal waste on-site by:
  - Choosing a site where slopes are under 6%, the soil is permeable, there is a low water table, it is located away from wetlands or marshes, there is a closed drainage system.
  - Avoiding application of waste to the site when it is raining or when the ground is saturated with water.
  - Growing vegetation on land disposal areas to stabilize soils and reduce the volume of surface water runoff from the site.
  - Maintaining adequate barriers between the land application site and the receiving waters. Planted strips are particularly good.
  - Using erosion control techniques such as mulching and matting, filter fences, straw bales, diversion terracing, and sediment basins.
  - Performing routine maintenance to ensure the erosion control or site stabilization measures are working.

References and Resources

King County Stormwater Pollution Control Manual - http://dnr.metrokc.gov/wlr/dss/spcm.htm

Orange County Stormwater Program

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Associations (BASMAA). On-line; http://www.basmaa.org
Building & Grounds Maintenance

Objectives
- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description
Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, and abnormal pH. Utilizing the following protocols will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

Approach
Pollution Prevention
- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.
- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.
Suggested Protocols

Pressure Washing of Buildings, rooftops, and other large objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a waste water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum, or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.

- If soaps or detergents are not used, and the surrounding area is paved, wash water runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.

- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement. Ensure that this practice does not kill grass.

Landscaping Activities

- Do not apply any chemicals (insecticide, herbicide, or fertilizer) directly to surface waters, unless the application is approved and permitted by the state.

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.

- Use mulch or other erosion control measures on exposed soils.

- Check irrigation schedules so pesticides will not be washed away and to minimize non-stormwater discharge.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.

- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.

- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.

- Clean paint brushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.
Building & Grounds Maintenance

- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. In which case you should direct the water through hay bales and filter fabric or use other sediment filters or traps.

- Store toxic material under cover with secondary containment during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.

- Use mulch or other erosion control measures when soils are exposed.

- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.

- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain, pour over landscaped areas.

- Use hand or mechanical weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.

- Follow manufacturers’ recommendations and label directions. Pesticides must never be applied if precipitation is occurring or predicted. Do not apply insecticides within 100 feet of surface waters such as lakes, ponds, wetlands, and streams.

- Use less toxic pesticides that will do the job, whenever possible. Avoid use of copper-based pesticides if possible.

- Do not use pesticides if rain is expected.

- Do not mix or prepare pesticides for application near storm drains.

- Use the minimum amount needed for the job.

- Calibrate fertilizer distributors to avoid excessive application.

- Employ techniques to minimize off-target application (e.g. spray drift) of pesticides, including consideration of alternative application techniques.
SC-41  Building & Grounds Maintenance

- Apply pesticides only when wind speeds are low.
- Work fertilizers into the soil rather than dumping or broadcasting them onto the surface.
- Irrigate slowly to prevent runoff and then only as much as is needed.
- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Dispose of empty pesticide containers according to the instructions on the container label.
- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering, and repair leaks in the irrigation system as soon as they are observed.

Training

- Educate and train employees on use of pesticides and in pesticide application techniques to prevent pollution.
- Train employees and contractors in proper techniques for spill containment and cleanup.
- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup
- Keep your Spill Prevention Control and countermeasure (SPCC) plan up-to-date, and implement accordingly.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.

Other Considerations

- Alternative pest/weed controls may not be available, suitable, or effective in many cases.
Building & Grounds Maintenance

Requirements

Costs
- Overall costs should be low in comparison to other BMPs.

Maintenance
- Sweep paved areas regularly to collect loose particles, and wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping but it is subject to rusting and results in lower quality water. Initially the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushing. Nitrates, polyphosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time, typically a year; between flushes and may accumulate iron, manganese, lead, copper, nickel and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

References and Resources

California’s Nonpoint Source Program Plan [http://www.swrcb.ca.gov/nps/index.html]

King County - ftp://dnr.metrokc.gov/wlr/dss/spcm/Chapter%203.PDF

Orange County Stormwater Program


Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA) [http://www.basmaa.org/]

San Diego Stormwater Co-permitees Jurisdictional Urban Runoff Management Program (URMP) -
Housekeeping Practices

Description
Promote efficient and safe housekeeping practices (storage, use, and cleanup) when handling potentially harmful materials such as fertilizers, pesticides, cleaning solutions, paint products, automotive products, and swimming pool chemicals. Related information is provided in BMP fact sheets SC-11 Spill Prevention, Control & Cleanup and SC-34 Waste Handling & Disposal.

