
Lahontan Regional Water Quality Control Board

January 9, 2014

NOTICE OF INTENT TO CERTIFY A MITIGATED NEGATIVE DECLARATION

FOR THE

WILLIAM KENT CAMPGROUND REDEVELOPMENT PROJECT

PROJECT DESCRIPTION: The U.S. Forest Service – Lake Tahoe Basin Management Unit (LTBMU) is planning to redevelop service facilities and conduct water quality improvement activities at the William Kent Campground property. The property covers approximately 25-acres on the west shore of Lake Tahoe and consists of the William Kent Campground, an administrative site, and the William Kent day-use beach area.

The William Kent Campground Redevelopment Project (Project) includes:

- 1) **Redesign and upgrade campground facilities:** construct new and redesigned camping spurs and roadway to relocate campsites out of the Stream Environment Zone (SEZ), upgrade the waste dump station facility, upgrade potable water dispensers, relocate camp host sites, and redesign the entrance road and information kiosk;
- 2) **Day-use beach area water quality improvements:** improve 75-feet of storm water conveyance at the shorezone of Lake Tahoe and construct an access path to the lake;
- 3) **Campground SEZ restoration and water quality improvements:** install micro basins and swales for storm water retention; remove approximately 1060 linear feet of road, 5 culverts and 12 campsites from the SEZ, totaling approximately 15,816 square feet of SEZ impervious cover removal; and contour, decompact and seed to restore previously disturbed SEZ areas.

The LTBMU has prepared a draft Storm Water Pollution Prevention Plan (SWPPP) that contains erosion and sediment control BMPs, design plans, and project inspection and monitoring requirements to prevent erosion and storm water pollution during project construction.

PROJECT LOCATION: William Kent Campground; 1995 West Lake Blvd, Tahoe City, CA 96145; Placer County

REGULATORY PROCESS: The Regional Water Quality Control Board, Lahontan Region (Water Board) will regulate waste discharges associated with the LTBMU's implementation of the Project by: (1) the Water Board's General Waste Discharge Requirements and National Pollutant Discharge Elimination System Permit for Storm Water Discharges Associated with Construction Activity in the Lake Tahoe Basin; (2) granting exemptions to prohibitions contained in the Water Quality Control Plan for the Lahontan Region; and (3) issuing Clean Water Act Section 401 Water Quality Certification (if required). As the primary agency taking a discretionary action to approve project construction, the Water Board is the Lead Agency under the California Environmental Quality Act (CEQA).

PREVIOUS PUBLIC REVIEW: In compliance with the National Environmental Policy Act (NEPA), the LTBMU conducted public scoping for their project from November 26 to December 30, 2010 and prepared an Environmental Assessment for the William Kent Campground BMP Retrofit and Administrative Site Redevelopment Project (William Kent EA). On April 25, 2012 the LTBMU widely circulated the William Kent EA for public comment. On February 4, 2013 the LTBMU Forest Supervisor signed a Decision Notice/Finding of No Significant Impact (FONSI).

The current Project is a subset of the larger LTBMU project as analyzed in the William Kent EA and does not include redevelopment of the administrative facility or relocation of the Meeks Bay Fire Station as described in the EA. This Notice of Intent serves as a notice of the Water Board's intent to certify a Mitigated Negative Declaration for the campground and beach site improvements only.

INTENT TO ADOPT A MITIGATED NEGATIVE DECLARATION: The Project is subject to the requirements of both NEPA and CEQA. The LTBMU developed the William Kent EA and FONSI for the larger William Kent Campground BMP Retrofit and Administrative Site Redevelopment Project, pursuant to NEPA. Water Board staff have reviewed the information contained in the LTBMU's William Kent EA for compliance with CEQA, and determined that additional mitigation measures and information are needed to comply with CEQA.

The Water Board is circulating a Mitigated Negative Declaration and associated CEQA checklist along with supporting documents in compliance with CEQA guidelines.

The CEQA checklist was developed by Water Board staff to inform the public and interested agencies of the additional mitigation measures identified as necessary by the Water Board. It also summarizes the design features contained in the William Kent EA that will be implemented to reduce potential negative impacts to less than significant levels.

The CEQA checklist and supporting documentation, including the William Kent EA and draft SWPPP, are all available on the Water Board's website at:

http://www.waterboards.ca.gov/lahontan/board_info/agenda/2014/april/william_kent_mnd.pdf

The Water Board will consider certifying the Mitigated Negative Declaration during a public meeting held on:

DATE: April 9-10, 2014

TIME: During the Water Board's regular meeting. Meetings generally begin at 4:00PM; however this is subject to change. The exact time will be posted on the Water Board's web page at:
<http://www.waterboards.ca.gov/lahontan/index.shtml>

PLACE: Water Board Annex Office, 971 Silver Dollar Ave., South Lake Tahoe, CA 96150. The location information will also be available on the Water Board's web page at
<http://www.waterboards.ca.gov/lahontan/index.shtml> no less than 10 days before the meeting.

PUBLIC REVIEW PERIOD: The public review period for the Mitigated Negative Declaration is from **January 10, 2014 to February 10, 2014**. Written comments or questions on these documents should be directed to the attention of Laurie Scribe at the address below or via email to LScribe@waterboards.ca.gov

Paper or electronic copies of these documents may be obtained by emailing Laurie Scribe at the above email address or calling (530) 542-5465; or may be examined and photocopied on weekdays between 8:30 a.m. and 4:30 p.m. at the Lahontan Water Board's office, 2501 Lake Tahoe Boulevard, South Lake Tahoe, CA 96150.

Mitigated Negative Declaration

This statement and attachments constitute the Mitigated Negative Declaration as proposed for adoption by the California Regional Water Quality Control Board, Lahontan Region (Water Board) for the project described below.

Posting Date: January 10, 2014

**To State
Clearinghouse:** January 8, 2014

Comment Period: January 10, 2014-February 10, 2014

**Proposed Adoption
Date:** April 9, 2014

Project Name: William Kent Campground Redevelopment Project

Staff Contact: Laurie Scribe (530) 542-5465
Lscribe@waterboards.ca.gov

Project Description: The U.S. Forest Service – Lake Tahoe Basin Management Unit (LTBMU) is planning to redevelop facilities and conduct water quality improvement activities at the 25-acre William Kent Campground property on the west shore of Lake Tahoe. The Project includes facility upgrades, SEZ restoration, and improvements to storm water conveyances at the beach site.

The Water Board will regulate discharges from the Project by: (1) granting coverage under the Water Board's General Waste Discharge Requirements and National Pollutant Discharge Elimination System Permit for Storm Water Discharges Associated with Construction Activity in the Lake Tahoe Basin; (2) granting an exemption to a discharge prohibition in the Lahontan Regional Board Water Quality Control Plan; and (3) issuing Clean Water Act 401 Water Quality Certification (if required).

Project Location: 1995 West Lake Blvd, Tahoe City, CA 96145; Placer County

Environmental Finding: The project, as described in the attached CEQA Environmental Checklist, the LTBMU Environmental Assessment, and the LTBMU Draft Storm Water Pollution Prevention Plan (SWPPP), incorporates design features and best management practices to reduce potentially significant impacts to the environment to less than significant levels.

Lead Agency:

Lahontan Regional Water Quality Control Board
2501 Lake Tahoe Boulevard
South Lake Tahoe, California 96150
phone: (530) 542-5400 fax: (530) 544-2271

**Other Agencies Whose
Approval May be
Required:**

The Tahoe Regional Planning Agency, United States Army
Corps of Engineers

Attachments:

- 1) CEQA Environmental Checklist
- 2) LTBMU Environmental Assessment for the William Kent
Campground BMP Retrofit and Administrative Site
Redevelopment Project
- 3) LTBMU Draft Storm Water Pollution Prevention Plan

**How to Submit
Comments:**

The Lead Agency invites comments on the proposal from all interested persons and parties. **Written comments must be received by 5:00 p.m. on February 10, 2014.** Written comments should be addressed to the Lahontan Regional Water Quality Control Board at the address/fax provided above. For more information contact: Laurie Scribe, (530) 542-5465, LScribe@waterboards.ca.gov

California Regional Water Quality Control Board
Lahontan Region

CEQA Environmental Checklist

PROJECT DESCRIPTION AND BACKGROUND

Project Title:	William Kent Campground Redevelopment Project
Lead agency name and address:	Lahontan Regional Water Quality Control Board 2501 Lake Tahoe Blvd. South Lake Tahoe, CA 96150
Contact person and phone number:	Laurie Scribe, (530) 542-5465 LScribe@waterboards.ca.gov
Project Location:	William Kent Campground, West shore of Lake Tahoe, 1995 West Lake Blvd, Tahoe City, CA 96145; Placer County
Project sponsor's name and address:	U.S. Forest Service Lake Tahoe Basin Management Unit 35 College Drive South Lake Tahoe, CA 96150
Description of project: (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation.)	The U.S. Forest Service – Lake Tahoe Basin Management Unit (LTBMU) is planning to redevelop facilities and conduct water quality improvement activities at the William Kent Campground property. The property covers approximately 25-acres on the west shore of Lake Tahoe and consists of the William Kent Campground, an administrative site, and the William Kent day-use beach area. In 2012, the LTBMU prepared an Environmental Assessment for the William Kent Campground BMP Retrofit and Administrative Site Redevelopment Project (William Kent EA) and in 2013 signed a Decision Notice/Finding of No Significant Impact (FONSI) in compliance with the National Environmental Policy Act (NEPA). The William Kent Campground BMP Retrofit and Administrative Site Redevelopment Project includes: redesigning and upgrading the campground facilities, Stream Environment Zone (SEZ) restoration in the campground and beach site,

	redevelopment of an administrative facility, relocation of the Meeks Bay Fire Station to the administrative facility, and decommissioning and removal of the current Meeks Bay Fire Station. The LTBMU applied to the Water Board for permits to implement part of the federal project analyzed under NEPA. Some components of the federal project require discretionary approvals from the Water Board. The William Kent Campground Redevelopment Project (Project) analyzed in this Environmental Checklist, a subset of the larger project analyzed under NEPA, includes the following elements: 1) Redesign and upgrade of campground facilities: construction of new and redesigned camping spurs and roadway to relocate campsites out of SEZ, upgrading the dump station facility, upgrading potable water dispensers, relocating camp host sites, redesign of the entrance road and information kiosk. 2) Day-use beach area water quality improvements: day-lighting of 75-feet of a storm water culvert at the shorezone of Lake Tahoe, construction of an access path to the lake. 3) Campground SEZ restoration and water quality improvements: installation of micro basins and swales for storm water retention; removal of approximately 1060 linear feet of road, 5 culverts and 12 campsites from the SEZ, totaling approximately 15,816 square feet of impervious cover removed from the SEZ; contouring, decompacting and seeding to restore the SEZ. Other elements of the federal project that are not planned to be implemented at this phase, such as redevelopment of an administrative facility, relocation of the Meeks Bay Fire Station to the administrative facility, and decommissioning and removal of the current Meeks Bay Fire Station, are not addressed in this document. These elements have independent utility and are not a necessary element of the Project, as described above. If the LTBMU decides to move forward on those other elements of the federal project described in the EA, and the Water Board must take a discretionary action related to those elements, the Water Board will take additional action to comply with CEQA at that time. The LTBMU has prepared a draft Storm Water Pollution Prevention Plan (SWPPP), describing Best Management Practices (BMPs) that it will implement to control discharges of sediment and protect water quality. The SWPPP also

	contains: • Detailed Project description • Facility location maps • Campground site design plans • Beach site culvert design plans • Erosion and sediment control BMP descriptions • BMP inspection, maintenance, and monitoring plans • Construction schedule and phasing The LTBMU's William Kent EA and SWPPP together describe measures the LTBMU will use to avoid or substantially lessen and mitigate potential adverse environmental impacts associated with the Project. The Water Board will regulate discharges from the Project by: (1) granting coverage under the Water Board's General Waste Discharge Requirements and National Pollutant Discharge Elimination System Permit for Storm Water Discharges Associated with Construction Activity in the Lake Tahoe Basin; (2) granting Basin Plan Prohibition Exemptions, and by (3) granting Clean Water Act 401 Water Quality Certification if the Army Corps of Engineers determines that a Clean Water Act section 404 permit is required for the Project. The Water Board is the Lead Agency under the California Environmental Quality Act (CEQA).
Surrounding land uses and setting; briefly describe the project's surroundings:	The William Kent property is bounded by private residences to the North, South, and West. There are commercial properties to the East. Highway 89 separates the campground from the beach facility.
Other public agencies whose approval is required (e.g. permits, financial approval, or participation agreements):	Tahoe Regional Planning Agency, United States Army Corps of Engineers

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, as indicated by the checklist on the following pages.

☐	Aesthetics	☐	Agriculture and Forestry	☐	Air Quality
☒	Biological Resources	☐	Cultural Resources	☒	Geology/Soils
☐	Greenhouse Gas Emissions	☒	Hazards and Hazardous Materials	☒	Hydrology/Water Quality
☐	Land Use/Planning	☐	Mineral Resources	☐	Noise
☐	Population/Housing	☐	Public Services	☒	Recreation
☐	Transportation/Traffic	☐	Utilities/Service Systems	☒	Mandatory Findings of Significance

DETERMINATION:

On the basis of this initial evaluation:

☐	I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.
☒	I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.
☐	I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.
☐	I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.
☐	I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required

Signature:	Date:
Printed Name: PATTY Z. KOUYOUMDJIAN, EXECUTIVE OFFICER	

CEQA Environmental Checklist

This checklist identifies potential impacts to the environment from the Project. In some cases, background studies performed in connection with the project indicate no impacts, and in other circumstances, the nature and location of the project make it obvious that there would be certain types of impacts. A NO IMPACT answer in the last column reflects these determinations. Where there is a need for clarifying discussion, the discussion is included either following the applicable section of the checklist or referenced to the appropriate section of the William Kent EA or the draft Storm Water Pollution Prevention Plan (SWPPP), which are attached. The words "significant" and "significance" used throughout the following checklist are related to CEQA, not NEPA, impacts. The questions in this form are intended to encourage the thoughtful assessment of impacts and do not represent thresholds of significance.

The Project is subject to the requirements of both the federal National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). The LTBMU is the NEPA Lead Agency. In 2012 the LTBMU developed the William Kent EA and in February 2013 signed a FONSI for the William Kent EA, pursuant to NEPA.

Section 15221 of the CEQA Guidelines directs that when a project requires compliance with both NEPA and CEQA, state Lead Agencies should use the EA and FONSI rather than preparing a separate Negative Declaration, as long as the EA and FONSI comply with the requirements of CEQA. This Mitigated Negative Declaration and CEQA Environmental Checklist incorporate by reference the William Kent EA pursuant to CEQA Guidelines section 15150, and rely on that analysis. However, the Water Board staff has also determined that additional mitigation measures, which are described in the LTBMU's SWPPP and set forth here, are needed to comply with CEQA requirements.

Therefore, the Water Board is circulating a CEQA checklist, along with the William Kent EA and SWPPP to support a Mitigated Negative Declaration in compliance with CEQA guidelines. This CEQA checklist was developed by Water Board staff to inform the public and interested agencies of the potential environmental impacts of the Project and describe the additional mitigation measures, which are contained in the SWPPP and identified as necessary by the Water Board to avoid or mitigate those impacts to less than significant levels. A discussion of growth inducing impacts and mandatory findings of significance, as required by CEQA, is also included in the CEQA checklist.

The federal William Kent Campground BMP Retrofit and Administrative Site Redevelopment Project was designed to prevent negative environmental impacts by incorporating "Design Features" (DFs) into the project design to mitigate or avoid significant environmental effects. For each resource category, the CEQA Environmental Checklist identifies the DFs that have been incorporated into the federal project design to reduce impacts. The DFs are further described in the

William Kent EA, Section 2.5. In addition, water quality BMPs that are part of the federal project are included in the William Kent EA, Appendix A. Project maps and design plans are located in the SWPPP.

I. AESTHETICS: Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☒	☐
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☒	☐

Existing conditions and potential impacts to scenic resources are analyzed in the William Kent EA Section 3.4 (Scenic Resources). Section 3.4 describes the effects of the Project as generally improving scenic quality and scenic stability. Some trees will be removed for the Project but the overall scenic attribute of a forested campground will be retained and the remaining trees will have greater vigor and health. The SEZ restoration work will improve the scenic quality of the campground.

The Water Board concurs with that analysis and considers it to sufficiently describe how the Project, including its Design Features (DFs), will have a less than significant impact to scenic resources. The following Project DFs described in the William Kent EA will reduce impacts to aesthetic values of the area:

- DF Scenic Resources 1 (consistency with USFS Built Environment Image Guide)
- DF Scenic Resources 2 (retention of large mature trees)
- DF Engineering 4 (lighting that limits light pollution)
- DF Engineering 6 (construction hours from 7:00 AM to 7:00 PM)
- DF Tree Removal 1 (emphasis on retaining large trees)
- DF Tree Removal 2 (tree thinning will consider screening objectives)

a-b) The beach day use area, adjacent to Highway 89, has view of Lake Tahoe which may be considered a scenic vista. The Project will result in a change to topography in this area and an elimination of the pipe outfall at the lakeshore. Some vegetation, including approximately five trees, will be removed to create the open channel. The vegetation removal will slightly increase the view of the lake from the picnic area. Although the Project will remove some vegetation from the beach area, it will not have a substantial adverse effect on the vista; therefore the appropriate finding is a less than significant impact.

c) The Project will alter some of the facilities within the campground property; however the overall character of the property will remain as forested land. Project implementation will result in improved scenic quality through restoration of the SEZ and by upgrading campground restrooms and entrance kiosk to be in compliance with the USFS Built Environment Image Guide, which provides direction to ensure that constructed facilities reflect the visual character and cultural identity of the landscape within which they are built.

Scenic impacts to adjacent property from camp sites and traffic circulation within the campground will be improved along the southern property boundary due to removal of the road and camp sites from the SEZ. The number of camp sites and road alignments along the western and northern property boundary will remain unchanged from existing conditions. The addition of a new road segment through the interior of the site may result in a slight decrease in traffic along the northern property boundary, which would improve aesthetics for the properties adjacent on that side.

The appearance of the beach site will change by excavating 75-ft of the existing culvert and creating an open channel. This will reduce the size of the picnic area but will not restrict access to the lake.

Construction activities will cause short-term impacts to aesthetics, especially to the adjacent property owners. These impacts will occur for approximately 6 months, but will allow for overall improvement of scenic quality to the property. Due to the short duration of the construction and the implementation of DFs, the appropriate finding is less than significant.

d) Facility will not change significantly from the existing conditions and DFs will assure that any new lighting is designed to reduce light pollution; therefore the appropriate finding is less than significant.

II. AGRICULTURE AND FOREST RESOURCES:

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project; and the forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

a) There is no farmland or agricultural resources in or adjacent to the Project area, therefore the appropriate finding is no impact.

b-c) The Project does not conflict with zoning nor cause rezoning; therefore the appropriate finding is no impact.

d-e) The Project does not involve the conversion of forest land, therefore the appropriate finding is no impact.

III. AIR QUALITY: Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non- attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☒
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

Potential impacts to air quality are analyzed in the William Kent EA Section 3.7 (Air Quality). Section 3.7 states that most of the Lake Tahoe Basin air quality thresholds developed by the TRPA show a positive trend toward attainment. The most detrimental air pollutants in the area are greenhouse gases (GHGs), with the most common source being from vehicle emissions. Potential impacts on air quality are associated primarily with construction activities such as temporary dust from equipment, grading activities and road decommissioning. Dust abatement measures will reduce negative effects on air quality. The Project will not exceed state and local air quality standards. The Water Board concurs with that analysis and considers it to sufficiently describe how the Project, including its DFs, will have a less than significant impact to air quality. Project DFs to reduce air quality impacts are described in the William Kent EA Section 2.5, including:

- DF Air Quality 1 (stabilization of unpaved vehicle traffic areas)
- DF Air Quality 2 (speed limits on unpaved roads)
- DF Air Quality 3 (stockpile management)
- DF Air Quality 4 (watering an area prior to ground disturbance)
- DF Air Quality 5 (cleaning of vehicles leaving the Project area)

- DF Air Quality 6 (suspension of activities if prevention measures are inadequate)
- DF Air Quality 7 (stabilization of transported materials)
- DF Air Quality 8 (prevention of wind-driven dust from disturbed areas)

a-e) Construction activities, as described for the Project in the attached documents, are most likely to affect air quality by generating short-term and minor amounts of vehicle exhaust and fugitive dust. Project DFs minimize the production and transport of fugitive dust from the Project by providing dust abatement through such measures such as regular watering, stabilization of the disturbed surfaces, and stockpile management.

IV. BIOLOGICAL RESOURCES: Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☒	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☒	☐	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☒	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

The William Kent EA discusses potential biological impacts in Section 3.2 (Wildlife Resources) and Section 3.3 (Botanical Resources). The William Kent EA discloses potential effects on species (and/or their habitats) listed as endangered, threatened, candidate or proposed under the federal Endangered Species Act of 1973 as amended (ESA); species designated as sensitive by the Regional Forester in Region 5; species designated as special-interest by the Tahoe Regional Planning Agency; habitats designated for management indicator species (MIS) for the Lake Tahoe Basin Management Unit; and wildlife and fisheries threshold standards as designated by the TRPA report.

Information found in Sections 3.2 and 3.3 is based upon the Biological Assessment/Biological Evaluation Aquatic and Terrestrial Species Report, the MIS Report, and the TRPA Project Impact Analysis. There are no known special status botanical or wildlife species currently present in the Project area; however, suitable habitat for multiple species does exist. In general the campground is considered low quality habitat for wildlife because it is an urban campground that is surrounded by residential housing and commercial property, and it has frequent disturbance by intense recreational use.

There are potential minor direct and indirect impacts to individuals of a species related to project construction; however the Project is designed to improve habitat conditions in the long-term. The Project will remove an existing road in an SEZ and restore the area to natural conditions. No noxious weed infestations occur in the Project area; however, there are noxious bull thistle and St. John's Wort infestations adjacent to the Project area that could be spread unless DFs are utilized. Construction related impacts are minimized through implementation of the DFs listed below. The Water Board concurs with that analysis; however, it requires that additional mitigation be added to reduce Project impacts to less than significant.

DFs listed in the William Kent EA to protect biological resources include:

- DF Wildlife 1 (implementing Limited Operating Periods)
- DF Wildlife 2 (procedures if species found during construction)
- DF Wildlife 3 (retention of large diameter downed logs)
- DF Wildlife 4 (trash management during construction)
- DF Botany 1 (flagging and avoidance of sensitive plant species)
- DF Botany 2 (invasive species prevention)
- DF Botany 3 (equipment inspection for invasive species prevention)
- DF Botany 4 (equipment cleaning)
- DF Botany 5 (use of certified weed-free materials)
- DF Botany 6 (seed mix approved by LTBMU Forest Botanist)
- DF Botany 7 (avoidance of areas infested with invasive species for staging)
- DF Botany 8 (cheatgrass infestation protocols)
- DF Botany 9 (post-project monitoring for invasive species)

a) There are no known special status wildlife species currently present in the Project area; therefore the appropriate finding is no impact.

b-c) Construction activities may cause short term direct and indirect impacts to biological resources due to SEZ disturbance and tree removal. Overall, the Project will enhance biological resources within the Project area by removing a road and camping spurs located in an SEZ and improving and expanding riparian habitat. The lower portion of the culverts to be removed at the beach area are located below the high water rim of Lake Tahoe, and may be considered by the

Army Corps of Engineers to be Waters of the United States pursuant to Section 404 of the Clean Water Act.

The SWPPP provides additional measures necessary to mitigate potential impacts to biological resources. BMPs in the SWPPP (Section III) which mitigate impacts to riparian habitat and wetlands include:

- EC-1 (Scheduling to Avoid Wet Season Construction)
- EC-2 (Preservation of existing vegetation)
- NS-1 (Water Control and Conservation)
- NS-2 (Dewatering Operations)
- NS-5 (Clean Water Diversion Around Work Site)
- NS-6 (Illicit Connection and Illegal Discharge)

These additional measures are adequate to mitigate impacts to biological resources in the Project area to less than significant.

In addition, all work would comply with requirements of permits issued by the Water Board, including NPDES construction stormwater permit requirements and requirements set forth in a Clean Water Act section 401 State Water Quality Certification, if certification is required. The mitigation identified herein and in the attached Project documents will be incorporated into the terms of the permits.

d) As described in the William Kent EA, bears frequently travel through certain portions of the campground and tear down perimeter fencing. The Project will improve wildlife movement through the campground by creating breaks in fencing that will provide easy access across the property; therefore the appropriate finding is less than significant.

e-f) The Project does not conflict with any local or regional plans protecting biological resources and habitat, therefore the appropriate finding is no impact.

V. CULTURAL RESOURCES: Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☐	☐	☒
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☒	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☒	☐

Forest Service policy requires that projects with the potential to affect cultural resources be surveyed for such resources in order to comply with applicable federal laws and regulations. The LTBMU and the Forest Service currently operate under two major Programmatic Agreements with the California State Historic Preservation Officer (CA-SHPO). In 1996 the LTBMU evaluated the Project area for heritage and archeological resources. No cultural resources were recorded within the Project area. Documentation of this survey is retained in the Project record at the Water Board office.

a-b) The Project area has been evaluated for the presence of historic and archeological resources, and does not have any catalogued sites. Because there are no historical or archeological resources in the Project area, the appropriate finding is no impact.

c-d) It is possible that buried or concealed cultural resources, including human remains, could be present and detected during project ground disturbance activities. In the event of discoveries of heritage resources, the LTBMU will implement DF Heritage Resources 1, William Kent EA Section 2.5. This DF directs that project activities would cease in the area of the find, and the project operator would notify the LTBMU archaeologist to begin consultation process pursuant to the Code of Federal Regulations 36 CFR Part 800, Section 800.13. In the event that human remains are discovered during project activity, law requires that project managers contact the county coroner. If the remains are determined to be of Native American origin, both the Native American Heritage Commission and any identified descendants should be notified.

Water Board staff have reviewed DF Heritage Resources 1 and find that it is sufficient to protect cultural resources in the Project area. Therefore, the appropriate finding is less than significant.

VI. GEOLOGY AND SOILS: Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42?	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☒
b) Result in substantial soil erosion or the loss of topsoil?	☐	☒	☐	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒

Impacts to soil resources are discussed in the William Kent EA Section 3.6 (Hydrology/Soils). Section 3.6 describes the soil types, soil conditions and erosion potential within the Project area. The soil in the Project area is a Kneeridge gravelly sandy loam, moderately well drained to well-drained. Current recreational use by vehicles, foot traffic, and campers has caused compaction of the soils and decreased vegetative cover in the Project area. The elimination of existing campsites, roads, and impervious surfaces in the SEZ and creation of new, updated, and BMP-improved campsites, roads, and trails will have a net benefit to soil and water resources over the long term. The Water Board concurs with that analysis, however requires that additional mitigation be added to reduce short term Project impacts to less than significant.

Project-wide, significant erosion will be reduced through implementation of the prescribed DFs, including:

- DF Soil and Ground Disturbance 1(Grading season restrictions)
- DF Soil and Ground Disturbance 2 (USFS Water Quality BMPs)
- DF Soil and Ground Disturbance 4 (Staging area management)
- DF Soil and Ground Disturbance 5 (Stockpile management)
- DF Soil and Ground Disturbance 7 (Stormwater basins)
- DF Soil and Ground Disturbance 10 (SEZ flagging)
- DF Soil and Ground Disturbance 14 (Paving)

a i-iv) The proposed project is not located in an Earthquake Fault Zone, therefore the appropriate finding is no impact.

b) The Project is intended to restore the ecosystem function of the area by improving riparian and wetland habitat. However, Project implementation could result in short-term increases in erosion potential from the use of mechanical equipment for SEZ and wetland restoration and road decommissioning and building.

The SWPPP provides additional mitigation measures necessary to mitigate potential soils impacts. BMPs in the SWPPP (Section III), which mitigate potential soil erosion include:

- EC-1 (Scheduling to Avoid Wet Season Construction)
- EC-2 (Preservation of Existing Vegetation)
- EC-3 (Hydraulic Mulch)
- EC-4 (Hydroseed)
- EC-8 (Wood Mulch)
- EC-12 (Stream Bank Stabilization)
- SE-2 (Sediment Basins)

These measures are adequate to mitigate impacts to soils resources in the Project area to less than significant.

c-e) The Project is not located on an unstable geologic unit or expansive soil, and does not involve any wastewater disposal, therefore the appropriate finding is no impact.

VII. GREENHOUSE GAS EMISSIONS: Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☐	☒
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☒

Greenhouse gas (GHG) emissions are discussed in the William Kent EA Sections 3.7 (Air Quality) and Section 3.5 (Transportation/Traffic). As described in the William Kent EA, GHG impacts from the Project are primarily related to vehicle emissions. Implementation of the campground improvements will result in fewer daily vehicle trips than the existing condition and improve circulation within the campground facility. The reduction in vehicle trips will result in less GHG production. GHG emissions due to construction of the Project will be offset by the long-term reduction in vehicle trips.

The Water Board concurs with that analysis and considers it to sufficiently describe how the Project will have no impact to greenhouse gas emissions.

VIII. HAZARDS AND HAZARDOUS MATERIALS:

Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☒	☐	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☒	☐	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

a-b) The Project will not routinely transport, use, or dispose of hazardous materials. The LTBMU will use excavators and other heavy equipment within the Project area during construction. There is the potential for small gasoline, diesel fuel, oil, and hydraulic fluid spills and leaks that could create a hazard to the environment.

BMPs in the SWPPP (Section III) that mitigate potential impacts from hazardous materials include:

- WM-4 (Spill Prevention and Control)

- WM-5 (Solid Waste Management)
- WM-6 (Hazardous Waste Management)
- NS-8 (Vehicle and Equipment Cleaning)
- NS-9 (Vehicle and Equipment Fueling)
- NS-10 (Vehicle and Equipment Maintenance)

These measures will mitigate impacts from the minimal use of hazardous materials in the Project area to less than significant levels.

c) The Project is not located within one-quarter mile of any school; therefore, the appropriate finding is no impact.

d) The Project does not alter or weaken any requirements to identify risks due to hazardous materials sites pursuant to Government Code Section 65962.5; therefore, the appropriate finding is no impact.

e-f) The Project does not involve activities near an airport or airstrip that would result in a safety hazard; therefore, the appropriate finding is no impact.

g) The Project will not alter paved traffic routes, nor impede traffic flow and thus will not interfere with an emergency evacuation or response plan; therefore, the appropriate finding is no impact.

h) The Project involves the removal of trees to relocate campground roads, and these activities should result in slight decreased risk of exposure to wildland fires; therefore, the appropriate finding is no impact.

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IX. HYDROLOGY AND WATER QUALITY: Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Violate any water quality standards or waste discharge requirements?	☐	☒	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☒	☐	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☒	☐	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☒	☐	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation by seiche, tsunami, or mudflow	☐	☐	☐	☒

Impacts to hydrology and water quality are discussed in the William Kent EA Section 3.6 (Hydrology/Soils). Section 3.6 describes that the Project will have direct and indirect impacts on these resources. The Water Board concurs that the Project goals of increasing SEZ acreage and improving riparian habitat will result in overall improvements in riparian resource conditions. However, the Water Board finds that additional best management practices in the SWPPP

must be implemented to reduce potential short-term Project impacts to water quality from construction activities to less than significant. Those additional mitigation measures, described below, will be made requirements of the permits for the Project.

The LTBMU has incorporated DFs to reduce potential impacts, including:

- DF 1 (review BMPs prior to rain events)
- DF 2 (limit grading and soil disturbance to dry season)
- DF 58 (groundwater levels in construction area)
- DFs 59-60 (temporary roads)
- DF 61 (seasoning of new channel)
- DF 62 (soil erosion control)
- DF 64-65 (revegetation)

a), c), d), f) Project components involving SEZ restoration have the potential to cause short-term violations of water quality standards primarily related to increases in turbidity both during construction and immediately following Project completion.

The SWPPP provides additional measures necessary to mitigate potential impacts to hydrology and water quality. BMPs in the SWPPP (Section III) that mitigate impacts to hydrology and water quality include:

- WM-3 (Stockpile Management)
- EC-2 (Preservation of Existing Vegetation)
- EC-9 (Drainage Swales)
- EC-12 (Stream Bank Stabilization)
- SE-2 (Sediment Basins)
- NS-1 (Water Control and Conservation)
- NS-2 (Dewatering Operations)
- NS-5 (Clear Water Diversion)
- NS-6 (Illicit Connection and Illegal Discharge)
- NS-15 (Demolition Adjacent to Water)

Water Board staff have reviewed these measures, and find that they are adequate to mitigate water quality impacts from the Project to less than significant levels.

In addition, all restoration work would comply with requirements of permits issued by the Water Board, including NPDES construction stormwater permit requirements and requirements set forth in a Clean Water Act section 401 State Water Quality Certification, if certification is required. The mitigation identified herein and in the attached EA and SWPPP will be incorporated into the terms of the permits.

- b) The Project does not propose any use of groundwater supplies and will not interfere substantially with groundwater recharge; therefore, the appropriate finding is no impact.
- e) The Project will not increase storm water drainage therefore the appropriate finding is no impact.
- g) There is no housing developed for this Project, therefore the appropriate finding is no impact.
- h) The Project will not place structures within a 100-year flood zone that would impede flows, nor would it cause flooding beyond the SEZ boundary, therefore the appropriate finding is no impact.
- i) The Project will not subject people or non-natural structures to flooding; therefore the appropriate finding is no impact.
- j) The Project does not create a risk of inundation by seiche, tsunami, or mudflow therefore the appropriate finding is no impact.

X. LAND USE AND PLANNING: Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

Consistency with local plans and policies is discussed in William Kent EA Section 1.11.11. The Tahoe Regional Planning Agency (TRPA) Regional Plan contains environmental thresholds for both habitats and species of interest. No TRPA Special Interest Species, fish, or wildlife habitats of significance would be adversely affected by the Project. The Water Board concurs with that analysis and considers it to sufficiently describe how the Project, including its DFs, will have a less than significant impact to land use and planning.

a) The Project is within the existing campground property and does not include any development or construction that will physically divide the community, therefore the appropriate finding is no impact.

b-c) The proposed project does not conflict with any applicable land use plans, habitat conservation plan or natural community conservation plan. Because the project does not involve these elements, the appropriate finding is no impact.

XI. MINERAL RESOURCES: Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

a-b) There are no known mineral resources or locally-important mineral resource recovery sites within the Project area; therefore the appropriate finding is no impact.

XII. NOISE: Would the project result in:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

a,b,d) The Project is located in National Forest but access to some work areas is through residential communities. The Project may cause minor, short-term noise impacts from equipment usage. To ensure that noise impacts are reduced to less than significant levels, the LTBMU will generally restrict significant noise-generating activities to the hours between 7:00 AM and 7:00 PM, as described in DF Engineering 6.

c) The Project will not result in any permanent increases in ambient noise; therefore the appropriate finding is no impact.

e-f) The Project is not located within the vicinity of any public or private airports; therefore the appropriate finding is no impact.

XIII. POPULATION AND HOUSING: Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

a-c) The Project does not include plans that would influence population growth, housing, businesses, or infrastructure; therefore the appropriate finding is no impact.

XIV. PUBLIC SERVICES:

Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a)Fire protection?	☐	☐	☐	☒
b)Police protection?	☐	☐	☐	☒
c)Schools?	☐	☐	☐	☒
d)Parks?	☐	☐	☐	☒
e)Other public facilities?	☐	☐	☐	☒

a-e) The Project will make water quality improvements to the William Kent facility. The Project does not include provisions for new or physically altered governmental facilities that would affect public services; therefore the appropriate finding is no impact.

XV. RECREATION:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☒	☐
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☒	☐	☐

Recreation resources are analyzed in the William Kent EA Section 3.1 (Recreation). Section 3.1 describes the Project's impact to facility operations, to the recreation experience, and to the adjacent neighbors. The Project will reduce the number of campsites from 95 to 81, which represents a net capacity reduction from 475 persons-at-one-time (PAOTs) to 405 PAOTs. Over the long-term, the Project will enhance the recreational experience by upgrading campground facilities and improving the entranceway and kiosk.

The Water Board concurs with that analysis; however, it requires that additional mitigation be added to reduce Project impacts to less than significant.

a) The temporary closure of the William Kent facility during summer 2014 for Project construction may increase usage at other nearby campground facilities. This impact would be temporary, limited to one summer and would not be expected to cause substantial deterioration to other campgrounds. This Project will reduce the number of campsites by 14 units and 70 POATs, representing a 6% reduction in the area, which is considered to be the geographical area within a 30-minute drive in each direction from the campground. Over the long-term, this will not cause substantial deterioration to other campgrounds, which generally only reach capacity on a few busy weekends every summer. The impacts to other facilities are limited in duration and magnitude, therefore the appropriate finding is a less than significant impact.

b) The Project involves water quality improvements to an existing campground, which includes new road construction, decommissioning of existing roads in sensitive areas, heavy equipment usage within and adjacent to SEZ, and construction adjacent to the shore zone of Lake Tahoe. These activities have potential adverse effects on the environment related to SEZ disturbance, earth moving, and removal of existing vegetation. The LTBMU will construct the Project in accordance with the DFs described in the William Kent EA, and engineering plans and BMPs in the SWPPP. BMPs to mitigate Project impacts are described in this Initial Study in Sections: IV Biological Resources, VI

Geology and Soils, VIII Hazards and Hazardous Materials, and IX Hydrology and Water Quality.

Implementation of these BMPs, in addition to the DFs in the EA, and adherence to the engineering plans and specification will mitigate potential impacts from the recreation facilities to less than significant levels.

XVI. TRANSPORTATION/TRAFFIC: Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☐	☒
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒
f) Conflict with adopted policies, plans or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?	☐	☐	☐	☒

Transportation impacts are analyzed in the William Kent EA Section 3.5 (Transportation/Traffic). The existing campground entry area becomes congested during busy times and results in traffic being backed up onto the Highway 89 shoulder, contributing to congestion in the area. Within the campground, the paved footprint of most camping spurs is too small to accommodate modern recreational vehicles, leading to people parking off of paved areas and intruding into the main roads, causing compaction and congestion within the property. The Project will improve circulation within the facility and at the entrance area; and it will result in 14 fewer campsites which will decrease the usage of the facility and the number of daily vehicle trips. The Water Board concurs with that analysis and considers it to sufficiently describe how the Project will have no impact to transportation resources.

XVII. UTILITIES AND SERVICE SYSTEMS: Would the project:

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

a-g) The Project will not have any effect on utilities or service systems, including storm water or wastewater treatment facilities, nor will it produce much, if any, solid waste; therefore the appropriate finding is no impact.

XVIII. MANDATORY FINDINGS OF SIGNIFICANCE

	Potentially Significant Impact	Less Than Significant with Mitigation	Less Than Significant Impact	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☒	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☒	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

a) Without adequate mitigation, the Project has the potential to cause short-term environmental degradation. Specifically, Project construction may cause short term impacts to biological resources, soils, sensitive riparian lands, and the Lake Tahoe shore zone. However, due to the short duration of construction and the implementation of design features described in the William Kent EA and BMPs described in the SWPPP, identified potential impacts will be reduced to less than significant levels.

b) Although the Project will have temporary, short-term environmental impacts associated with construction, the cumulative effect will be environmental enhancement. This Project, when viewed in conjunction with other LTBMU campground upgrade projects, will result in a reduction of the number of campsites currently available in the Tahoe Basin. However, the campgrounds only reach capacity a few weekends per year and it is not anticipated that the loss of PAOTs will result in a loss of the ability to camp in the Tahoe Basin or negatively affect the range of available camping experiences. The appropriate finding is less than significant.

c) The Project is intended to improve human's experience in this National Forest campground by providing an updated campground facility and improved riparian ecosystem. The Project does not have any environmental effects that will cause substantial adverse effects on humans; therefore the appropriate finding is no impact.