Approach
Pollution Prevention
- Purchase only the amount of material that will be needed for foreseeable use. In most cases this will result in cost savings in both purchasing and disposal. See SC-61 Safer Alternative Products for additional information.
- Be aware of new products that may do the same job with less environmental risk and for less or the equivalent cost. Total cost must be used here; this includes purchase price, transportation costs, storage costs, use related costs, clean up costs and disposal costs.

Suggested Protocols
General
- Keep work sites clean and orderly. Remove debris in a timely fashion. Sweep the area.
- Dispose of wash water, sweepings, and sediments, properly.
- Recycle or dispose of fluids properly.
- Establish a daily checklist of office, yard and plant areas to confirm cleanliness and adherence to proper storage and security. Specific employees should be assigned specific inspection responsibilities and given the authority to remedy any problems found.
- Post waste disposal charts in appropriate locations detailing for each waste its hazardous nature (poison, corrosive, flammable), prohibitions on its disposal (dumpster, drain, sewer) and the recommended disposal method (recycle, sewer, burn, storage, landfill).
- Summarize the chosen BMPs applicable to your operation and post them in appropriate conspicuous places.

Objectives
- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents
- Sediment
- Nutrients
- Trash
- Metals
- Bacteria
- Oil and Grease
- Organics
- Oxygen Demanding

CASQA
California Stormwater BMP Handbook
Municipal
www.cabmphandbooks.com
Housekeeping Practices

- Require a signed checklist from every user of any hazardous material detailing amount taken, amount used, amount returned and disposal of spent material.

- Do a before audit of your site to establish baseline conditions and regular subsequent audits to note any changes and whether conditions are improving or deteriorating.

- Keep records of water, air and solid waste quantities and quality tests and their disposition.

- Maintain a mass balance of incoming, outgoing and on hand materials so you know when there are unknown losses that need to be tracked down and accounted for.

- Use and reward employee suggestions related to BMPs, hazards, pollution reduction, workplace safety, cost reduction, alternative materials and procedures, recycling and disposal.

- Have, and review regularly, a contingency plan for spills, leaks, weather extremes etc. Make sure all employees know about it and what their role is so that it comes into force automatically.

Training

- Train all employees, management, office, yard, manufacturing, field and clerical in BMPs and pollution prevention and make them accountable.

- Train municipal employees who handle potentially harmful materials in good housekeeping practices.

- Train personnel who use pesticides in the proper use of the pesticides. The California Department of Pesticide Regulation license pesticide dealers, certify pesticide applicators and conduct onsite inspections.

- Train employees and contractors in proper techniques for spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill if one should occur.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.

- Keep your Spill Prevention Control and Countermeasure (SPCC) plan up-to-date, and implement accordingly.

- Have spill cleanup materials readily available and in a known location.

- Cleanup spills immediately and use dry methods if possible.

- Properly dispose of spill cleanup material.

Other Considerations

- There are no major limitations to this best management practice.

- There are no regulatory requirements to this BMP. Existing regulations already require municipalities to properly store, use, and dispose of hazardous materials.
Housekeeping Practices

Requirements

Costs
- Minimal cost associated with this BMP. Implementation of good housekeeping practices may result in cost savings as these procedures may reduce the need for more costly BMPs.

Maintenance
- Ongoing maintenance required to keep a clean site. Level of effort is a function of site size and type of activities.

Supplemental Information

Further Detail of the BMP
- The California Integrated Waste Management Board's Recycling Hotline, 1-800-553-2962, provides information on household hazardous waste collection programs and facilities.

Examples
There are a number of communities with effective programs. The most pro-active include Santa Clara County and the City of Palo Alto, the City and County of San Francisco, and the Municipality of Metropolitan Seattle (Metro).