United States
Department of
Agriculture

Forest
Service

February 2013



Environmental Assessment

William Kent Campground BMP Retrofit and Administrative Site Redevelopment

Region 5, Lake Tahoe Basin Management Unit
Placer County, CA



The William Kent Campground in 1922.

For More Information Contact:

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Table of Contents

List of Tables	4
List of Figures	4
Acronyms	5
1.0 Introduction	7
1.1 Document Organization.....	7
1.2 Background	7
1.3 Overview of Existing Condition.....	10
1.4 Management Direction	16
1.5 Desired Condition.....	17
1.6 Purpose and Need for Action	18
1.7 Summary of Initial Proposed Action	19
1.8 Decision Framework	19
1.9 Public Involvement.....	20
1.10 Issues	20
1.11 Applicable Laws, Regulations, and Policies	21
1.11.1 National Forest Management Act.....	21
1.11.2 Endangered Species Act.....	21
1.11.3 National Historic Preservation Act.....	22
1.11.4 Clean Water Act (Public Law 92–500).....	22
1.11.5 Clean Air Act (Public Law 84–159).....	22
1.11.6 Environmental Justice (Executive Order 12898)	22
1.11.7 Migratory Bird Treaty Act of 1918 as amended (16 USC 703-712).....	23
1.11.8 Invasive Species, Executive Order 13112 of February 3, 1999	23
1.11.9 Floodplain Management, Executive Order 11988 of May 24, 1977, and Protection of Wetlands, Executive Order 11990 of May 24, 1977	23
1.11.10 Special Area Designations.....	23
1.11.11 Local Agency Permitting Requirements and Coordination.....	24
2.0 Alternatives, Including the Proposed Action.....	25
2.1 Alternatives Considered but Dismissed from Detailed Analysis	25
2.2 Alternative 1 – No Action	25
2.3 Alternative 2 – Proposed Action	29
Campground Facilities:	29
Administrative Site:.....	31
Beach:	31
Meeks:	31
2.4 Alternative 3 – Alternative Action	35
Campground Facilities:	36
Administrative Site:.....	38
Beach:	38
Meeks:	38
2.5 Design Features Common to All Alternatives.....	41
Recreation and Access.....	41
Scenic Resources.....	42
Heritage Resources.....	42
Soil and Ground Disturbance	42
Botany/Non-Native Invasive Plant Species.....	44
Wildlife.....	44
Engineering	45

Air Quality	45
Tree Removal.....	46
Monitoring	47
2.6 Comparison of Alternatives	47
3.0 Environmental Consequences.....	51
3.0.1 Organization of Chapter 3.....	51
3.0.2 Projects Considered for Cumulative Effects.....	51
3.1 Recreation	54
3.1.1 Introduction.....	54
3.1.2 Existing Condition	54
3.1.3 Direct and Indirect Effects	55
3.1.4 Cumulative Effects	59
3.1.5 Analytical Conclusions	60
3.2 Wildlife Resources.....	62
3.2.1 Introduction.....	62
3.2.2 Existing Condition	62
3.2.3 Direct and Indirect Effects	69
3.2.4 Cumulative Effects	70
3.2.5 Analytical Conclusions	71
3.3 Botanical Resources.....	72
3.3.1 Introduction.....	72
3.3.2 Existing Condition	72
3.3.3 Direct and Indirect Effects	75
3.3.4 Cumulative Effects	76
3.3.5 Analytical Conclusions	77
3.4 Scenic Resources	78
3.4.1 Introduction.....	78
3.4.2 Existing Condition	78
3.4.3 Direct and Indirect Effects	79
3.4.4 Cumulative Effects	80
3.4.5 Analytical Conclusions	80
3.5 Transportation/Traffic.....	82
3.5.1 Introduction.....	82
3.5.2 Existing Condition	82
3.5.3 Direct and Indirect Effects	83
3.5.4 Cumulative Effects	84
3.5.5 Analytical Conclusions	85
3.6 Hydrology/Soils	86
3.6.1 Introduction.....	86
3.6.2 Existing Condition	87
3.6.2 Direct and Indirect Effects	89
3.6.3 Cumulative Effects	91
3.6.4 Analytical Conclusions	91
3.7 Air Quality	92
3.7.1 Introduction.....	92
3.7.2 Direct and Indirect Effects	92
3.7.3 Cumulative Effects	93
3.7.4 Analytical Conclusion.....	93
4.0 Consultation and Coordination	94
4.1 Interdisciplinary Team Members:.....	94
4.2 Federal, State, and Local Agencies:.....	94

4.3	Tribes:.....	94
4.4	Individuals	94
4.5	Organizations.....	95
5.0	References	96
	Cited Documents.....	96
	Appendix A	99
	Best Management Practices for the William Kent Campground BMP Retrofit & Administrative Site Redevelopment.....	99
	Appendix B.....	105
	Projects Considered for Cumulative Effects	105
	Present Projects	105
	Projects in the Foreseeable Future.....	105

List of Tables

Table 2-1. Issues with Alternative 2 that were raised during public scoping, which resulted in the creation of an alternative action (Alt 3).	35
Table 2-2. Issues with Alternative 3 that were raised during the legal 30 day public comment period and the Forest Service response.	36
Table 2-3. Issues received during scoping and response.	41
Table 2-4. Comparison of total impervious surface coverage for each alternative.	47
Table 2-5. Comparison of Campsite type and number for each alternative.	48
Table 2-6. Summary of Effects of Alternatives.	48
Table 3-1. Number of camping spurs for each alternative by size and type.	59
Table 3-3. Special status wildlife distribution, habitat, and occurrence	63
Table 3-4. Selection of MIS for project-level analysis	68
Table 3-5. Candidate and sensitive plant and fungi species with potential habitat in the proposed project area and are known or suspected to occur on the LTBMU.	73
Table 3-6. Daily vehicle trips (DVT) generated by each alternative.	84
Table 3-7. Acres of Soil Map Units in Project Area	88
Table 3-8. Soil Characteristics	89
Table B-1. Future projects considered for cumulative effects.	105

List of Figures

Figure 1-1. Site vicinity map.....	8
Figure 1-2. William Kent Area context map.....	9
Figure 1-3. Meeks Bay Fire Station Area Context Map	9
Figure 1-3. Existing condition of William Kent campground, ... administrative site, and beach day use site.	10
Figure 1-4. Existing site challenges.	12
Figure 1-5. Evidence of sheet flow (water flowing evenly over a surface) from the subdivision onto the William Kent campground site (point B on the map in Figure 4).....	13
Figure 1-6. Non-universally accessible restroom facility with extensive deferred maintenance.....	13
Figure 1-7. Camping spurs and the roadway were constructed over the top of the ephemeral stream using culverts in 8 locations on the site (indicated as stars on Figure 4).....	14
Figure 1-8. The camping spurs are very small and of variable sizes. The constrained size results in off-pavement parking and subsequent soil compaction and resource damage.	14
Figure 1-9. The stormwater pipe on the beach day use site flows directly into Lake Tahoe. This photo was taken during the spring snow melt. The depth of the scour area below the outfall is approximately 3 feet deep (point G on figure 4).....	15
Figure 1-10. The stormwater pipe at the beach day use site, as viewed when standing on the outfall wall and looking towards the lake during spring snowmelt (point G on the map in Figure 4).....	15
Figure 1-11. Meeks Bay Fire Station when viewed from across Hwy 89. The structure is extremely small and does not meet the needs of the fire crew stationed there.	16
Figure 2-1. No Action Illustration.....	27
Figure 2-2. Alternative 2 Concept Design.	33
Figure 2-3. Alternative 3 Concept Design.	39

Acronyms

Acronym/ Abbreviation	Definition
ABA	Architectural Barriers Act
BA/BE	Biological Assessment/Biological Evaluation
BEIG	Built Environment Image Guide
BMPs	Best Management Practices
BMPEP	Best Management Practice Evaluation Program
Caltrans	California Department of Transportation
CAR	Critical Aquatic Refuge
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CLM	California Land Management
CO	Carbon Monoxide
CWA	Clean Water Act
CWHR	California Wildlife Habitat Relationship System
DBH	Diameter at Breast Height
DOE	Determination of Eligibility
DVT	Daily Vehicle Trips
EA	Environmental Assessment
EIP	Environmental Improvement Program
EIS	Environmental Impact Statement
ERA	Equivalent Roaded Acres
ESA	Endangered Species Act of 1973 as amended
FONSI	Finding of No Significant Impact
Forest Plan	Lake Tahoe Basin Management Unit Land and Resource Management Plan
Forest Service	USDA Forest Service
FSORAG	Forest Service Outdoor Recreation Accessibility Guideline
GFA	Gross Floor Area
GHGs	Greenhouse Gases
GIS	Geographic Information System
HUC	Hydrologic Unit Code
LEED	Leadership in Energy and Environmental Design
LOP	Limited Operating Period
LRMP	Land and Resource Management Plan

Acronym/ Abbreviation	Definition
LTBMU	Lake Tahoe Basin Management Unit
MIS	Management Indicator Species
MIS Report	Management Indicator Species for the Lake Tahoe Basin Management Unit
ND	Neighborhood Development
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
NHPA	National Historic Preservation Act
NO _x	Nitrous Oxides
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
OHV	Off-Highway Vehicle
PAC	Protected Activity Center
PAOT	Persons At One Time
PM10	Particulate Matter less than 10 microns in diameter
RCA	Riparian Conservation Area
RCOs	Riparian Conservation Objectives
ROS	Recreation Opportunity Spectrum
SEZ	Stream Environment Zone
SHPO	State Historic Preservation Officer
SNF MIS	2007 Sierra Nevada Forests Management Indicator Species
SNFPA	Sierra Nevada Forest Plan Amendment
SO ₂	Sulfur Dioxide
South Shore Project	South Shore Fuel Reduction and Healthy Forest Restoration Project
TEPS	Threatened, Endangered, Proposed, or Sensitive
TES	Threatened and Endangered Species
TMPO	Tahoe Metropolitan Planning Agency
TRPA	Tahoe Regional Planning Agency
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
VMT	Vehicle Miles Traveled
VQO	Visual Quality Objective

1.0 Introduction

The US Forest Service has prepared this environmental assessment in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This environmental assessment discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives.

1.1 Document Organization

The document is organized as follows:

Chapter 1, “Introduction,” includes information on the structure of the Environmental Assessment (EA), background of the project, overview of the existing condition, the desired conditions, the purpose of and need for action, summary of the proposed action, applicable management direction, and the decision framework. This chapter also details how the Forest Service informed the public of the proposal through public involvement, describes the issues identified by the public, and summarizes laws, regulations, and policies that are applicable to the proposed project.

Chapter 2, “Alternatives, Including the Proposed Action,” provides descriptions of alternatives considered but dismissed from detailed analysis, the no-action alternative, the Forest Service’s proposed action, and the alternative action. It also summarizes the direct, indirect, and cumulative effects of the no-action alternative, the proposed action, and the alternative action.

Chapter 3, “Affected Environment and Environmental Consequences,” presents an overview of the analysis, the indicators used to document the effects, the existing conditions, and the environmental effects of implementing the proposed action, alternative action, and no-action alternative. The effects of the no-action alternative are described first to provide a baseline for evaluation and comparison of the action alternatives.

Chapter 4, “Consultation and Coordination,” provides a list of preparers, as well as individuals and agencies consulted during the development of this document.

Additional documentation may be found in the project record located at the Lake Tahoe Basin Management Unit (LTBMU) Forest Supervisor’s Office in South Lake Tahoe, CA.

1.2 Background

The US Forest Service facilities at the William Kent site are located approximately two miles south of Sunnyside-Tahoe City on Hwy 89 West Lake Blvd, Section 24, Township 15N, Range 16E. The property covers 22 acres and consists of the William Kent campground, the William Kent administrative site, and the William Kent day use beach area.

The administrative site is just west of the campground visitor check-in kiosk on the north side of the campground road. The previous buildings on the administrative site

were decommissioned and removed. Previous uses of the site included a small fire station, maintenance area, and residential home that was used as a barracks.

The day use beach area is located directly east of the campground on the east side of Hwy 89.

All facilities within the project area are federally owned and managed by the US Forest Service.

Refer to Figure 1-1 for the project area location and Figure 1-2 for an area context map.

The William Kent Campground is a US Forest Service recreation facility, managed by the LTBMU, and operated under special use permit. The campground originally dates back to 1924, but the current infrastructure dates to the 1960's. The campground is bounded by private residences to the North, South, and West. Hwy 89 splits the campground and the beach facility.

Wildland fire protection on the west shore is currently serviced by the Meeks Bay Fire Station. This facility is a converted gas station, constructed circa 1940's and does not meet current building or accessibility standards. In 2003 a decision was made to replace the Meeks Bay Fire Station building in its current location at the entrance to the Meeks Bay Resort on Highway 89 (Meeks Bay Resort Fire Station Reconstruction Decision Memo, 2003 – Project Record H).

Figure 1-1. Site vicinity map.



Figure 1-2. William Kent Area context map.

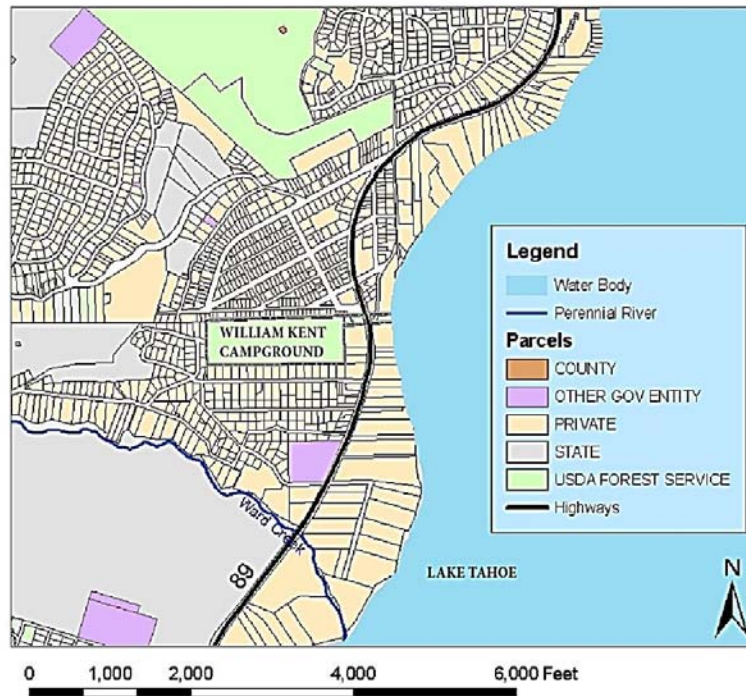
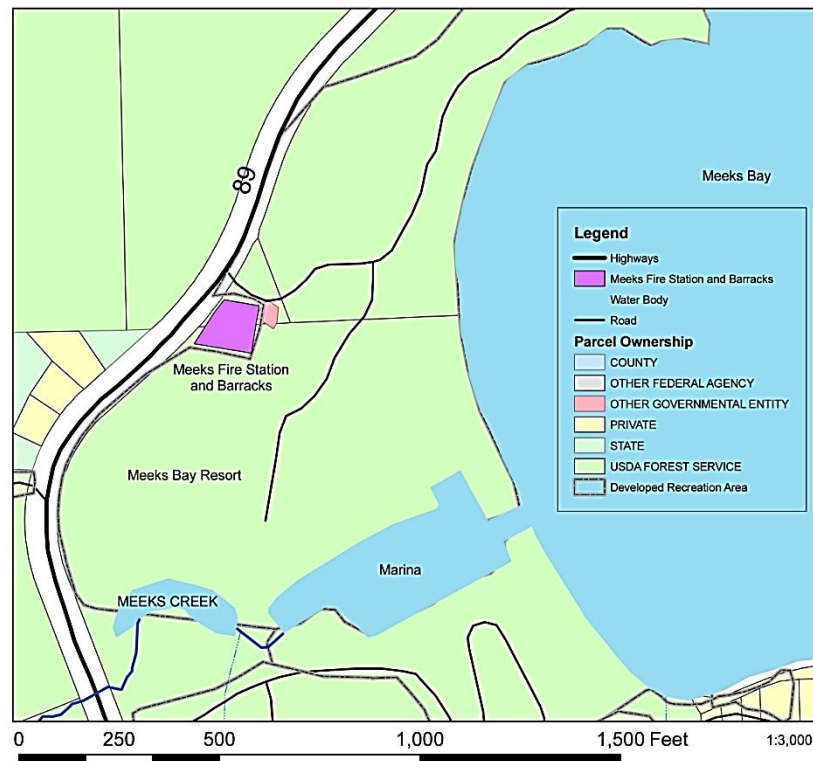


Figure 1-3. Meeks Bay Fire Station Area Context Map

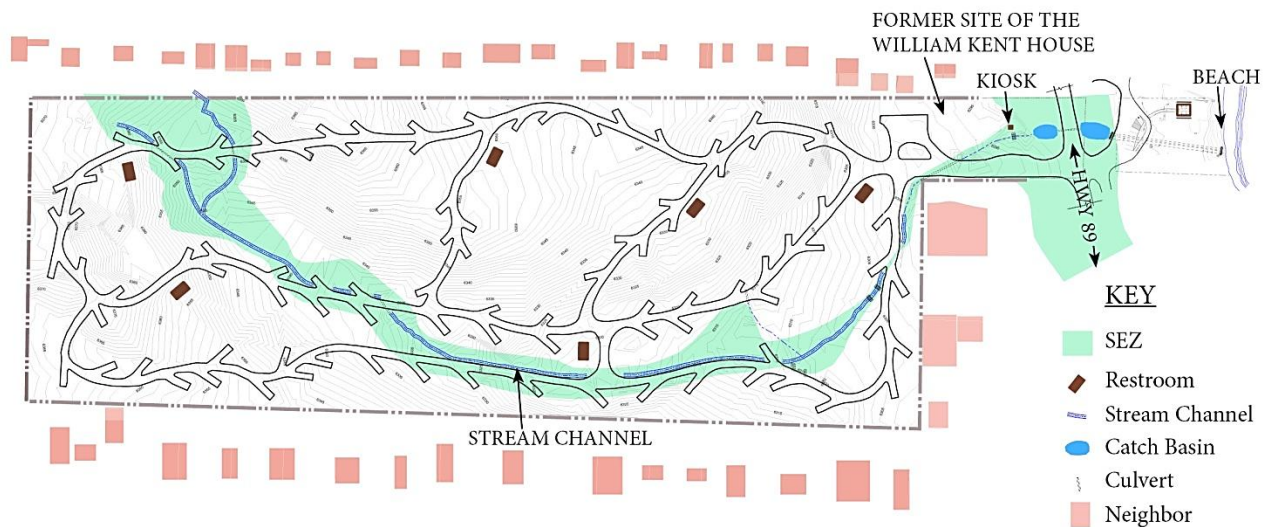


1.3 Overview of Existing Condition

The William Kent campground was originally constructed in 1924. The current road and camping spur design was implemented in 1963 with 95 spurs (see Figure 1-3). Six flush toilet restroom facilities were constructed in 1969. No major upgrades to the facilities have occurred since that time.

The restroom facilities do not meet current building codes or universal accessibility standards for guidelines such as threshold height, door clearance, surface type, etc (Figure 1-6). The camping spurs do not meet Forest Service accessibility guidelines for standards such as surface type, maximum slope, and spur width (Figure 1-8). The small paved footprint of the camping spurs has led to off-pavement vehicular traffic and parking in areas where physical barriers are not present, resulting in destruction of vegetation, soil compaction and erosion. Visitor use patterns at campgrounds have changed over the last 50 years and now include the use of larger vehicles and camping trailers, which contribute to site impacts. The small turning radii and confusing circulation patterns on the site sometimes results in vehicles driving the wrong way on the one way roads, traffic congestion, and damage to trees along the roads. See Figure 1-4 for a map of site challenges.

Figure 1-3. Existing condition of William Kent campground, administrative site, and beach day use site.



A small visitor information/campground check-in kiosk sits at the entrance to the campground. The only parking for the structure is a pull-off for short term parking on the main campground access road. Once the pull-off becomes full, parking along the road edges occurs on occasion, which causes erosion, vegetation destruction, and sometimes results in vehicles stacking up onto the highway. The pedestrian path to

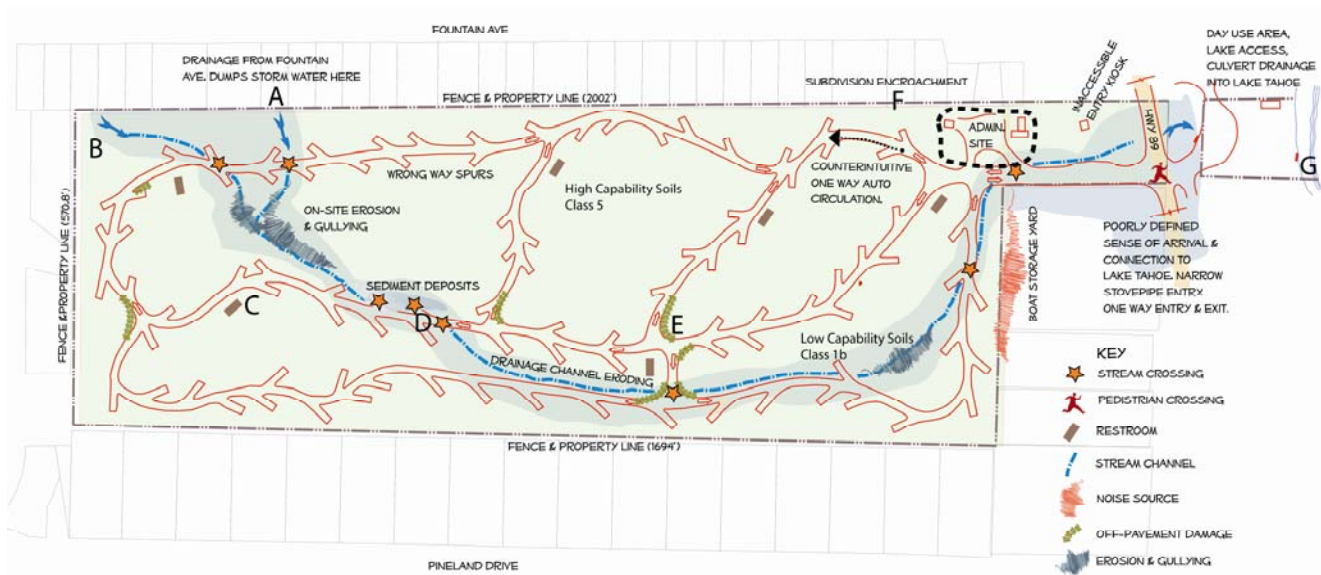
the kiosk does not meet Forest Service Outdoor Recreation Accessibility Guidelines (FSORAG) for slope, surface type, and width.

The administrative site currently contains only a parking area that serves as overflow for the campground and parking for the campground host vehicles. The William Kent house and garage that previously existed on the administrative site were decommissioned and removed in 2011. The administrative site has been previously used as a small fire station and maintenance area, administrative offices, and as an employee barracks.

William Kent beach day use area has approximately 150 linear feet of pebble shoreline. It is one of the few public beaches on the western shore of Lake Tahoe. The parking lot has 9 parking spaces that are almost always full during the summer and fall months. The elevation change from the picnic area to the beach occurs rapidly, resulting in a steep slope that is not accessible and readily erodes directly into the lake.

A stormwater pipe discharges onto the steep beach slope and the water then flows into Lake Tahoe. The outflow path below the pipes and the wall supporting the pipes has been almost completely undermined by erosion (Figure 1-9 and 1-10). The stormwater pipe collects the water from an ephemeral stream channel that runs through the campground and from the roadways. The stream is fed from a stormwater channel that serves the residential area to the north and west, as well as by sheet-flow (water running in a thin sheet evenly over a surface) from the residences to the west of the campground (Figure 1-5.) The area surrounding the channel is classified as a stream environment zone (SEZ). The resulting stream is highly disturbed and channelized (Figure 1-7).

The fire station at Meeks Bay, as described in the 2003 *Meeks Bay Resort Campground Rehabilitation Project* Decision Memo, is planned for replacement to alleviate health, safety, and accessibility problems. The Decision Memo describes replacing the fire station on the same site. The site is small, which does not allow enough space for a building that meets current standards, as well as adequate parking for station employees (see Figure 1-11). Furthermore, the site does not have a year-round water source, which limits the use of the facility during winter months. For these reasons, this document analyzes relocating the Meeks Fire Station to the William Kent site in Alternative 2 and 3.

Figure 1-4. Existing site challenges.

Map Designation	Existing Site Challenges Legend
A	Stormwater from the subdivision drains via a ditch onto USFS property.
B	Sheet flow from the subdivision drains onto USFS property.
C	Non-universally accessible restrooms (typical throughout).
D	The stream has been diverted under camping spurs and the road numerous times via culverts (indicated as stars on the map above).
E	Small turning radii and small campground spurs have resulted in off-pavement resource damage.
F	The fence along the property border is damaged seasonally by bears.
G	The stormwater pipe outlet drains directly into Lake Tahoe.

Figure 1-5. Evidence of sheet flow (water flowing evenly over a surface) from the subdivision onto the William Kent campground site (point B on the map in Figure 4).



Figure 1-6. Non-universally accessible restroom facility with extensive deferred maintenance.



Figure 1-7. Camping spurs and the roadway were constructed over the top of the ephemeral stream using culverts in 8 locations on the site (indicated as stars on Figure 4).



Figure 1-8. The camping spurs are very small and of variable sizes. The constrained size results in off-pavement parking and subsequent soil compaction and resource damage.



Figure 1-9. The stormwater pipe on the beach day use site flows directly into Lake Tahoe. This photo was taken during the spring snow melt. The depth of the scour area below the outfall is approximately 3 feet deep (point G on figure 4).



Figure 1-10. The stormwater pipe at the beach day use site, as viewed when standing on the outfall wall and looking towards the lake during spring snowmelt (point G on the map in Figure 4).



Figure 1-11. Meeks Bay Fire Station when viewed from across Hwy 89. The structure is extremely small and does not meet the needs of the fire crew stationed there.



1.4 Management Direction

The project specifically meets the following goals and objectives at the national, regional, and forest levels:

National Strategic Plan Goals and Objectives:

Goal 1. *Restore, Sustain, and Enhance the Nation's Forests and Grasslands*

Objective 1.5 Restore and maintain healthy watersheds and diverse habitats.

Goal 4. *Sustain and Enhance Outdoor Recreation Opportunities (USDA Objective 6.3)*

Objective 4.1 Improve the quality and availability of outdoor recreation experiences.

The LRMP, as amended (USDA FS 1988) guides overall LTBMU land management and resource protection through practices, standard and guidelines. Practices, Standards and Guidelines (S&G) that apply to this project:

S&G 30: Water Quality Maintenance and Improvement (pages IV-33-34).

Activities designed to prevent water quality degradation and the installation and maintenance of structures and vegetation to remedy impaired water quality. The primary purpose is to assure that activities on national forest land do not exceed

environmental standards and to restore damaged sites. Activities include installation of check dams, settling basins, infiltration devices, water spreading devices, water canalization conduits, riprap, retaining walls, straw and jute mat spreading and the planting of grass, shrubs, or trees.

Ward Management Area: *Resource Management Emphasis:*

“The major resource emphasis in this management area is to maintain opportunities for expansion of outdoor recreation. This includes ... developed recreation facilities, and both motorized and nonmotorized dispersed recreation. There are also opportunities for vegetation management and improvement for wildlife and fisheries enhancement.”

Forest-wide standards and guidelines apply. The following direction in the LRMP for the Ward Management Area supplements them:

Practice	Standard and Guideline
Recreation Construction	Development of new recreation facilities is projected at 280 PAOT* over present level.

*PAOT: Persons-at-one-time

1.5 Desired Condition

The desired condition at William Kent Campground, beach, and administrative site is to provide a high quality recreation setting and comply with established water quality protection Best Management Practices (BMPs). All developed amenities should meet current construction standards and provide universal access for persons with disabilities, consistent with FSORAG and the Architectural Barriers Act (ABA).

Improvements to the stream channel are desired to reduce erosion and improve water quality. A new fire station and administrative space are desired to improve the wildland fire response on the north shore, increase the efficiency of fire services, and increase the administrative presence on the west shore of Lake Tahoe and to provide appropriate facilities for these functions.

The following is the desired condition for all FSORAG-compliant facilities:

All new or altered camping facilities, picnic areas, beach access routes, outdoor recreation access routes (ORARs), and other constructed features associated with outdoor recreation areas in the National Forest System (including benches; trash, recycling, and other essential containers; viewing areas at overlooks; telescopes and periscopes; mobility device storage; pit toilets; warming huts; and outdoor rinsing showers) shall comply with the FSORAG.

Construction or alteration of all other outdoor recreation areas such as toilet buildings and information centers in the National Forest System shall comply with the applicable requirements of the Architectural Barriers Act Accessibility Standards (ABAAS).

The following is the desired condition for all ABA-compliant facilities:

All areas of newly designed and newly constructed buildings and facilities and altered or leased portions of existing buildings and facilities shall comply with these requirements.

Application Based on Building or Facility Use: Where a site, building, facility, room, or space contains more than one use, each portion shall comply with the applicable requirements for that use.

Temporary and Permanent Structures: These requirements shall apply to temporary and permanent buildings and facilities.

1.6 Purpose and Need for Action

The purpose of this project is to improve water quality and stream environment zone function, enhance the recreational experience, improve wildland fire response on the West and North shores, and address health and safety issues at the William Kent campground, administrative facility, and beach. This action is needed because of the deficiencies in stormwater treatment onsite, the lack of universal accessibility, and impacts to the recreation experience.

There is a need to increase stormwater infiltration and improve water quality due to conditions such as:

- Impervious coverage and compaction within the SEZ and low capability soils.
- Absence of BMPs to capture and infiltrate stormwater.
- Direct storm water outflow to Lake Tahoe at the William Kent Beach.

There is a need to improve the recreation experience and accessibility of the site due to:

- Absence of efficiently designed FSORAG compliant campsites and amenities.
- Six restroom facilities in the campground do not meet current building standards, including universal accessibility.
- Campground check-in kiosk is not universally accessible and is located where vehicles affect the traffic on Highway 89.
- Poorly located entrance signage and wayfinding mechanisms.
- Need for better privacy and screening between the campground facility and neighboring residences.
- Public demand for a greater range of camping opportunities.
- Inadequate pedestrian circulation and connection to the beach site.
- Inefficient and counter-intuitive vehicular circulation within the campground.

There is a need to improve the condition of Forest Service facilities relating to health and safety codes due to:

- The Meeks Bay Fire Station is no longer adequate for the size and mission of the fire engine module.
- Wildland fire response to the north and west shores of Lake Tahoe is not optimized due to current location of facility at Meeks Bay.
- There is no universally accessible administrative building and fire station that meets the function and needs of the LTBMU on the North and/or West shores.

1.7 Summary of Initial Proposed Action

Improvements in BMPs are proposed to bring the William Kent Campground, William Kent administrative site, and William Kent beach day use area into compliance with water quality protection and accessibility requirements. This includes implementation of water quality protection BMPs where appropriate to reduce stormwater runoff volume, reduce peak flow levels, reduce the amount of sediment and pollutants reaching Lake Tahoe, as well as to provide for universal accessibility consistent with the FSORAG and ABA requirements.

The proposal includes reconfiguration of the campground circulation pattern, with the primary access route created along the northern boundary of the campground. The initial proposed action also includes relocation of the kiosk area, relocation of the RV waste dump station, construction of new accessible restroom facilities, addition of utilities at some campsites, and an increase in the diversity of camping opportunities through the incorporation of yurt camping sites.

A new administrative building would be constructed on the William Kent administrative site. The building would serve as a replacement for the Meeks Bay Fire Station. The existing Meeks Bay Fire Station would be removed and the area rehabilitated.

The beach day use site would be re-contoured and excavated to shorten the stormwater pipe on the beach to expose the flow (“daylight” the stream), as well as to stabilize the resulting slope. This will increase the area for infiltration and reduce the pollutant/sediment loads of the stormwater before it enters Lake Tahoe. Stabilization of the slope may include riprap, boulder placement, retaining walls, structural walls, and vegetation. Bridges, footpaths, and safety rails would be installed where needed to ensure navigability, safety, and efficient use of the site by visitors. An accessible path would be constructed to access the beach from the picnic area.

A detailed description of the proposed action can be found in Chapter 2.

1.8 Decision Framework

This EA is prepared in accordance with NEPA and Council on Environmental Quality (CEQ) Regulations 40 CFR § 1500. The Responsible Official under NEPA is the

LTBMU Forest Supervisor who expects to issue a Decision Notice / Finding of No Significant Impact (DN/FONSI).

Based on the analysis provided in this EA, the Forest Supervisor will decide whether or not to implement the no-action alternative, the proposed action, or an alternative to the proposed action as described in this EA. It should be noted that the final decision may entail some combination of components of the proposed action and alternatives, as deemed most appropriate in consideration of the analyses described in this document.

1.9 Public Involvement

The proposal was listed in the Schedule of Proposed Actions on January 1, 2011. The proposal was mailed to adjacent property owners and interested agencies for comment during scoping from November 26 to December 30, 2010. In addition, the proposed action and scoping letter were posted on the LTBMU public website.

A total of 12 written, oral, or electronic comment letters were submitted (Project Record Documents Section C) and a total of 83 comments were identified and evaluated for relevance. These comments and their disposition are summarized in Project Record Document D-1. Using these comments (see *Issues* section), the interdisciplinary team developed a list of issues to consider in developing an action alternative (Alternative 3).

The analysis of the existing condition (Alternative 1), the initial proposed action (Alternative 2), and the new Alternative 3 were released for public comment on April 25, 2012. In response to the legal notice for the 30 day comment period for the Environmental Assessment (EA), ten comment letters were received. Three additional letters were dated after the comment period ended. The comments and the Forest Service (FS) responses are listed in Appendix C of the *Decision Notice and Finding of No Significant Impact* document for the William Kent BMP Retrofit and Administrative Site Redevelopment Project. No comments resulted in the need for an additional action alternative. Some of the comments, however, did result in the addition of a design feature or a slight modification of Alternative 3. This document (the EA) was then edited to reflect these changes. A summary of the changes that resulted from the public comment period can be found in Section 2.4, Table 2-2.

1.10 Issues

The Forest Service separated the issues into three groups: relevant issues, non-issues, and issues considered but eliminated from detailed study. A list of issues and the Forest Service response may be found in Project Record Document D-1. If an issue was listed as Category 1 (see below), the rationale for not being included in the analysis is incorporated in that document, as well.

Non- issues (Category 1) do not meet the purpose and need for the project; are outside the scope of the proposed action; are already decided by law, regulation, or LRMP; are not supported by scientific evidence; are addressed by project design

features; or are addressed by additional information or clarification of the proposed action. Non-issues also represent opinions and statements that do not present problems or alternatives. Numerous comments were received. Most of these were requests to the Forest Service to discuss and disclose specific items in the environmental document. None of these comments necessitated development of an alternative to the proposed action.

Issues considered but eliminated from detailed study (Category 2) meet the purpose and need for the project but were considered in alternatives already studied and eliminated, or additional project design features were developed which reduced or eliminated the effects. See Section 2.1 for a summary of these issues.

Relevant issues (Category 3) were used to develop alternatives to the proposed action. Relevant issues meet the purpose and need for the project and are important in the extent of the geographic distribution, the duration of effects, or the intensity of interest or resource conflict and therefore merit consideration for the development of an alternative to the proposed action. Comments relating to the location of the proposed administrative building, the location of new roads and restrooms within the campground, and the effect of noise and disturbance of increased activity near residential lots were considered relevant issues and initiated the development of the alternative proposed action. See section 2-4 for a description of these issues and how they were addressed by an alternative action.

1.11 Applicable Laws, Regulations, and Policies

All resource management activities described and proposed in this document would be consistent with applicable federal law, USDA regulations, Forest Service policies, and applicable provisions of state law. The major applicable laws are as follows:

1.11.1 National Forest Management Act

The National Forest Management Act (NFMA) requires the development of long-range land and resource management plans. The LRMP was approved in 1988 as required by this act. It has been amended several times, including in the Sierra Nevada Forest Plan Amendment (SNFPA). The LRMP provides guidance for all natural resource management activities on National Forest System lands. The NFMA requires that all projects and activities be consistent with the Forest Plan. The Forest Plan has been reviewed in consideration of this project, and the design of the William Kent Campground BMP Retrofit and Administrative Site Redevelopment Project is consistent with the Forest Plan. A Forest Plan consistency matrix and review for this project was completed (Project Record Document B-1).

1.11.2 Endangered Species Act

In accordance with Section 7(c) of the Endangered Species Act, the U.S. Fish and Wildlife Service (USFWS) list of “endangered and threatened species that may be affected by Projects in the Lake Tahoe Basin Management Area” (December 14, 2010) was reviewed. It was determined that the proposed action and alternative action of the William Kent Project may affect individuals, but is not likely to result in

a trend toward Federal listing or loss of viability for any endangered and threatened species (Project Record Document G-1).

1.11.3 National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to take into account the effect of a project on any district, site, building, structure, or object that is included in, or eligible for inclusion in, the National Register of Historic Places. Surveys were conducted for Native American religious or cultural sites, archaeological sites, and historic properties or areas that may be affected by this project (Project Record Document G-3). Compliance with the NHPA was achieved through the use of the USDA Forest Service Region 5 and California State Historic Preservation Officer (SHPO) Programmatic Agreement (2001) regarding compliance with Section 106 of the NHPA. There was a no effect determination made with the use of standard resource protection measures, so consultation with SHPO was not required as described in the Programmatic Agreement.

1.11.4 Clean Water Act (Public Law 92–500)

All federal agencies must comply with the provisions of the Clean Water Act (CWA), which regulates forest management activities near federal waters and riparian areas. The design features associated with the proposed action ensure that the terms of the CWA are met, primarily prevention of pollution caused by erosion and sedimentation.

1.11.5 Clean Air Act (Public Law 84–159)

The project area lies within the Lake Tahoe Air Basin and the Placer County Air Quality Management District. The Traffic Study (Project Record Document G-9) identifies an insignificant increase in vehicle trips. Chapter 93.3.B of the TRPA Code of Ordinances (TRPA 1987) requires that a project provide an air quality impact analysis only if the project is expected to significantly increase vehicle trips.

PLACER COUNTY AIR POLLUTION CONTROL DISTRICT: Construction and Grading Dust Control Requirements. Rule 228, Fugitive Dust, is applicable to the entire County of Placer and addresses fugitive dust generated by construction and grading activities, and by other land use practices including recreational activities. The proposed action and alternative action incorporate design features to comply with these requirements.