References and Resources
http://www.nalms.org/bclss/bmphome.html#bmp

King County Stormwater Pollution Control Manual - http://dnr.metrokc.gov/wir/dss/spcm.htm


Orange County Stormwater Program

San Mateo STOPPP - (http://stoppp.tripod.com/bmp.html)
Plaza and Sidewalk Cleaning

**Objectives**
- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

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**Description**
Pollutants on sidewalks and other pedestrian traffic areas and plazas are typically due to littering and vehicle use. This fact sheet describes good housekeeping practices that can be incorporated into the municipality's existing cleaning and maintenance program.

**Approach**

*Pollution Prevention*
- Use dry cleaning methods whenever practical for surface cleaning activities.
- Use the least toxic materials available (e.g., water-based paints, gels or sprays for graffiti removal).

**Suggested Protocols**

*Surface Cleaning*
- Regularly broom (dry) sweep sidewalk, plaza, and parking lot areas to minimize cleaning with water.
- Dry cleanup first (sweep, collect, and dispose of debris and trash) when cleaning sidewalks or plazas, then wash with or without soap.
- Block the storm drain or contain runoff when cleaning with water. Discharge wash water to landscaping or collect water and pump to a tank or discharge to sanitary sewer if allowed. (Permission may be required from local sanitation district.)
SC-71  Plaza and Sidewalk Cleaning

- Block the storm drain or contain runoff when washing parking areas, driveways or drivethroughs. Use absorbents to pick up oil; then dry sweep. Clean with or without soap. Collect water and pump to a tank or discharge to sanitary sewer if allowed. Street Repair and Maintenance.

_Graffiti Removal_

- Avoid graffiti abatement activities during rain events.

- Implement the procedures under Painting and Paint Removal in SC-70 Roads, Streets, and Highway Operations and Maintenance fact sheet when graffiti is removed by painting over.

- Direct runoff from sand blasting and high pressure washing (with no cleaning agents) into a dirt or landscaped area after treating with an appropriate filtering device.

- Plug nearby storm drain inlets and vacuum/pump wash water to the sanitary sewer if authorized to do so if a graffiti abatement method generates wash water containing a cleaning compound (such as high pressure washing with a cleaning compound). Ensure that a non-hazardous cleaning compound is used or dispose as hazardous waste, as appropriate.

_Surface Removal and Repair_

- Schedule surface removal activities for dry weather if possible.

- Avoid creating excess dust when breaking asphalt or concrete.

- Take measures to protect nearby storm drain inlets prior to breaking up asphalt or concrete (e.g. place hay bales or sand bags around inlets). Clean afterwards by sweeping up as much material as possible.

- Designate an area for clean up and proper disposal of excess materials.

- Remove and recycle as much of the broken pavement as possible to avoid contact with rainfall and stormwater runoff.

- When making saw cuts in pavement, use as little water as possible. Cover each storm drain inlet completely with filter fabric during the sawing operation and contain the slurry by placing straw bales, sandbags, or gravel dams around the inlets. After the liquid drains or evaporates, shovel or vacuum the slurry residue from the pavement or gutter and remove from site.

- Always dry sweep first to clean up tracked dirt. Use a street sweeper or vacuum truck. Do not dump vacuumed liquid in storm drains. Once dry sweeping is complete, the area may be hosed down if needed. Wash water should be directed to landscaping or collected and pumped to the sanitary sewer if allowed.

_Concrete Installation and Repair_

- Schedule asphalt and concrete activities for dry weather.
Plaza and Sidewalk Cleaning

- Take measures to protect any nearby storm drain inlets and adjacent watercourses, prior to breaking up asphalt or concrete (e.g. place sand bags around inlets or work areas).
- Limit the amount of fresh concrete or cement mortar mixed, mix only what is needed for the job.
- Store concrete materials under cover, away from drainage areas. Secure bags of cement after they are open. Be sure to keep wind-blown cement powder away from streets, gutters, storm drains, rainfall, and runoff.
- Return leftover materials to the transit mixer. Dispose of small amounts of hardened excess concrete, grout, and mortar in the trash.
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile, or dispose in the trash.
- Protect applications of fresh concrete from rainfall and runoff until the material has dried.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- Wash concrete trucks off site or in designated areas on site designed to preclude discharge of wash water to drainage system.

Controlling Litter

- Post “No Littering” signs and enforce anti-litter laws.
- Provide litter receptacles in busy, high pedestrian traffic areas of the community, at recreational facilities, and at community events.
- Cover litter receptacles and clean out frequently to prevent leaking/spillage or overflow.
- Clean parking lots on a regular basis with a street sweeper.

Training

- Provide regular training to field employees and/or contractors regarding surface cleaning and proper operation of equipment.
- Train employee and contractors in proper techniques for spill containment and cleanup.
- Use a training log or similar method to document training.

Spill Response and Prevention

- Refer to SC-11, Spill Prevention, Control & Cleanup.
- Have spill cleanup materials readily available and in a known location.
- Cleanup spills immediately and use dry methods if possible.
- Properly dispose of spill cleanup material.
SC-71 Plaza and Sidewalk Cleaning

Other Considerations

- Limitations related to sweeping activities at large parking facilities may include current sweeper technology to remove oil and grease.

- Surface cleaning activities that require discharges to the local sewer agency will require coordination with the agency.

- Arrangements for disposal of the swept material collected must be made, as well as accurate tracking of the areas swept and the frequency of sweeping.

Requirements

Costs

- The largest expenditures for sweeping and cleaning of sidewalks, plazas, and parking lots are in staffing and equipment. Sweeping of these areas should be incorporated into street sweeping programs to reduce costs.

Maintenance

Not applicable

Supplemental Information

Further Detail of the BMP

Community education, such as informing residents about their options for recycling and waste disposal, as well as the consequences of littering, can instill a sense of citizen responsibility and potentially reduce the amount of maintenance required by the municipality.

Additional BMPs that should be considered for parking lot areas include:

- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and infiltration devices.

- Utilize sand filters or oleophic collectors for oily waste in low concentrations.

- Arrange rooftop drains to prevent drainage directly onto paved surfaces.

- Design lot to include semi-permeable hardscape.

- Structural BMPs such as storm drain inlet filters can be very effective in reducing the amount of pollutants discharged from parking facilities during periods of rain.

References and Resources


Plaza and Sidewalk Cleaning


Orange County Stormwater Program


Storm Drain Signage

Design Objectives

Maximize Infiltration
Provide Retention
Slow Runoff
Minimize Impervious Land Coverage
☐ Prohibit Dumping of Improper Materials
Contain Pollutants
Collect and Convey

Description
Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach
The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications
Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations
Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations
The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include "NO DUMPING"
SD-13

Storm Drain Signage

- DRAINS TO OCEAN* and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations
Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under "designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources


Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.


### Description
Trash storage areas are areas where a trash receptacle(s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

### Approach
This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

### Suitable Applications
Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

### Design Considerations
Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

### Designing New Installations
Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.

- Make sure trash container areas are screened or walled to prevent off-site transport of trash.
Trash Storage Areas

- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations
Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define “redevelopment” in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of “redevelopment” must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under “designing new installations” above should be followed.

Additional Information
Maintenance Considerations
The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.


Vehicle Washing Areas

Design Objectives
- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description
Vehicle washing, equipment washing, and steam cleaning may contribute high concentrations of metals, oil and grease, solvents, phosphates, and suspended solids to wash waters that drain to stormwater conveyance systems.

Approach
Project plans should include appropriately designed area(s) for washing-steam cleaning of vehicles and equipment. Depending on the size and other parameters of the wastewater facility, wash water may be conveyed to a sewer, an infiltration system, recycling system or other alternative. Pretreatment may be required for conveyance to a sanitary sewer.

Suitable Applications
Appropriate applications include commercial developments, restaurants, retail gasoline outlets, automotive repair shops and others.

Design Considerations
Design requirements for vehicle maintenance are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements. Design criteria described in this fact sheet are meant to enhance and be consistent with these code requirements.

Designing New Installations
Areas for washing/steam cleaning should incorporate one of the following features:
- Be self-contained and/or covered with a roof or overhang
- Be equipped with a clarifier or other pretreatment facility
- Have a proper connection to a sanitary sewer
Vehicle Washing Areas

- Include other features which are comparable and equally effective

**CAR WASH AREAS** - Some jurisdictions' stormwater management plans include vehicle-cleaning area source control design requirements for community car wash racks in complexes with a large number of dwelling units. In these cases, wash water from the areas may be directed to the sanitary sewer, to an engineered infiltration system, or to an equally effective alternative. Pre-treatment may also be required.