1.11.6 Environmental Justice (Executive Order 12898)

Executive Order 12898 requires that all federal actions consider potentially disproportionate effects on minority and low-income communities, especially if adverse effects to environmental or human health conditions are identified. Adverse environmental or human health conditions created by any of the alternatives considered would not affect any minority or low-income neighborhood disproportionately.

The activities proposed in alternatives 2 and 3 were based solely on the existing and desired condition of the campground facilities and surrounding vegetation, sensitivity of the natural environment adjacent to Lake Tahoe, the recreational needs of Forest users, and access in response to the purpose and need. In no case were the

campground and infrastructure/access designs based on the demographic makeup, occupancy, property value, income level, or any other criteria reflecting the status of adjacent non-federal land. Reviewing the location, scope, and nature of the proposed alternatives in relationship to non-federal land, there is no evidence to suggest that any minority or low-income neighborhood would be affected disproportionately. Conversely, there is no evidence that any individual, group, or portion of the community would benefit unequally from any of the actions in the proposed alternatives.

1.11.7 Migratory Bird Treaty Act of 1918 as amended (16 USC 703-712)

The original 1918 statute implemented the 1916 Convention between the United States and Great Britain (for Canada) for the protection of migratory birds. Later amendments implemented treaties between the United States and Mexico, Japan, and the Soviet Union (now Russia). Specific provisions in the statute include the establishment of a federal prohibition, unless permitted by regulations, to “pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention...for the protection of migratory birds...or any part, nest, or egg of any such bird.” Because forestlands provide a substantial portion of breeding habitat, land management activities within the LTBMU can have an impact on local populations. The William Kent Campground BMP Retrofit and Administrative Site Redevelopment Project would not adversely impact any populations or habitat of migratory birds (Project Record Document G-1) .

1.11.8 Invasive Species, Executive Order 13112 of February 3, 1999

This EA covers botanical resources and noxious weeds. The project’s design features are designed to minimize risk of new weed introductions. The Sierra Nevada Forest Plan Amendment (SNFP) outlines the direction for completing a noxious weed risk assessment (SNFP Appendix L). In addition, the Forest Service Manual 2080 Noxious Weed Management (effective 11/29/1995) includes a policy statement calling for a risk assessment for noxious weeds to be completed for every project (Project Record Document G-1).

1.11.9 Floodplain Management, Executive Order 11988 of May 24, 1977, and Protection of Wetlands, Executive Order 11990 of May 24, 1977

These executive orders provide for protection and management of floodplains and wetlands. Compliance with these orders will be ensured by adhering to the project design features.

1.11.10 Special Area Designations

There are no special designated areas that would be affected by the William Kent Campground BMP Retrofit and Administrative Site Redevelopment Project (e.g., Research Natural Areas, Inventoried Roadless Areas, Wilderness Areas, and Wild and Scenic Rivers).

1.11.11 Local Agency Permitting Requirements and Coordination

Lahontan Regional Water Quality Control Board

The LRWQCB has determined that the proposed action will require a (NPDES) General Permit for Discharges of Storm Water Runoff Associated with Construction Activity Involving Land Disturbance in the Lake Tahoe Hydrologic Unit, Board Order No. R6T-2005-0007. In addition, a Project-Specific Storm Water Pollution Prevention Plan (SWPPP) and a Storm Water General Permit (a new permit adopted in April 2011) will be required.

Permits will be obtained to comply with Sections 401 and 404 of the CWA through the Lahontan Regional Water Quality Control Board and the U.S. Army Corps of Engineers for stream and wetland restoration and road and trail activities that are not associated with vegetation and fuel reduction activities (as described above). The degree of permitting would be known by the time of the decision by the Forest Supervisor.

TRPA

It is anticipated that a TRPA project permit will be required because the proposed action falls outside of the terms outlined for exempt activities in the Memorandum of Understanding between the TRPA and the US Department of Agriculture, Forest Service (2009) due to the change in land coverage of the administrative structure and management activities proposed within the SEZ and the shore zone.

Placer County Air Pollution Control District

Placer County Air Pollution Control District Rule 228, Fugitive Dust, establishes standards to be met by activities generating fugitive dust. Rule 228 applies to the entire County of Placer and addresses fugitive dust generated by construction and grading activities, and by other land use practices including recreational uses. Fugitive dust is particulate matter discharged into the atmosphere due to a man-made activity or condition. Examples of dust sources that are subject to the rule are excavating and trenching, drilling, boring, earthmoving and grading operations, pavement or masonry cutting operations, brush clearing, travel on unpaved roads within construction sites, and wind-blown dust from uncovered graded areas and storage piles. Rule 228 establishes standards to be met by activities generating fugitive dust. Among these standards to be met is a prohibition on visible dust crossing the property boundary, generation of high levels of visible dust (dust sufficient to obscure vision by 40%), and controls on the track-out of dirt and mud on to public roads. The regulation also establishes minimum dust mitigation and control requirements. These requirements are incorporated in the design features for the project.

2.0 Alternatives, Including the Proposed Action

This chapter describes the alternatives considered for the William Kent Campground BMP Retrofit and Administrative Site Redevelopment Project, including alternatives considered but dismissed from detailed analysis, the no-action alternative, the proposed action, and an alternative action.

2.1 Alternatives Considered but Dismissed from Detailed Analysis

An alternative considered but dismissed from detailed analysis was to implement the campground and beach proposed actions and keep the fire station at Meeks or another site. This alternative was dismissed based on fact that the Meeks site did not meet the needs of a new fire station and after a review of alternate locations on the West Shore, no other viable sites were found. Alternate sites were evaluated for wildland fire response effectiveness, access to utilities, impact to sensitive sites, and for regulations prohibiting construction (ex: Santini-Burton lots). This alternative was not analyzed further as the effects were analyzed in either Alternative 1 (leaving fire station at Meeks), or Alternatives 2 and 3 (different locations of the fire station/administration building within the William Kent site). See Project Record Documents B-2.

2.2 Alternative 1 – No Action

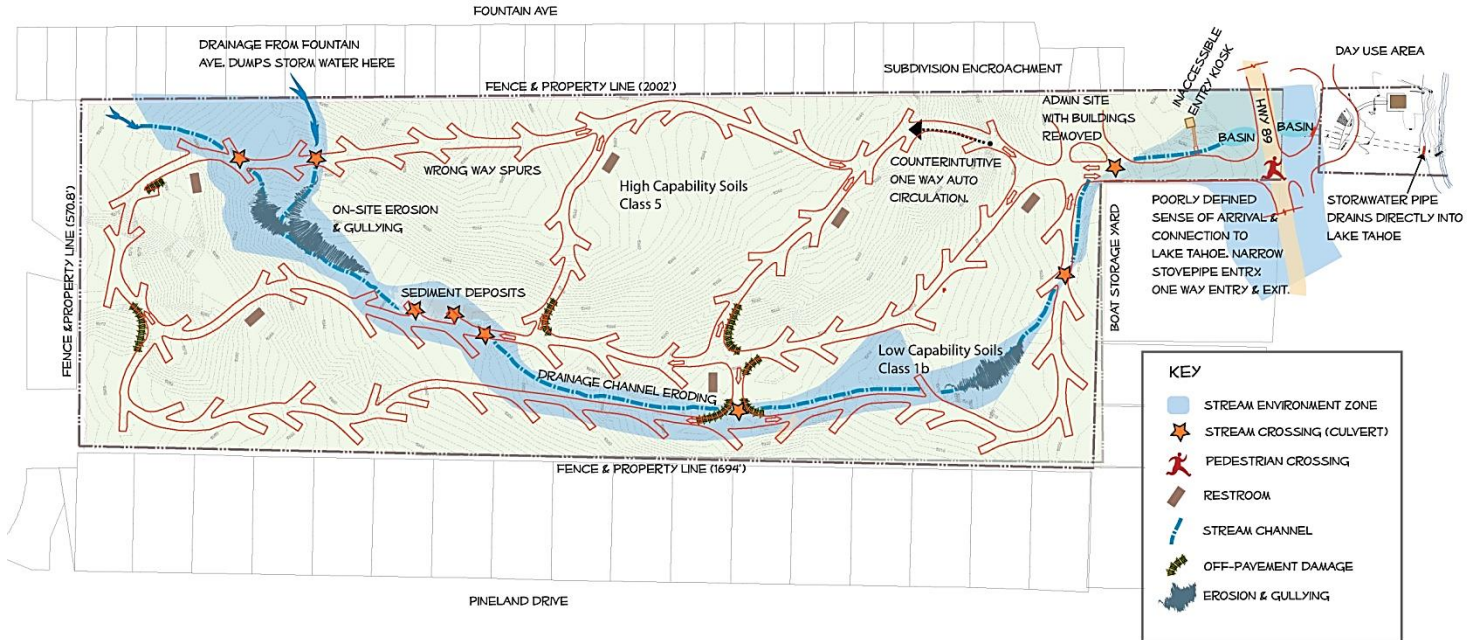
The No Action Alternative provides a baseline for comparing the effects of the action alternatives. The No Action Alternative reflects a continuation of existing recreational, administrative and traffic activities. No improvements to recreational, administration or traffic facilities would be made beyond those considered to be routine maintenance. No campground reconfiguration, BMP retrofit, administrative site construction, or accessibility upgrades would be implemented. A new fire station would not be built on the William Kent site and fire operations would remain at the Meeks fire station (Figure 2-1).

The campground would remain open and continue to be operated by the campground concessionaire. The restroom facilities would continue to degrade, resulting in more frequent repair and maintenance effort and costs. The road system within the campground will continue to be maintained at the present level. Parking and access to the beach area will continue at its present location and condition.

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Figure 2-1. No Action Illustration.

ALTERNATIVE 1 - NO ACTION ALTERNATIVE



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2.3 Alternative 2 – Proposed Action

The William Kent site is planned for rehabilitation, which would include installation of water quality BMPs, control of vehicle circulation by redefining and paving travel routes and camping spurs, relocation of the kiosk, and removal of inadequate restroom buildings. New construction would include four new toilet/shower buildings in the campground and a new fire station/administrative building on the administrative site (Figure 2-2). The Meeks Bay Fire Station would then be decommissioned and the area rehabilitated.

Areas of existing soil compaction that are not planned for campground, administrative building, or other use would be decompacted and mulched where appropriate. The areas may also be planted with native/adapted vegetation such as grasses and shrubs.

Overall project area impervious coverage would decrease from 207,000 to 200,300 square feet. SEZ coverage from current recreation use is proposed to be reduced from 34,600 to 12,800 square feet. BMP measures would be designed to meet the demands of a 1 inch / 1-hour storm, as well as a 2 inches / 24-hours storm event.

This project includes the removal of some existing trees in order to meet the requirements of the Proposed Action. Cut trees may be removed from the site or used as fuel wood. Any slash material generated from tree removal (e.g., smaller trees and limbs and tops) would be removed in whole, chipped and removed, or chipped for use on site. Tree removal may require the use of ground-based mechanical equipment, chainsaws, or chippers, and a staging area(s) in order to process materials. The stumps of cut trees would also be removed as part of this action.

Proposed improvements to the beach include improved stormwater management and accessibility to the beach from the parking lot.

Campground Facilities:

Camping capacity and the overall number of campsites are proposed for reduction. The Proposed Action includes a reduction of campsites from 95 to 81. Traffic routes and direction of travel would be changed to improve traffic flow and access to campsites. The size and configuration of the individual campsites will also be changed.

1. Remove approximately 21,714 square feet (83%) of asphalt from within the SEZ in the campground (Table 2-3).
2. Reduce the stream crossings from 8 to 2.
3. Remove and reconfigure all paved surfaces into four one-way loops connected to a two-way road that runs along the northern border of the campground.
4. Remove a net of 14 campsites for a total remaining of 81 campsites (Table 2-4).
5. Construct all new spurs to meet FSORAG accessibility requirements; 16' wide by 40' long (33 non-utility sites), 20' wide by 60' long (5 utility sites), 16' wide by 60' long (43 utility sites) (Table 2-4).

6. Up to 11 campsites (of the 81 total sites) may include yurts or tent cabins.
7. Relocate the RV dump site to an area of high capability soils near the exit that allows for easier vehicular circulation.
8. Relocate the entry kiosk further into the campground on the two-way road to allow for drive-up traffic on both sides.
9. Construct small infiltration basins and vegetated swales along the roadways and in areas where water flows from paved surfaces into the SEZ to prevent any campground pavement runoff from contributing to the water volume of the stream.
10. Remove impervious surfaces from within the SEZ and re-contour the stream channel in areas where the paved surfaces are removed to permit the water to spread out over the SEZ and allow for infiltration and to reduce the flow volume and velocity.
11. Plant native vegetation in eroded and disturbed areas.
12. Stabilize slopes in the campground with boulder placement and revegetate where needed.
13. Replace the signage along Hwy 89 and in the campground to improve navigation for vehicles and pedestrians.
14. Install electrical hookups in two campground loops closest to the entrance.
15. Install utilities at two host sites; to include water, electric, and sewer.
16. Repair fencing along the property line. “Gates” or gaps in the fence will be included to ensure that wildlife does not encounter a solid barrier when crossing the campground.
17. Remove the six existing restrooms and replace with four accessible shower/bathroom facilities, one serving each loop.
18. Plant vegetation for screening in any areas where vegetation was disturbed or removed along the campground perimeter and intensively plant for screening around the administrative site.
19. Approximately 400-800 trees would be removed to facilitate construction of BMPs and associated infrastructure. In addition, thinning of ladder fuels (smaller trees) will take place throughout the project area in order to provide defensible space for facilities.
20. Construct a ten-space overflow parking lot south of the campground entrance road.

Administrative Site:

A new combined fire station/administrative building would be built on the location of the existing administrative site. All new facilities will meet FSORAG and ABA accessibility guidelines.

1. Construct a new fire station/administrative building and associated parking on the site of the former house and garage.
2. The fire station/administrative building will contain two bays for a Type III fire engine, offices for the fire personnel (no overnight accommodations), a kitchen and meeting area, bathrooms and showers, office space for other Forest Service employees, and a public entrance. Approximate building size is 3,500 square feet. Design of the building is to be similar to the USFS Spooner Fire Station on Hwy 50 on the east side of Lake Tahoe.
3. Administrative facility parking lot would have room for twelve spaces dedicated for the fire crew and other forest service personnel, and ten spaces for public visitors, including two universally accessible spaces (approximately 10,000 square feet).
4. Redesign of the campground entry road will include widening of the road to allow for a dedicated striped emergency vehicle lane.
5. Privacy fencing will be installed along the property line between the administrative site and neighboring residences (minimum height to be six feet).

Beach:

Proposed activities at the beach site include improvements to stormwater management and accessibility to the beach from the parking lot.

1. Excavate and shorten the stormwater pipe on the beach to expose the flow ("daylight" the stream) and stabilize the resulting slope. Stabilization may include riprap, boulder placement, retaining walls, structural walls, and vegetation. Bridges, footpaths, and safety rails will be installed where needed to ensure navigability, safety, and efficient use of the site by visitors.
2. Create an accessible pathway from the beach parking to the waterfront.

Meeks:

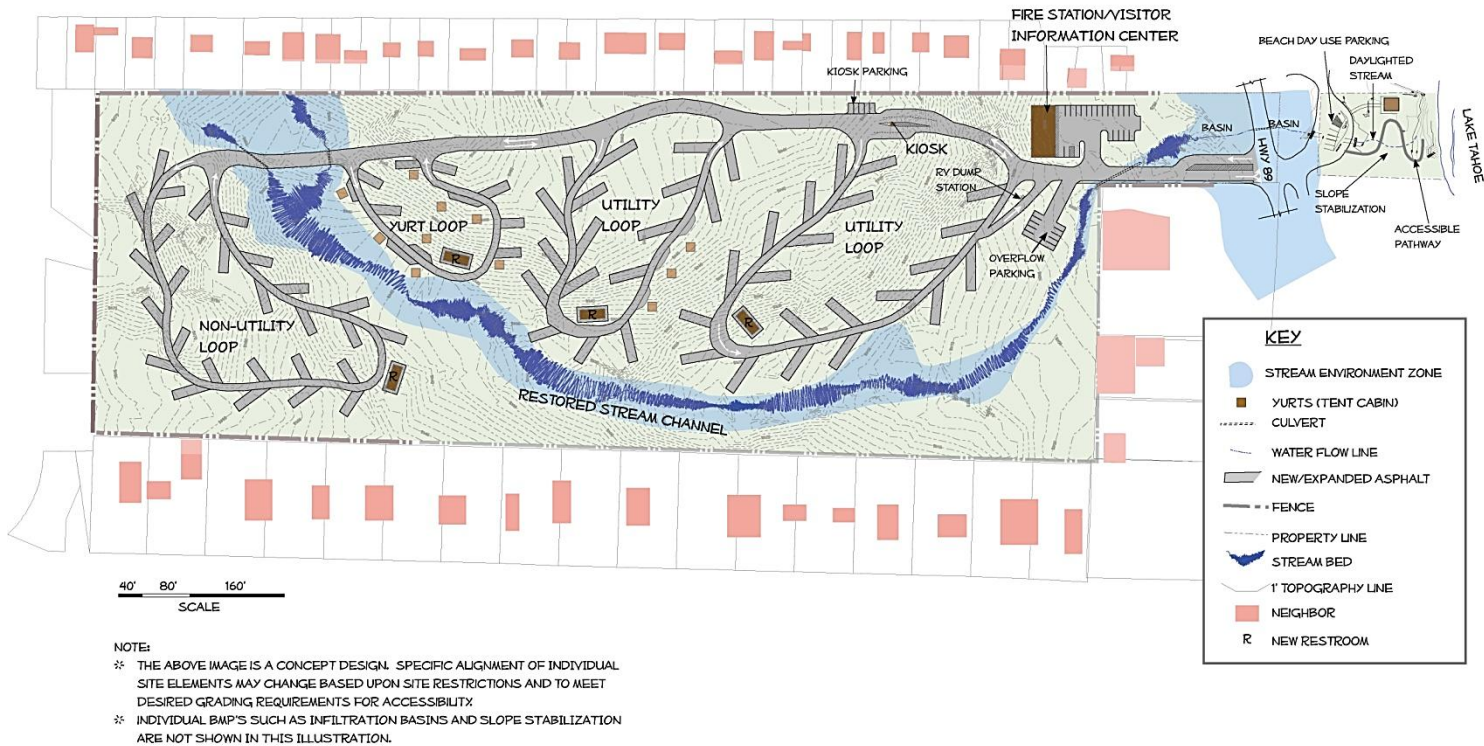
Proposed activities at the Meeks fire station include removing the fire station building and rehabilitate the site.

1. Decommission the building and remove excess asphalt.
2. Decompact the site and cover exposed soil (wood chips, pine needles, etc) to allow for natural revegetation.

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Figure 2-2. Alternative 2 Concept Design.

ALTERNATIVE 2 - PROPOSED ACTION
CONCEPT DESIGN



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2.4 Alternative 3 – Alternative Action

This alternative was developed in response to public comments received during the scoping period and EA comment period, as well as internal discussion relating to the use of the administrative site that resulted in the identification of issues (see Chapter 1.10) that merited the development and analysis of an alternative to the proposed action. Since the release of the EA to the public for comment, the need for visitor information services at this site was re-evaluated. It was determined that visitor information services are adequately provided at other facilities in the area and are therefore not considered further in this alternative. Table 2-1 discusses the major issues raised during public scoping and how such issues are addressed in Alternative 3.

After the action alternative was developed, the EA was released to the public for the legal 30 day comment period. Table 2-2 discusses issues raised during the comment period and how such issues were addressed in Alternative 3. No comments resulted in the need for an additional action alternative. Some of the comments, however, did result in the addition of a design feature or a slight modification of Alternative 3. A summary of the changes that resulted from the public comment period can be found in Table 2-2. See Appendix C of the *Decision Notice and Finding of No Significant Impact* document for the William Kent BMP Retrofit and Administrative Site Redevelopment Project for the full Forest Service response.

Table 2-1. Issues with Alternative 2 that were raised during public scoping, which resulted in the creation of an alternative action (Alt 3).

Issue with Alt 2	Forest Service Response
The location of the main campground two-way road will increase noise and activity levels along the northern boundary.	The two-way road was relocated into the interior of the campground in Alternative 3. The configurations of the one-way loops were changed to accommodate this new circulation pattern.
The location of the kiosk will increase noise and activity levels along the northern boundary.	The kiosk was relocated to the administrative site in Alternative 3.
The location of the fire station will increase noise and activity levels along the northern boundary.	The administrative building was relocated to the south of the campground entrance road and a greater distance from residential lots in Alternative 3.
The proposed action increases paved surfaces, even though it decreases the overall coverage in the SEZ and compacted areas.	The size of the overflow parking lots was reduced and the number of yurt parking spaces was decreased in Alt 3. The number of 60' camping spurs were reduced from 48 to 18 and only provides 7 overflow parking spaces. The actual total impervious surfaces amount is significantly decreased.

Table 2-2. Issues with Alternative 3 that were raised during the legal 30 day public comment period and the Forest Service response.

Issue with Alt 3	Forest Service Response
There is concern about the activity associated with the RV dump station in the location proposed in Alt 3 (too close to residential lots).	The RV waste dump station was moved slightly to be further from the residential lots in response to this concern. It is now located off of the proposed traffic circle.
The kiosk and RV dump station increase the general disturbance on the site of the former William Kent house and garage from the past uses.	A design feature was added to install a 6 foot (minimum) privacy fence along this portion of the campground. The RV dump station was moved (see above).
The proposed traffic circulation pattern results in an increase in vehicular movement in proximity to 480 Pineland Drive.	The roadway was moved slightly and the configuration of the campsites changed so that the road intersection is further from the property line. Additional vegetation screening or solid fencing may be added in this area, as well.
There is a general concern about screening of the campground from the residential lots.	The project description relating to vegetated screening was changed slightly to allow for screening in areas other than just where vegetation was disturbed (see #19 under Campground Facilities, Section 2.4).

Campground Facilities:

In Alternative 3 there are changes in the configuration of the roads within the campground and the addition of a two-way road traveling through the center of the site and reconfiguring the entrance road. The number of campsites proposed are the same as Alternative 2 but will be configured differently with the yurts located throughout the site rather than located in one loop as proposed in Alternative 2. General SEZ reconstruction is similar to Alternative 2 (Figure 2-3).

1. Remove approximately 23,500 square feet (90%) of asphalt from within the SEZ in the campground (Table 2-3).
2. Reduce the stream crossings from 8 to 1.
3. Remove and reconfigure all paved surfaces into three one-way loops connected to a two-way road that runs down the middle of the campground.
4. Remove a net total of 14 campsites for a total remaining of 81 campsites (Table 2-4).
5. Construct all new spurs to meet FSORAG accessibility requirements; 16' wide by 40' long (31 non-utility sites, 32 utility sites), 20' wide by 60' long (5 utility sites), and 16' wide by 60' long (13 utility sites) (Table 2-4).

6. Ten yurt or tent cabin sites will be mixed in with the other campground sites. Sites may function as a regular campsite until a yurt is constructed.
7. Reconfigure the entrance road to include a one-way traffic circle.
8. Relocate the kiosk and dump station to the site of the former William Kent house and garage. Reconfigure the circulation patterns to allow for drive-up kiosk and pedestrian access via a sidewalk. A total of five parking spaces will also be provided for overflow parking and walk-up access.
9. Construct small infiltration basins and vegetated swales along the roadways and in areas where water flows from paved surfaces into the SEZ to prevent any campground pavement runoff from contributing to the water volume of the stream.
10. Remove impervious surfaces from within the SEZ and re-contour the stream channel in areas where the paved surfaces are removed to permit the water to spread out over the SEZ and allow for infiltration and to reduce the flow volume and velocity.
11. Plant native vegetation in eroded and disturbed areas.
12. Stabilize slopes in the campground with boulder placement and revegetate where needed.
13. Replace the signage along Hwy 89 and in the campground to improve navigation for vehicles and pedestrians.
14. Install electrical hookups in two campground loops closest to the campground entrance.
15. Install utilities at two host sites; to include water, electric, and sewer.
16. Repair fencing along the property line. "Gates" or gaps in the fence will be included to ensure that wildlife does not encounter a solid barrier when crossing the campground. Fencing may be replaced with any type of fencing materials that fits the BEIG guidelines (ex: solid wood, split rail, poly-coated chain link, etc).
17. Remove the six existing restrooms and replace with five accessible shower/bathroom facilities.
18. Create seven overflow parking sites on high capability lands outside the SEZ.
19. Plant vegetation for screening in suitable areas where vegetation was disturbed or removed along the campground perimeter. Vegetation may also be planted for screening of facilities. Screening vegetation must follow defensible space guidelines for facilities.
20. Approximately 400-800 trees would be removed to facilitate construction of BMPs and associated infrastructure. In addition, thinning of ladder fuels (smaller trees) will take place throughout the project area in order to provide defensible space for facilities.

21. Privacy fencing will be installed along the property line between the check-in kiosk area and neighboring residences (minimum height to be six feet).

Administrative Site:

In Alternative 3, the administrative facility would be moved to the south side of the campground entrance road. The design for the building would be the same as Alternative 2.

1. Construct a new fire station/administrative building and associated parking south of the campground road to the west of the boat storage facility to serve the north and west shores of Lake Tahoe.
2. The fire station/administrative building will contain one or two bays for a Type III fire engine, offices for the fire personnel (no overnight accommodations), a kitchen and meeting area, bathrooms and showers, and office space for other forest service employees. Approximate building size is less than 3,500 square feet. Design of the building is to be similar to the USFS Spooner Fire Station on Hwy 50 on the east side of Lake Tahoe.
3. Administrative facility parking lot would have 23 parking spaces, including two universally accessible spaces (approximately 14,000 square feet).
4. Redesign of the campground entry road will include widening of the road to allow for a dedicated striped emergency vehicle lane.
5. Privacy fencing will be installed along the property line between the administrative site and neighboring residences (minimum height to be six feet).

Beach:

In Alternative 3 changes to the beach facility are similar to Alternative 2.

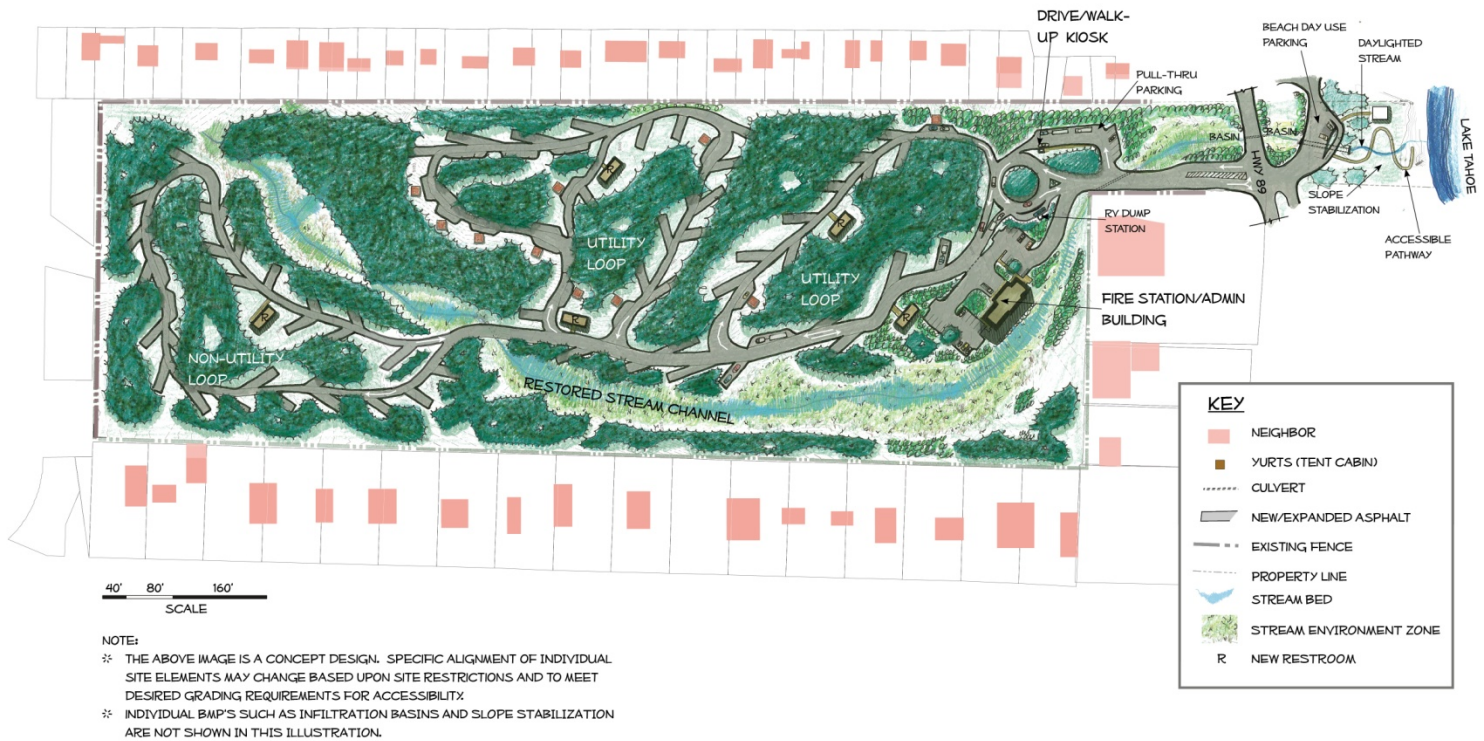
1. Excavate and shorten the stormwater pipe on the beach to expose the flow ("daylight" the stream) and stabilize the resulting slope. Stabilization may include riprap, boulder placement, retaining walls, structural walls, and vegetation. Bridges, footpaths, and safety rails will be installed where needed to ensure navigability, safety, and efficient use of the site by visitors.
2. Create an accessible pathway from the beach parking to the waterfront.

Meeks:

Proposed activities at the Meeks fire station are the same as those identified in Alternative 2.

Figure 2-3. Alternative 3 Concept Design.

FIGURE 2-3
ALTERNATIVE 3 - CONCEPT DESIGN



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2.5 Design Features Common to All Alternatives

Activities associated with implementation of this project could have localized, short-term effects. The following design features have been incorporated into both Action Alternatives and are intended to minimize or avoid effects on soils, water, vegetation, wildlife, fisheries, heritage resources, recreational resources, and air quality. Some of the design features were developed in response to comments received during scoping. Table 2-3 summarizes these comments. In addition to the following design features, applicable BMPs are identified in *Water Quality Management for Forest System Lands in California* (USDA Forest Service 2011). Adherence to these BMPs ensures compliance with the Clean Water Act. These specific BMPs are listed in Appendix A.

Table 2-3. Issues received during scoping and response.

Issue	Response
The fence along the northern edge of the site is constantly knocked down by bears traversing the site from south to north.	A design feature was added to accommodate bear movement along this north-south line and to ensure the fence does not create an impenetrable barrier along the entire length of the property line, therefore preventing the bears from needing to knock down the fence.
The campground design should follow the “dark-skies” initiative.	A design feature was added to include lighting guidelines that meet current code while minimizing light pollution for the campground and administrative facility.
Privacy screening needed between the administrative site and the neighbors.	A design feature was added to include native vegetative screening and fencing where needed between the administrative site and the neighboring residential lots.
The addition of an administrative building will add to congestion on Hwy 89.	A traffic analysis was conducted in response to this issue. It was determined that the addition of the administrative building is offset by the reduction in Daily Vehicle Trips (DVT) due to the reduction of campsites by 14 spaces. Increase in DVT is considered insignificant under Alternative 2 and 3.

Recreation and Access

1. Maintain recreational facilities in a usable condition to the extent possible as long as human health and safety is not compromised and project implementation is unimpeded. The existing kiosk would not be removed until the new kiosk is installed and vehicular access is available. Existing bathrooms would remain in operation until the new bathroom facilities are opened and accessible.
2. Prepare a traffic control plan prior to commencing project operations. A temporary forest closure may be implemented for project activities. Closure should be as limited as possible to reduce restrictions to public access. Closure would be only for areas of active construction activity.

3. Prohibit vegetative slash and construction burning. Construction wastes will be hauled offsite to an approved waste facility. Slash will be either chipped and used onsite or hauled offsite to an approved waste facility.
4. Provide advanced notice to the public to ensure that the public is aware of proposed project activity. Post signs in project areas near public access points to highlight the proposed action and impacts to public access.
5. Signing and temporary fencing would be provided around the construction site.

Scenic Resources

1. New building facilities would be designed to blend with and enhance the existing landscape through the use of native materials and neutral colors. The design will be consistent with the USFS Built Environment Image Guide.
2. Emphasis will be placed on retaining large mature trees to ensure the natural forested appearance of the campground remains.

Heritage Resources

1. If any previously unrecorded cultural resources are discovered during project monitoring or project construction, all project-related activities would cease immediately in the vicinity of such discoveries, the Forest Service would begin the consultation process, as outlined in Section 800.13 of the Advisory Council on Historic Preservation regulations “Protection of Historic Properties” (36 CFR Part 800).

Soil and Ground Disturbance

1. Project activities would occur within the TRPA grading ordinance season (May 01 to October 15) and in accordance with the LRWQCB permit. If grading or movement of soil outside of this window becomes necessary (i.e. to finish BMP’s, etc.) a standard grading exemption permit request would be submitted to TRPA and LRWQCB for approval. During periods of inclement weather, operations would be shut down at the discretion of the Contracting Officer until conditions are sufficiently dry and stable to allow construction to continue without the threat of substantial erosion, sedimentation, or offsite sediment transport.
2. Erosion control and prevention of sediment transport for this project (EA Appendix A) would be implemented in accordance with; *USDA, Water Quality Management for Forest System Lands in California -Best Management Practices* (USDA 2011).
3. Provision for hazardous materials spill kits would be included in the contract specifications.
4. Staging of materials and equipment would be limited to existing disturbed areas outside the SEZ (where soil is already compacted and vegetation has been cleared). Following project completion, any areas used for staging and not intended for continued vehicular use would be tilled, seeded, and mulched.

5. Rock, soil and other earthen material removed during grading operations may be stockpiled and used for construction activities. Consistent with BMP requirements, measures would be employed that prevent stockpiled material from entering the stream channel or otherwise adversely affecting ground water, such as with the use of fiber logs, covering with tarps, etc.
6. Riparian/stream/SEZ and soil restoration activities would be developed where appropriate. Appropriate restoration actions, methods, locations, and amount would be developed based on the types and magnitude of disturbance within the SEZ, as well as site-specific and watershed-level opportunities and constraints for SEZ enhancement.
7. Infiltration basins and vegetated swales would be installed to intercept stormwater flowing from the campground into the SEZ. BMPs would be designed for the 1 inch 1 hour event, and the 2 inch 24 hour rainfall event.
8. Disposal areas for sidecast material will be displayed on engineering plans. Compliance with contract specifications during implementation will be handled by the project contracting officer representative (COR).
9. To prevent pollutants such as fuels, lubricants, and other harmful materials from being discharged into watercourses or other natural channels, unless otherwise agreed upon by the COR, service and re-fueling areas shall be located outside of SEZs. If fuel storage capacities meet or exceed those stated in contract provisions, project Spill Prevention, Containment, and Counter Measures (SPCC) plans are required. Operators are required to remove service residues, waste oil, and other materials from National Forest land and be prepared to take responsive actions in case of a hazardous substance spill, according to the SPCC plan.
10. Construction and maintenance activities adjacent to SEZs will be done in accordance with construction designs. SEZ boundaries will be flagged prior to starting work adjacent near the SEZ. Compliance with contract specifications during implementation will be handled by the project COR.
11. The following will be required in contracts: Coordination with the LRWQCB for permits will be required when diverting any flow. Specifications for such activities will be included in the engineering plans. Compliance with contract specifications during implementation will be handled by the project COR.
12. Culvert specifications will be included in the engineering plans. Temporary BMPs such as silt fence will be used to ensure water quality is protected during installation. Compliance with contract specifications during implementation will be handled by the project COR.
13. Riprap (rock stabilization) use will be included in the engineering plans. Plans will specify what type and size to be used. Compliance with contract specifications during implementation will be handled by the project COR.
14. The road surface within the campground will be paved. Compliance with contract specifications during implementation will be handled by the project COR.

15. Erosion control will be accomplished through applying seed to disturbed areas, paving road surfaces, installing drainage features and basins, and retaining walls.

Botany/Non-Native Invasive Plant Species

1. If any sensitive plants or special interest plants are found they would be flagged by an LTBMU Forest Botanist and avoided.
2. Include non-native invasive species prevention measures in project contract. In the event that noxious weeds are found on the site, the LTBMU noxious weed coordinator would be consulted.
3. All construction and earth-moving equipment would be free of non-native invasive plant species before moving into the project area. Equipment would be considered free of non-native invasive plant species when visual inspection by the COR does not reveal soil, seeds, plant material, or other such debris.
4. Equipment would be cleaned prior to moving to other National Forest System lands.
5. All gravel, fill, or other materials would be required to be weed-free. Obtain certified weed-free materials from gravel pits and fill sources that have been certified weed free or have been surveyed and approved by the LTBMU Forest Botanist.
6. All mulches and seed mixes would be weed free. Seed mixes must be approved by the LTBMU Forest Botanist.
7. Staging areas for equipment, materials, or crews would not be situated in areas infested by non-native invasive species. Areas containing non-native invasive species would be “flagged and avoided” before implementation.
8. Cheatgrass infestations found during project activities would be treated and covered with weed matting prior to and during project implementation. Treatment may include chemical or hand methods, depending on the size of the infestation (see 2010 TIPS EA).
 - a. Staging areas for equipment, materials, or crews will be designated in paved areas away from cheatgrass and noxious weed infestations.
9. After the project is completed, all disturbed project areas will be monitored for 3 years to ensure non-native invasive species do not spread and additional non-native invasive species do not become established in areas affected by the project. Monitoring will occur through the LTBMU invasive weeds monitoring program.

Wildlife

1. If special status wildlife species are detected in the project vicinity, Limiting Operating Procedures (LOPs) would be implemented as determined by the project biologist. The project biologist would determine if LOPs are necessary based on habitat suitability or the most current wildlife data from pre-project field surveys.

2. Any sightings of threatened, endangered, candidate, sensitive, management indicator, or special interest species would be reported to the project biologist. Nests and dens would be protected with flagging, fencing, or limited operating periods in accordance with management direction. Species identification, known locations, and protection procedures for both plants and animals would be addressed with implementation crews during a pre-construction meeting.
3. Existing down logs greater than 20 inches dbh may be retained. Logs that are moved during construction could be repositioned.
4. Bear-proof garbage dumpsters would be temporarily installed during implementation or food-related trash associated with project activity would be removed daily to prevent wildlife attraction to the project area.

Engineering

1. Building construction would incorporate “green” sustainable construction features where appropriate (i.e. sourcing sustainably produced or local materials, utilizing passive solar, integrating energy-saving technologies, etc).
2. Paved surfaces around structures that do not require vehicular circulation would be designed with porous paving systems or other semi-pervious surface (i.e. gravel) where appropriate to enhance infiltration of stormwater.
3. Building structures would have roofline drip trenches or other BMPs to catch and slow stormwater flowing from the roof.
4. Select light features for the campground and administrative site that limit light pollution while following building code and Forest Service lighting design guidelines.
5. Fence repairs and new fence construction will allow places for through-travel of large wildlife (i.e. bears) in at least one location along each property line in a manner that does not necessitate the animal to go over the fence or push it down.
6. Specific allowable construction hours would be set from 7:00 am to 7:00 pm, Monday through Friday. Construction outside of these allowable hours must be coordinated and approved by the COR and the permittee.