Depending on the jurisdiction, developers may be directed to divert surface water runoff away from the exposed area around the wash pad (parking lot, storage areas), and wash pad itself to alternatives other than the sanitary sewer. Roofing may be required for exposed wash pads.

It is generally advisable to cover areas used for regular washing of vehicles, trucks, or equipment, surround them with a perimeter berm, and clearly mark them as a designated washing area. Sumps or drain lines can be installed to collect wash water, which may be treated for reuse or recycling, or for discharge to the sanitary sewer. Jurisdictions may require some form of pretreatment, such as a trap, for these areas.

**Redeveloping Existing Installations**

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of "redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment.

**Additional Information**

**Maintenance Considerations**

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

**Other Resources**


Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.


Outdoor Material Storage Areas

Design Objectives
- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutant
- Collect and Convey

Description
Proper design of outdoor storage areas for materials reduces opportunity for toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to enter the stormwater conveyance system. Materials may be in the form of raw products, by-products, finished products, and waste products. The type of pollutants associated with the materials will vary depending on the type of commercial or industrial activity.

Approach
Outdoor storage areas require a drainage approach different from the typical infiltration/detention strategy. In outdoor storage areas, infiltration is discouraged. Containment is encouraged. Preventative measures include enclosures, secondary containment structures and impervious surfaces.

Suitable Applications
Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment.

Design Considerations
Some materials are more of a concern than others. Toxic and hazardous materials must be prevented from coming in contact with stormwater. Non-toxic or non-hazardous materials do not have to be prevented from stormwater contact. However, these materials may have toxic effects on receiving waters if allowed to be discharged with stormwater in significant quantities. Accumulated material on an impervious surface could result in significant impact on the rivers or streams that receive the runoff.

Material may be stored in a variety of ways, including bulk piles, containers, shelving, stacking, and tanks. Stormwater contamination may be prevented by eliminating the possibility of stormwater contact with the material storage areas either through diversion, cover, or capture of the stormwater. Control measures may also include minimizing the storage area. Design
requirements for material storage areas are governed by Building and Fire Codes, and by current City or County ordinances and zoning requirements. Control measures are site specific, and must meet local agency requirements.

**Designing New Installations**
Where proposed project plans include outdoor areas for storage of materials that may contribute pollutants to the stormwater conveyance system, the following structural or treatment BMPS should be considered:

- Materials with the potential to contaminate stormwater should be: (1) placed in an enclosure such as, but not limited to, a cabinet, shed, or similar structure that prevents contact with runoff or spillage to the stormwater conveyance system, or (2) protected by secondary containment structures such as berms, dikes, or curbs.

- The storage area should be paved and sufficiently impervious to contain leaks and spills.

- The storage area should slope towards a dead-end sump to contain spills and direct runoff from downspouts/roofs should be directed away from storage areas.

- The storage area should have a roof or awning that extends beyond the storage area to minimize collection of stormwater within the secondary containment area. A manufactured storage shed may be used for small containers.

Note that the location(s) of installations of where these preventative measures will be employed must be included on the map or plans identifying BMPs.

**Redeveloping Existing Installations**
Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of "redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

**Additional Information**
Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permits.

**Other Resources**

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.
Outdoor Material Storage Areas  SD-34


Vegetated Swale

General Description
Vegetated swales are open, shallow channels with vegetation covering the side slopes and bottom that collect and slowly convey runoff flow to downstream discharge points. They are designed to treat runoff through filtering by the vegetation in the channel, filtering through a subsoil matrix, and/or infiltration into the underlying soils. Swales can be natural or manmade. They trap particulate pollutants (suspended solids and trace metals), promote infiltration, and reduce the flow velocity of stormwater runoff. Vegetated swales can serve as part of a stormwater drainage system and can replace curbs, gutters and storm sewer systems. Therefore, swales are best suited for residential, industrial, and commercial areas with low flow and smaller populations.