Air Quality

1. Unpaved areas during construction subject to vehicle traffic must be stabilized by being kept wet, treated with chemical dust suppressants or covered. Cover materials must contain less than 0.25 percent naturally-occurring asbestos.
2. The speed limit on unpaved areas must be 15 mph or less unless the road surface and surrounding area is sufficiently stabilized to prevent vehicles and equipment traveling more than 15 mph from emitting dust exceeding Ringelmann 2 (dust sufficient to obscure vision by 40%), or visible emissions from crossing the project boundary line.

3. Storage piles and disturbed areas not subject to traffic must be stabilized by being kept wet, treated with a chemical dust suppressant, or covered when material is not being added to or removed from the pile.
4. Prior to any ground disturbance, including grading, excavating, and land clearing, sufficient water must be applied to the area to be disturbed to prevent emitting dust exceeding Ringelmann 2 and to minimize visible emissions crossing the boundary line.
5. Construction vehicles leaving the site must be cleaned to prevent dust, silt, mud, and dirt from being released or tracked off site.
6. When wind speeds are high enough to result in dust emissions crossing the boundary line, despite the application of dust mitigation measures, grading and earthmoving operations are suspended.
7. No trucks are allowed to transport excavated material off site unless no spillage can occur from holes or openings, and loads are either covered with tarps, or wetted and loaded such that the material does not touch the front, back, or sides of the cargo compartment at any point less than six inches from the top and that no point of the load extends above the top of the cargo compartment.
8. Actions must be taken such as surface stabilization, establishment of a vegetative cover, or paving to minimize wind-driven dust from inactive disturbed surface areas.
9. Track-out of dirt or mud onto public paved roadways must be minimized and cleaned up.
10. A Dust Control Plan (DCP) will be submitted to the Dust Control District for approval prior to the start of earth-disturbing activities if this requirement has been established as a Condition of Approval of a discretionary permit.

Tree Removal

1. Emphasis will be placed on retaining structurally complex large trees. Where feasible based on project activities, Jeffrey pine, sugar pine, and incense cedar would be retained and lodgepole pine and white fir would be removed. Trees showing signs of stress, or insect and disease infection would be removed, consistent with project activities.
2. Thinning of ladder fuels for defensible space standards around structures will take into consideration recreation and screening objectives. Identification of ladder fuels will occur in coordination with recreation program managers.
3. Cut trees may be removed, or utilized as fuelwood. Any slash material generated from tree removal (i.e. smaller trees, limbs, and tops) would be removed in whole, chipped, and removed or chipped for use on the site. Tree removal may require the use of ground-based mechanical equipment, chainsaws, or chippers, and a staging area(s) in order to process material.

Monitoring

1. The William Kent Campground BMP Retrofit and Administrative Site Renovation project would be included in the pool of projects for random BMP evaluations under the Best Management Practices Evaluation Program (BMPEP) program. Each year the LTBMU completes evaluations for the BMPEP as part of the Pacific Southwest Region's effort to evaluate the implementation and effectiveness of BMPs created for protecting soil and water resources associated with Forest Service management activities.
2. Monitoring to ensure that all contract items including temporary BMPs, design features, and permit requirements are being followed, will be provided by the Forest Service Contracting Officer's Representative following protocols established for public works contract administration.

2.6 Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the tables focuses on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives. Chapter 3 provides the scientific and analytical basis for the comparison of effects found in Table 2-6.

Table 2-4. Comparison of total impervious surface coverage for each alternative.

	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3 (Alternative Action)
Total impervious surfaces (campground and admin site)	207,000 ft ² *	200,300 ft ²	190,500 ft ²
Reduction in impervious coverage (campground and admin site)	0	3%	8%
Total impervious coverage in SEZ (campground and admin site)	34,600 ft ²	12,800 ft ²	12,000 ft ²
Total impervious coverage in SEZ (campground only)	26,200 ft ²	4,500 ft ²	2,700 ft ²
Impervious coverage removed from SEZ (campground only)	0 ft ²	21,700 ft ²	23,500 ft ²
% impervious coverage removed from SEZ (campground only)	0%	83%	90%

*Calculation of total impervious surface for Alternative 1 is based on existing paved surface footprint plus a 2 foot buffer of compacted native surface surrounding the asphalt. The 2 foot buffer is an average estimate of the amount of disturbed soils as observed on the site.

Table 2-5. Comparison of Campsite type and number for each alternative.

	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3 (Alternative Action)
12' wide by 25' long spurs	95*	0	0
16' wide by 40' long spurs	0	33	63
20' wide by 60' long spurs	0	5	5
16' wide by 60' long spurs	0	43	13
Total	95	81	81

*Existing average spur size is 12' x 25', but is highly variable.

Table 2-6. Summary of Effects of Alternatives.

Area of Effect	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3 (Alternative Action)
Recreation	Existing recreation and management continues. Facilities do not meet accessibility standards, deferred maintenance remains. Undersized camp spurs remain, confusing circulation; traffic stacks up on Hwy 89. Noise levels remain consistent. Beach day use site remains the same.	Loss of 14 campsites. Facilities meet the BEIG ¹ and accessibility standards; deferred maintenance lowered. Increased amenities (showers, utilities). Increased noise and disturbance to neighbors along northern boundary. Campsites near admin site less rustic. Reduced amount of level ground on beach site, increased accessibility to beach.	Loss of 14 campsites. Facilities meet BEIG and accessibility; deferred maintenance lowered. Increased amenities (showers, utilities). Increased noise and disturbance to residential properties near admin site, but less so than Alt 2. Campsites near admin site less rustic. Reduced amount of level ground on beach site, increased accessibility to beach.
Wildland Fire Response	Fire station remains at Meeks Bay. The majority of wildland fire response calls are located significantly north of Meeks Bay and require longer response times. Facility does not meet accessibility needs, only usable in summer months, does not meet the space or facility needs of the fire crew.	Wildland fire response on north shore greatly improved. Improved facility that is universally accessible and able to be occupied year-round. Facility meets the needs of the fire crews.	Wildland fire response on north shore greatly improved. Improved facility that is universally accessible and able to be occupied year-round. Facility meets the needs of the fire crews.
Wildlife	Bears continue to knock down the fence. No effect on special status species.	Bears can travel through gaps in the fence without property destruction. May affect individuals, but is not likely to result in a trend toward Federal listing of special status species.	Bears can travel through gaps in the fence without property destruction. May affect individuals, but is not likely to result in a trend toward Federal listing of special status species.

Area of Effect	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3 (Alternative Action)
Botanical Resources	No known special status species or noxious weed species on the site.	Potential for introduction of noxious weed species during construction is moderate. Design features implemented to mitigate this. Likely no impact to botanical resources. Restoration of riparian vegetation.	Potential for introduction of noxious weed species during construction is moderate. Design features implemented to mitigate this. Likely no impact to botanical resources. Greater restoration of riparian vegetation than Alt 2.
Heritage Resources	No effect on heritage resources	No effect on heritage resources.	No effect on heritage resources.
Scenic Resources	Restrooms do not meet BEIG ¹ guidelines. Partial retention VQO ² for the middle ground; modification or better for foreground. Scenic stability moderate.	All facilities meet the BEIG. VQO is maintained. Beach visual appearance altered, but remains consistent with VQO. Scenic stability increases. Aesthetic appearance of campground improved. Aesthetic appearance of the Meeks Bay Resort entrance is improved.	All facilities meet the BEIG. VQO is maintained. Increased spacing between admin center and neighborhood residences compared to Alt 2. Beach visual appearance altered, but remains consistent with VQO. Scenic stability increases. Aesthetic appearance of campground improved. Aesthetic appearance of the Meeks Bay Resort entrance is improved.
Transportation and Traffic	Traffic stacks up onto Hwy 89 during periods of heavy use. DVT ³ is 481. Confusion and congestion within campground remains. Traffic patterns at Meeks Bay Fire Station remain.	Traffic does not stack onto Hwy 89. Insignificant increase in DVT (1 DVT). Reconfiguration of roadways increases efficiency and decreases confusion and congestion in campground. Traffic congestion and conflict at the Meeks Bay Resort entrance is reduced.	Traffic does not stack onto Hwy 89. Insignificant increase in DVT (2 DVT). Reconfiguration of roadways increases efficiency and decreases confusion and congestion in campground. Traffic congestion and conflict at the Meeks Bay Resort entrance is reduced.
Hydrology and Soils	Erosion and sedimentation of stream channel and impacts to water quality. 8 stream crossings remain in the campground.	Improved soil retention and infiltration, reduced erosion. 83% of impervious surfaces removed from SEZ ⁴ in campground. Two stream crossings remain.	Increased infiltration and soil retention, reduced erosion. 90 % of impervious surfaces removed from SEZ in campground. One stream crossing remains.
Air Quality/Greenhouse Gas Emissions	No change from existing condition.	Increase in DVT, but not significant. Not considered a significant increase in greenhouse gas emissions or decrease in air quality.	Increase in DVT, but not significant. Not considered a significant increase in greenhouse gas emissions or decrease in air quality.

Area of Effect	Alternative 1 (No Action)	Alternative 2 (Proposed Action)	Alternative 3 (Alternative Action)
Visitor Information	Limited visitor information disbursed from kiosk.	Visitor services for North and West Shores of Lake Tahoe offered in the administrative building.	Limited visitor information disbursed from kiosk.

¹BEIG : Built Environment Image Guide

²VQO: Visual Quality Objectives

³DVT: Daily Vehicle Trips

⁴SEZ: Stream Environment Zone

3.0 Environmental Consequences

The Council on Environmental Quality (CEQ) regulations direct that agencies succinctly describe the environment that may be affected by the alternatives under consideration (40 CFR 1502.15). This chapter describes the existing physical, biological, social, and economic aspects of the project area that have the potential to be affected by implementing any of the alternatives (i.e., the existing conditions). Each description of the existing conditions is followed by a description of the environmental effects (direct, indirect, and cumulative) that would be expected to result from undertaking the proposed action or other alternatives. Together, these descriptions form the scientific and analytical basis for the comparison of effects table found at the end of Chapter 2, “Summary of Effects of Alternatives.”

3.0.1 Organization of Chapter 3

Chapter 3 combines information on the existing conditions and environmental effects of the alternatives for the various resources. The information is separated into these resource areas for ease in reading. The discussion of alternatives is organized by resource area, and each resource area is presented as follows:

- *Introduction.* The scope of the analysis briefly describes the geographic area(s) for the individual resource and its indicators potentially affected by implementation of the proposed action or alternative. The scope of the analysis varies according to individual resource area and may also vary for direct, indirect, and cumulative effects.
- *Existing Conditions.* The existing conditions section provides a description of the resource environment that is potentially affected based on current resource conditions, uses, and management decisions.
- *Direct, Indirect, and Cumulative Effects.* This section provides an analysis of direct, indirect, and cumulative environmental effects on the resource area by implementing each of the alternatives, according to the indicators and issues identified for that resource.
- *Analytical Conclusions.* This section provides a synthesis of the effects analysis for that resource.

Direct effects are caused by the actions to implement an alternative, and occur at the same time and place. Indirect effects are caused by the implementation action and are later in time or removed in distance, but are still reasonably foreseeable (i.e., likely to occur within the duration of the project).

Cumulative effects are the result of the incremental direct and indirect effects of any action when added to other past, present, and reasonably foreseeable future actions. Cumulative effects can result from individually minor, but collectively significant actions, taking place over a period of time.

3.0.2 Projects Considered for Cumulative Effects

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing

conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions. Additionally, focusing on the impacts of past human actions, risks ignoring the important residual effects of past natural events, which may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Third, public scoping for this project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.”

The cumulative effects analysis in this EA is also consistent with Forest Service National Environmental Policy Act (NEPA) Regulations (36 CFR 220.4(f)) (July 24, 2008), which state, in part:

“CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions. Once the agency has identified those present effects of past actions that warrant consideration, the agency assesses the extent that the effects of the proposal for agency action or its alternatives would add to, modify, or mitigate those effects. The final analysis documents an agency assessment of the cumulative effects of the actions considered (including past, present, and reasonable foreseeable future actions) on the affected environment. With respect to past actions, during the scoping process and subsequent preparation of the analysis, the agency must determine what information regarding past actions is useful and relevant to the required analysis of cumulative effects. Cataloging past actions and specific information about the direct and indirect effects of their design and implementation could in some contexts be useful to predict the cumulative effects of the proposal. The CEQ regulations, however, do not require agencies to catalogue or exhaustively list and analyze all individual past actions. Simply because information about past actions may be available or obtained with reasonable effort does not mean that it is relevant and necessary to inform decision-making. (40 CFR 1508.7)”

For these reasons, the analysis of past actions in this section is based on current environmental conditions.

Appendix B discloses the present and foreseeable future actions that have affected or may affect resources in the William Kent Campground area that were considered for the analysis of cumulative effects.

3.1 Recreation

3.1.1 Introduction

There are more than 5 million visits to the LTBMU every year (USDA 2010). A large portion of these visits are to developed recreation sites, such as William Kent. The infrastructure and development in these areas allows for concentrated public use, while managing impacts to the natural setting.

This section evaluates the effects to the human environment and recreation use of the no-action, the proposed action, and the alternative actions. In evaluating the three alternatives, the following three categories of effects were analyzed:

1. Effects of the project on facility operations to the permittee
2. Effects to the recreation experience
3. Effects to the adjacent neighbors

3.1.2 Existing Condition

The William Kent campground and day use beach site offers forest setting recreation experiences and is popular with visitors due to its close proximity to Tahoe City and nearby amenities such as the swimming beach, restaurants, stores, a marina, and access to the rest of Lake Tahoe. Contributing to its popularity is that there are only three campgrounds situated in this area of Lake Tahoe and very few public access points to the lake along the west shore of Lake Tahoe.

The campground and administrative site have coexisted since 1924. The campground was operated by the Forest Service from its construction until 1990. Since 1990, the campground has been operated under special use permit. The administrative site currently contains only a parking area that serves as overflow for the campground and parking for the campground host vehicles. The William Kent house and garage that previously existed on the administrative site were decommissioned and removed in 2011.

The campground is well forested with tall Jeffery pine, white fir, and incense cedar; and campsites are spread among low ridges and shallow ravines. Urbanization over the years has surrounded this campground. The campground is surrounded by neighbors on three sides and a boat yard to the east. Some campsites are small and not level and others back up to perimeter fences. Highway noise can be heard from some campsites near the entrance. In spite of these site challenges, visitors report high satisfaction levels with their camping experience (as determined from comment cards returned to the permittee) and many campers return year-after-year.

The campground and day use beach area are open from mid-May to mid-October. The campsites are often full on busy weekends during the peak season from the Fourth of July through the end of the Labor Day. Campsites near the entrance currently experience high levels of vehicle and pedestrian activity during peak occupancy periods because all campground traffic flows by those campsites due to the one-way configuration of the roads. Currently, the campsites that are located

within the SEZ provide early season camping opportunities because the snow melts away from these sites first and little snow removal is needed in order to accommodate early season camping. The permittee uses the kiosk as their office, campground check-in, and visitor information center (the permittee offers general interpretive information to the public in addition to issuing Desolation Wilderness permits).

The day use beach area is directly across Highway 89 from the campground and is adjacent to the Sunnyside Resort. The permittee manages the day use area, parking lot, and restroom facility. It has an approximately ½-acre picnic area and a small rocky beach with lake access. It is a popular beach and is often visited by upwards of 100 people per day during the peak summer period by both visitors and neighbors alike for picnicking, swimming and beach activities.

3.1.3 Direct and Indirect Effects

Alternative 1 - No Action

The No Action Alternative would allow existing recreational activities at the campground and day use beach area to continue without interruption or substantial changes. The permit holder would continue to operate the campground and day use beach area as described in their special use permit and operation plan. There would be no addition of utilities to the campsites and no addition of yurt camping opportunities or reduction in deferred maintenance on the site. The restroom facilities would continue to not meet Forest Service accessibility standards. Camp spurs would continue to be undersized. The campground capacity would remain at 95 campsites accommodating 475 persons-at-one-time (PAOTs). The two host camping sites would continue to be located together near the campground entrance. There would be no change to the problems associated with the existing traffic patterns and the permittee would continue to operate the campground and manage their operations out of the existing kiosk. Little snow removal would continue to occur. Traffic would continue stacking up past the campground kiosk parking area onto Hwy 89 during periods of heavy use. There would be no change to the existing experience neighbors have while living in close proximity to a campground. Noise levels in and around the campground would remain the same. Some campsites would continue to be situated close to neighbors' backyards. There would be no change to the William Kent day use beach area. Demand for the campground and day use beach area is expected to increase with population growth. There would be no change to the administrative site and overflow parking would continue to occur there. There would be no change to the existing traffic patterns or administrative use at the Meeks Bay Fire Station. This alternative does not preclude future upgrades on the site.

Alternative 2 - Proposed Action

Alternative 2 provides improved campsite navigability by reconfiguring the campground, as well as the addition of shower facilities, yurt campsites, and electric hook-ups in two of the campground loops. All campsites would be upgraded to meet FSORAG and ABA accessibility guidelines, as well as to meet the Forest Service sizing guidelines. Increasing the size of the camp spurs will result in less vehicles driving on unpaved areas and less subsequent resource damage, as well as to decrease the incidence of vehicles blocking the roadway and parking on the roadside. Providing electric hookups in two of the campground loops would help update the

campground to meet public expectations. This alternative provides a total of 81 campsites, 14 less than is currently provided, which represents a net loss of 70 PAOTs available to the public.

The campground roads and camping spurs are reconfigured to improve circulation and to remove impervious coverage within the SEZ. With the loss of the campground sites in the SEZ that melt off first during the spring months, the campground permittee would incur more costs for snow removal to accommodate mid-May camping opportunities.

The new campsites which are designed with approximately 60 feet between the living areas of adjacent campsites would result in a sense of distance from neighboring campsites for a quality camping experience. See Table 3-1 for a summary of campground types and sizes. Upgrades to campsites would decrease the overall deferred maintenance costs that the permittee addresses on an annual basis.

The eleven new yurt sites or tent cabin sites would result in enhanced alternative camping opportunities offered to the public. The changeover of some sites to yurts would have some impact on the permittee's current operation of the facility. The permittee would be required to purchase and maintain the actual yurt structures, including the daily care and maintenance. The campsites may be used as regular campsites until the yurt structures are installed.

Host campsites 94 and 95 would be relocated within the campground. Host sites would have electric, water, and sewer hookups. Currently the hosts are located adjacent to one another. The planned separation of the host sites would provide campers with better access to hosts and improve customer service. This separation may result in a change in host operations. Relocation of the on-site RV dump station would result in better support for campground operations, as well. Providing these amenities that reflect changing public use patterns would increase the overall desirability of the campground and the financial viability of the campground is expected to improve.

The new kiosk would be positioned further into the campground and would be located in the middle of the entrance roadway. Its location further into the campground in the middle of the road would reduce the impacts from check-in traffic stacking up onto Hwy 89 and would allow both incoming and outgoing traffic the opportunity to conveniently stop by the kiosk for information without visitors getting out of their vehicle. Pedestrians can access the kiosk under Alternative 2 via the road with an 8% slope and then must cross traffic to approach the kiosk.

The kiosk is located on a road that parallels the northern boundary of the campground and subsequently parallels the private homes on Fountain Avenue that lie along its length. An overflow parking lot would also be situated on this road. As a result, those neighbors along this boundary would experience more vehicle movement, noise and headlights than they currently experience.