Inspection/Maintenance Considerations
It is important to consider that a thick vegetative cover is needed for vegetated swales to function properly. Usually, swales require little more than normal landscape maintenance activities such as irrigation and mowing to maintain pollutant removal efficiency. Swales can become a nuisance due to mosquito breeding in standing water if obstructions develop (e.g., debris accumulation, invasive vegetation) and/or if proper drainage slopes are not implemented and maintained. The application of fertilizers and pesticides should be minimized.

Maintenance Concerns, Objectives, and Goals
- Channelization
- Vegetation/Landscape Maintenance
- Vector Control
- Aesthetics
- Hydraulic and Removal Efficacy

Targeted Constituents
- Sediment
- Nutrients
- Trash
- Metals
- Bacteria
- Oil and Grease
- Organics
- Oxygen Demanding

Legend (Removal Effectiveness)
- Low
- Medium
- High

January 2003
California Stormwater BMP Handbook
Municipal
www.cabmphandbooks.com
## TC-30 Vegetated Swale

### Inspection Activities
- Inspect after seeding and after first major storms for any damages.
- Inspect for signs of erosion, damage to vegetation, channelization of flow, debris and litter, and areas of sediment accumulation. Perform inspections at the beginning and end of the wet season. Additional inspections after periods of heavy runoff are desirable.
- Inspect level spreader for clogging, grass along side slopes for erosion and formation of rills or gullies, and sand/soil bed for erosion problems.

### Suggested Frequency
- Post construction
- Semi-annual
- Annual

### Maintenance Activities
- Mow grass to maintain a height of 3–4 inches, for safety, aesthetic, or other purposes. Litter should always be removed prior to mowing. Clippings should be composted.
- Irrigate swale during dry season (April through October) or when necessary to maintain the vegetation.
- Provide weed control, if necessary to control invasive species.
- Remove litter, branches, rocks blockages, and other debris and dispose of properly.
- Maintain inlet flow spreader (if applicable).
- Repair any damaged areas within a channel identified during inspections. Erosion rills or gullies should be corrected as needed. Bare areas should be replanted as necessary.
- Declog the pea gravel diaphragm, if necessary.
- Correct erosion problems in the sand/soil bed of dry swales.
- Plant an alternative grass species if the original grass cover has not been successfully established. Reseed and apply mulch to damaged areas.
- Remove all accumulated sediment that may obstruct flow through the swale. Sediment accumulating near culverts and in channels should be removed when it builds up to 3 in. at any spot, or covers vegetation, or once it has accumulated to 10% of the original design volume. Replace the grass areas damaged in the process.
- Rototill or cultivate the surface of the sand/soil bed of dry swales if the swale does not draw down within 48 hours.

### Suggested Frequency
- As needed (frequent, seasonally)
- Semi-annual
- Annual (as needed)
- As needed (infrequent)
Vegetated Swale

Additional Information
Recent research (Colwell et al., 2000) indicates that grass height and mowing frequency have little impact on pollutant removal. Consequently, mowing may only be necessary once or twice a year for safety or aesthetics or to suppress weeds and woody vegetation.

References

U.S. Environmental Protection Agency, Post-Construction Stormwater Management in New Development & Redevelopment BMP Factsheets. Available at: cfpub.epa.gov/npdes/stormwater/menubmp/bmp_files.cfm

Bioretention

General Description
The bioretention best management practice (BMP) functions as a soil and plant-based filtration device that removes pollutants through a variety of physical, biological, and chemical treatment processes. These facilities normally consist of a grass buffer strip, sand bed, ponding area, organic layer or mulch layer, planting soil, and plants. The runoff's velocity is reduced by passing over or through a sand bed and is subsequently distributed evenly along a ponding area. Exfiltration of the stored water in the bioretention area planting soil into the underlying soils occurs over a period of days.

Inspection/Maintenance Considerations
Bioretention requires frequent landscaping maintenance, including measures to ensure that the area is functioning properly, as well as maintenance of the landscaping on the practice. In many cases, bioretention areas initially require intense maintenance, but less maintenance is needed over time. In many cases, maintenance tasks can be completed by a landscaping contractor, who may already be hired at the site. In cold climates the soil may freeze, preventing runoff from infiltrating into the planting soil.

Maintenance Concerns, Objectives, and Goals
- Clogged Soil or Outlet Structures
- Invasive Species
- Vegetation/Landscape Maintenance
- Erosion
- Channelization of Flow
- Aesthetics

Targeted Constituents
- Sediment
- Nutrients
- Trash
- Metals
- Bacteria
- Oil and Grease
- Organics
- Oxygen Demanding

Legend (Removal Effectiveness)
- Low
- High
- Medium
## Bioretention

### Inspection Activities

- Inspect soil and repair eroded areas.
- Inspect for erosion or damage to vegetation, preferably at the end of the wet season to schedule summer maintenance and before major fall runoff to be sure the strips are ready for winter. However, additional inspection after periods of heavy runoff is desirable.
- Inspect to ensure grass is well established. If not, either prepare soil and reseed or replace with alternative species. Install erosion control blanket.
- Check for debris and litter, and areas of sediment accumulation.
- Inspect health of trees and shrubs.

### Suggested Frequency

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<tr>
<th>Activity Description</th>
<th>Frequency</th>
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<tbody>
<tr>
<td>Monthly</td>
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<td>Semi-annual</td>
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### Maintenance Activities

- Water plants daily for 2 weeks.
- Remove litter and debris.
- Remove sediment.
- Reseal void areas.
- Treat diseased trees and shrubs.
- Mow turf areas.
- Repair erosion at inflow points.
- Repair outflow structures.
- Unclog underdrain.
- Regulate soil pH regulation.
- Remove and replace dead and diseased vegetation.
- Add mulch.
- Replace tree stakes and wires.
- Mulch should be replaced every 2 to 3 years or when bare spots appear. Reseal prior to the wet season.

### Suggested Frequency

<table>
<thead>
<tr>
<th>Activity Description</th>
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<tr>
<td>At project completion</td>
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<td>Monthly</td>
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<td>As needed</td>
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<td>Semi-annual</td>
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<td>Annual</td>
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<td>Every 2-3 years, or</td>
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### Additional Information

Landscaping is critical to the function and aesthetic value of bioretention areas. It is preferable to plant the area with native vegetation, or plants that provide habitat value, where possible. Another important design feature is to select species that can withstand the hydrologic regime they will experience. At the bottom of the bioretention facility, plants that tolerate both wet and dry conditions are preferable. At the edges, which will remain primarily dry, upland species will be the most resilient. It is best to select a combination of trees, shrubs, and herbaceous materials.

### References

Bioretention


U.S. Environmental Protection Agency, Post-Construction Stormwater Management in New Development & Redevelopment BMP Factsheets. Available at: cfpub.epa.gov/nepes/stormwater/menuofbmps/bmp_files.cfm

Multiple Systems

General Description
A multiple treatment system uses two or more BMPs in series. Some examples of multiple systems include: settling basin combined with a sand filter; settling basin or biofilter combined with an infiltration basin or trench; extended detention zone on a wet pond.

Inspection/Maintenance Considerations
Each of the separate treatment processes will require maintenance as described in the previous fact sheets. For example, multiple system comprises of a biofilter combined with an infiltration basin would require the inspection and maintenance considerations outlined on the fact sheet for each process.

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<thead>
<tr>
<th>Inspection Activities</th>
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<td>Refer to individual treatment control factsheets</td>
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Maintenance Concerns, Objectives, and Goals
May include the following:
- Accumulation of Metals
- Aesthetics
- Channelization of Flow
- Clogging of the Outlet
- Endangered Species Habitat Creation
- Erosion
- Groundwater Contamination
- Hazardous Waste
- Hydraulic and Removal Efficiency
- Invasive Species Management
- Mechanical Malfunction
- Pollutant Breakthrough
- Re-suspension of settled material
- Sediment and Trash Removal
- Sedimentation
- Vector/Pest Control
- Vegetation harvesting
- Vegetation/Landscape Maintenance

Targeted Constituents
- [ ] Sediment
- [ ] Nutrients
- [ ] Trash
- [ ] Metals
- [ ] Bacteria
- [ ] Oil and Grease
- [ ] Organics
- [ ] Oxygen Demanding

Legend (Removal Effectiveness)
- Low
- High
- Medium