In Alternative 2 the new administrative building is planned on the existing administrative site location, north of the campground entrance road. Constructing the administrative center along the northern site boundary would only modestly impact the permittee's operation of the campground. Traffic controls would be implemented

to ensure that guests do not hinder emergency traffic leaving the administrative center. Some campsites situated closest to the administrative center and over flow parking lot may become less desirable due to their proximity to the increased activities of the administrative site. The overall camping experience in the campsites near the Administrative Center and overflow parking lot may become less rustic than in the past. It is anticipated that the campground would still fill up during the peak season and the overall impact on the viability of the campground would not be largely affected by the presence of the new administrative center.

Neighbors situated close to the entrance area along the northern boundary currently experience impacts from general campground operations (traffic and activities), and the noise generated by traffic on Highway 89. Activity and noise levels introduced by the proposed action would increase from the existing levels. Siren noise is not expected to have a significant impact on campground activities and neighboring residences because sirens would not be activated under normal emergency operations until reaching the highway/campground intersection.

The changes to the day use beach area may concentrate the current use of the picnic area into a smaller footprint. Less level open space would be available for recreation activities and picnic tables may be positioned closer together due to the grading required to re-create the stream channel. Creating a stream channel through the middle of the day use beach area may increase the permittee's on-site management obligations due to the increased site infrastructure. Easy access to the restrooms from all points within the day use site would be maintained.

Alternative 3 - Alternative Action

Alternative 3 provides improved campsite navigability by reconfiguring the campground, as well as the addition of shower facilities, yurt campsites, and electric hook-ups in two of the campground loops. All campsites would be upgraded to meet FSORAG and ABA accessibility guidelines. Increasing the size of the camp spurs will result in less vehicles driving on unpaved areas and less subsequent resource damage, as well as to decrease the incidence of vehicles blocking the roadway and parking on the roadside. Providing electric hookups in two of the campground loops would update the campground to meet public expectations of utility services in campgrounds.

The primary difference between Alternative 2 and Alternative 3 is that the 2-way road would be located in the center of the campground instead of the northern boundary. This design provides three one-way campground loops (instead of four loops in Alternative 2) and five restroom/shower facilities (instead of four in Alternative 2). The new Administrative Center would be situated to the south of the campground entrance road (adjacent to private property currently used as a boat storage yard).

The relocation of the kiosk onto the existing administrative site in Alternative 3 would improve and speed-up the permittee's check-in process. Campers would be able to check-in without leaving their vehicle via the drive-up window. This would result in faster check-ins and minimize waiting times, reducing the number of vehicles waiting for check-in. The kiosk would have a walk-up window accessible via a pedestrian sidewalk where interpretive information and wilderness permits can be dispensed to pedestrian traffic, as well. Relocating the existing entry kiosk to this

location would reduce potential impacts from check-in traffic stacking up onto Hwy 89. The additional parking would also serve as overflow parking during busy periods. The neighbors adjacent to the kiosk site would experience an increase in activity from current levels, but it is anticipated that it would be less activity than an administrative site in this location (as is proposed in Alternative 2).

It is anticipated that the proposed improvements to the campground would increase the overall quality of the campground and impacts to the permittee's operation would be minimal. The addition of ten yurts would not adversely affect the permittee's operation. Host sites would be separated (similar to Alternative 2) and would have electric, water, and sewer hookups.

The RV dump station was originally located near the kiosk in Alternative 3. In response to comments received during the 30 day legal comment period, the RV dump station was moved further from the residential lots. The RV dump station is now proposed under Alternative 3 to be located off the traffic circle. Moving the RV waste dump station closer to the staffed kiosk will result in an improved ability of the permittee to keep it well maintained. The effects from general disturbance to the residential lots near the kiosk are reduced from the original Alternative 3 concept plan.

This alternative provides a total of 81 campsites, 14 less than is currently provided, which represents a net loss of 70 PAOTs available to the public. See Table 3-1 for a summary of campground types and sizes. Some campsites situated along the two-way road would experience more traffic compared to existing conditions. Most of the campsites within the campground will experience less traffic than they currently experience. It is anticipated that these campsites would still provide an acceptable camping experience. As in Alternative 2, the overall quality of the campsite experience in the campground would be improved. The campsites nearest to the administrative center would become less rustic and more modified than in the past and may be considered less desirable, as well. It is anticipated that the campground would fill-up during the peak season and the overall impact on the economic viability of the campground would not be largely affected and most likely would be improved.

This Alternative should have fewer impacts to neighbors on the northern boundary than Alternative 2 because the two-way road is located in the center of the campground. Relocation of the Administrative Center away from the residential houses would reduce its effects on neighbors, as well. Siren noise is not expected to have a significant impact on campground activities and neighboring residences because sirens would not be activated under normal emergency operations until reaching the highway/campground intersection. The aesthetics of living next to a campground would be improved over those expected in Alternative 2 because the main roadway (and subsequent increased activity) is located on the interior of the campground.

Impacts to the William Kent day use beach area are the same as Alternative 2 and may result in a reduction in flat areas for picnic use.

Table 3-1 Number of camping spurs for each alternative by size and type.

Alternative	12' w¹ x 25' l²	20' w x 60' l	16' w x 60' l	16' w x 40' l
Alt 1	95	0	0	0
Alt 2	0	5 utility	43 utility	33 non-utility
Alt 3	0	5 utility	13 utility	31 non-utility, 32 utility

¹width, ²length**Direct and Indirect Effects from Construction common to Alternative 2 and 3**

The noises that would be generated from the campground construction would come from asphalt grinding machines, dump trucks, and heavy rolling equipment. Road construction noise would be heard by campers and nearby neighbors during the construction period. The campground usually does not reach capacity until the 4th of July weekend. Many of the neighboring homes serve as vacation homes and are not often occupied until early summer. The project can be phased to produce as little impact as possible on campground operations, the neighbors, and the recreating public.

The permit holder may experience a loss of revenue if the whole or sections of the campground is closed during any of the construction periods. Some campers may avoid William Kent due to construction activities. Campers would be notified of the status of construction activities when they make reservations and prior to their decision to select William Kent. The permit holder may also be impacted by having to manage visitors around construction zones. Information about the construction would be added to the online registration system, as well as at the kiosk.

Construction of the administrative building would span at least one entire calendar year. Ground-disturbing activities would be limited to the grading season (May 1 to October 15), but non-ground disturbing activities may continue outside of this period. Noises associated with construction of the administrative building would be typical building construction noises.

3.1.4 Cumulative Effects

Cumulative recreation impacts from this project would be represented by the number of campsites lost from this and other projects in the Lake Tahoe Basin Management Unit. No other non-Forest Service reductions in available campsites are known at this time.

Using a geographical area based on a 30 minute drive in each direction from William Kent, this project would reduce the number campsites by 14 units and 70 PAOTs, which represents only a 6% reduction in this geographical area. This project would, in turn, increase the quality of the camping experience in this region by upgrading the campground and providing improvements to meet changing user needs (e.g. showers, larger campsites and electric utility hookups).

When looking at the entire Lake Tahoe Basin Management Unit, there are cumulative losses to the number of campsites from the Camp Richardson Campground and Vehicle Circulation BMP Retrofit Project. This project is still in the planning stages and is anticipated to result in a decrease of campsites over the range of alternatives. The reduction in campsites from the Camp Richardson BMP Project and the William Kent BMP Project represent a loss of campsites currently available in the Lake Tahoe Basin in Forest Service campgrounds and resorts. The PAOT capacity of these campgrounds is reached only on a few weekends during the summer months. It is not anticipated that the loss in PAOTs will result in a loss of the ability to camp in the Lake Tahoe Basin or negatively affect the range of camping experiences available to the public. For these reasons this project does not contribute to significant negative cumulative effects due to decreased numbers of campsites. Water Quality improvements to the William Kent day use beach area would not decrease the public's ability to access Lake Tahoe.

3.1.5 Analytical Conclusions

Alternative 1 - No Action:

The result of not installing BMP's and removing the roadway from the SEZ would allow the campground to continue as it is currently operating with the associated resource damage. This action prolongs the period that the recreation site is managed below resource sustainability standards. Campsites would continue to be too small for the larger camping vehicles and the restrooms would remain non-universally accessible and in poor condition. Some campsites would remain close to the fence line and residences. Traffic stacking up onto Hwy 89 during busy periods would continue, as well as the perpetuation of confusing circulation within the campground.

Alternative 2 - Proposed Action:

Alternative 2 would bring the recreation sites up to resource sustainability standards by improving the circulation, accessibility, and quality of the recreation experience. Though the proposed action represents a net loss of 14 campsites available to the public, it provides improved campsite accessibility, showers, yurts and electric hook-ups. Providing amenities requested by the public would increase the overall desirability of the campground and encourage more visitors to use the facility in the early and late seasons. The new administrative center is not anticipated to negatively impact the permittee's operations, the overall campground economic viability, or the overall visitor experience. The proposed roadway/kiosk reconfigurations and administrative building location near the northern campground boundary would result in the neighbors along the northern boundary experiencing more vehicle movement, noise and headlights than they currently experience.

Alternative 3 - Alternative Action:

Alternative 3 would bring the recreation sites up to resource sustainability standards, and would have fewer impacts to visitors and neighbors than Alternative 2. By constructing the Administrative site to the south of the entrance road, the closest campsites would become more modified and less rustic. The overall camping experience in the campsites adjacent to the Administrative site would be less of a forested experience than in the past.

This Alternative should have fewer impacts to neighbors on the northern boundary than Alternative 2. This would be a result of relocating the 2-way road through the center of the campground and moving campsites away from the edges of the property. This would lessen campsites proximity to neighbors and minimize potential conflicts.

3.2 Wildlife Resources

3.2.1 Introduction

This section discloses the existing conditions and potential effects of the three alternatives on 1) species and their habitats listed as endangered, threatened, or proposed under the Endangered Species Act of 1973 as amended (ESA); 2) species designated as sensitive by the Regional Forester in Region 5; 3) habitats designated for Management Indicator Species (MIS) for the Lake Tahoe Basin Management Unit (MIS Report); and 4) wildlife and fisheries threshold standards as designated by the TRPA. This discussion is based on the Biological Assessment/Biological Evaluation (BA/BE) for Aquatic and Terrestrial Species Report (Project Record Document E-5), the MIS Report (Project Record Document E-9), and the TRPA Project Impact Analysis (Project Record Document E-6).

The existing condition of forest vegetation and the changes that would likely occur as a result of the proposed alternatives, as they relate to wildlife habitat suitability, are quantified using the California Wildlife Habitat Relationship (CWHR) personal computer program developed by California Department of Fish and Game (2005) and by field visits to the site collected prior to January 31, 2011. The CWHR program describes vegetation conditions through metrics such as tree size classes and canopy closure and functions as a predictive model of habitat suitability for wildlife species. Habitat suitability within each vegetation type is ranked as 0.0 (not suitable), 0.33 (low), 0.66 (moderate), or 1.0 (highly suitable) for each wildlife species. Changes in vegetation condition are therefore correlated to changes in habitat suitability. This correlation provides a useful tool to estimate the direction and magnitude of changes in wildlife habitat suitability caused by changes in vegetation condition.

3.2.2 Existing Condition

The CWHR program classifies the vegetation community within the William Kent campground as white fir and sagebrush. Vegetation communities within 0.5 miles of the campground include mid seral coniferous and lacustrine or lake. The open canopy white fir forest is extremely thick, with 44% canopy cover, 16 inches mean diameter at breast height, and consists of white fir, Jeffery pine, huckleberry oak, and Coulter pine. Shrubs include sagebrush and green leaf Manzanita. Herbaceous understory is sparse.

In general, the William Kent campground is considered unsuitable habitat for wildlife species because it is an urban campground that is surrounded by residential housing and is highly and frequently disturbed by intense recreational use.

Black bears frequently travel from north to south through the campground. The bears travel the same routes and often knock down the fence in attempt to pass through the campground. Human-bear interactions in the past have resulted in trapping and relocation of individuals.

Special Status Wildlife

The U.S. Forest Service's wildlife sensitive species are listed according to the Pacific Southwest Region's list as of 1988, which was most recently amended on October 15,

2007. These are the most current versions for the LTBMU. There is no proposed or designated critical habitat for federally listed species on the LTBMU. Table 3-2 below summarizes the distribution, habitat requirements, potential for occurrence, and rationale for exclusion or inclusion in the effects analysis.

Table 3-3. Special status wildlife distribution, habitat, and occurrence

Wildlife (genus and species)	Legal status ¹	Distribution	Suitable habitat in project area	Known to occur in project area ²	Comments
Birds					
Bald eagle (<i>Haliaeetus leucocephalus</i>)	D, S, SI, MB	Occurs throughout California. Nests in dense forest with supercanopy trees within one mile of large lakes with abundant fish prey.	Yes	no	Suitable habitat along the shore of Lake Tahoe. No bald eagles were detected during 2009 and 2010 surveys. The nearest nest is 12 miles southeast of the project area.
Northern goshawk (<i>Accipiter gentiles</i>)	S, SI	Occurs in the north Coast Ranges, Sierra Nevada, Klamath, Cascade, Warner, San Jacinto, and San Bernardino Mountains. Found in older-age coniferous, mixed conifer, and deciduous forest habitats at mid to high elevations during breeding season.	Yes	no	Forested portions of the project area are potential habitat for this species. No protocol-level surveys were completed during 2009 and 2010, because William Kent is a fragmented patch of habitat in an urban neighborhood, and no major tree removal is planned. The nearest detection is 0.6 mile north. 1.6 miles south to the East Blackwood PAC, with an active nest in 1981. Forested areas may be used for foraging, but human disturbance and road traffic makes nesting unlikely.
California spotted owl (<i>Strix occidentalis</i>)	S, MIS, MB	Species occurs from the southern Cascades in Shasta County south through the Sierra Nevada into the mountains of southern California, and in the central Coast Ranges as far north as Monterey County. Usually found in old, dense, and layered mixed conifer forest. Also found in riparian/hardwood, ponderosa pine/hardwood, red fir, and east side pine forest.	Yes	no	Forested portions of the project area are potential habitat for this species. No protocol-level surveys were completed during 2009 and 2010, because William Kent is a fragmented patch of low quality mid seral habitat surrounded by an urban neighborhood, and no major tree removal is planned. The nearest detection is 0.8 mile north of the project area, 0.9 mile northwest to the Page Meadow East PAC, with no known active nest. Forested areas may be used for foraging, but human disturbance and road traffic makes nesting unlikely.

Wildlife (genus and species)	Legal status ¹	Distribution	Suitable habitat in project area	Known to occur in project area ²	Comments
Great gray owl (<i>Strix nebulosa</i>)	S	Found in the Sierra Nevada from Plumas County south into the southern Sierra Nevada. Nest in mature mixed conifer, red fir, or lodgepole pine forests within 600 feet of large meadow openings greater than 10 acres.	No	no	There is no suitable habitat for this species in or adjacent to the project area. Not known to occur in the Lake Tahoe Basin. The nearest detection is 30 miles south of the project area near Carson Pass.
Willow flycatcher (<i>Empidonax traillii</i>)	S, MB	A near arctic-neotropical migrant that breeds across North America and winters in Mexico to northern South America. In the Sierra Nevada, the species occurs in wet meadow and montane riparian habitats larger than 15 acres. Nest in dense willow thickets, with standing or running water on June 1.	No	no	There is no suitable habitat for this species in or adjacent to the project area. The nearest detection is 2 miles west of the project area.
Mammals					
Townsend's big-eared bat (<i>Corynorhinus townsendii</i>)	S	Found throughout California in arid western desert scrub and pine forest regions. Strongly associated with caves, mines, tunnels, or rocky outcrops near wetlands or forest edges with moths. Occasionally found in old, abandoned buildings and other manmade structures.	No	no	There is no suitable roosting habitat for this species in or adjacent to the project area. This species may forage in the project area. The nearest documented occurrence is 11 miles east of the project area.

Wildlife (genus and species)	Legal status ¹	Distribution	Suitable habitat in project area	Known to occur in project area ²	Comments
American marten (<i>Martes americana</i>)	S, MIS	In California, this species occurs in the North Coast regions, Sierra Nevada, Klamath, and Cascade Mountains. The subspecies, Sierra marten, is found in dense late successional coniferous forest with snags, down logs, debris piles, and abundant squirrel prey. Usually found in mature red/white fir mix, lodgepole pine, and Sierran mixed conifer. Also found in montane hardwood-conifer, aspen, and red fir.	No	no	There is no suitable habitat for this species in or adjacent to the project area. The nearest detection is 0.7 mile north of the project area, but the residential neighborhood is considered a barrier to marten movement. The campground is mid successional white fir, and lacks abundant snags, down logs, debris piles, and abundant squirrel prey.
California wolverine (<i>Gulo gulo luteus</i>)	S	This species historically occurred throughout the Sierra Nevada and the North Coast Mountains. In the Sierra Nevada the species has historically occurred in a variety of habitats, including red fir, mixed conifer, lodgepole pine, sub-alpine conifer, alpine dwarf-shrub, barren, wet meadows, montane chaparral, and Jeffrey pine. The species has a large home range, and usually avoids areas of human disturbance.	No	no	There is no suitable habitat for this species in or adjacent to the project area. Species has not been documented in the Lake Tahoe Basin (CDFG, 2011).

Wildlife (genus and species)	Legal status ¹	Distribution	Suitable habitat in project area	Known to occur in project area ²	Comments
Sierra Nevada red fox (<i>Vulpes vulpes necator</i>)	S	Historically found across the Sierra Nevada. Currently known to occur in Lassen National Park. Detected in 2010 at Sonora Pass in the Toiyabe National Forest. Found in lodgepole pine, red fir, sub-alpine conifer, and alpine dwarf shrub with interspersed meadows or alpine fell-fields over 7,000 feet.	No	no	There is no suitable habitat for this species in or adjacent to the project area. Species has not been documented in the Lake Tahoe Basin and usually avoids areas of human disturbance (Perrine et al., 2010)
Amphibians					
Sierra Nevada (mountain) yellow-legged frog (<i>Rana sierra muscosa</i>)	C, S	Found in the Sierras between 4,500 and 12,000 feet elevation in streams, lakes, and ponds in montane riparian, lodgepole pine, subalpine conifer, and wet meadow habitats. Usually utilize open, gently sloping areas along aquatic habitats within a short distance of pools with refugia such as rocks, undercut banks, woody debris, and vegetation.	No	no	There is no suitable habitat for this species in or adjacent to the project area; habitat contains predatory trout that feed on frog tadpoles. Yellow-legged frogs have been extensively surveyed for in the Lake Tahoe Basin, and are currently known at one location 24 miles southeast of the project area.
Northern leopard frog (<i>Rana pipiens</i>)	S	Species occurs sporadically in California, and may mostly be introduced populations. Historic occurrences in the Lake Tahoe Basin are thought to be introductions from Nevada. Found in riverine and wet meadow habitat.	No	no	There are historic occurrences from Fallen Leaf Lake, Taylor Creek, and near William Kent (CNDDDB 2011). The LTBMU has conducted extensive amphibian surveys in streams, lakes, ponds, and meadows around the lake and have never located a northern leopard frog.

Wildlife (genus and species)	Legal status ¹	Distribution	Suitable habitat in project area	Known to occur in project area ²	Comments
Fish					
Lahontan Lake tui chub (<i>Gila bicolor pectinifer</i>)	S	Found in Lake Tahoe, Pyramid Lake, and Walker Lakes. Species occurs in large, deep lakes. Spawns in shallow water with aquatic vegetation.	Yes	no	Species is known to occur in Lake Tahoe, but not within 0.5 mile of the project area. No direct effects anticipated and indirect effects would be avoided through BMPs.
Lahontan cutthroat trout (<i>Oncorhynchus clarkii henshawi</i>)	T, SI	Found in lakes and streams, including Fallen Leaf Lake, Pyramid Lake, Walker Lake, Independence Lake, Summit Lake, and associated tributaries.	No	no	Extirpated from Lake Tahoe by 1939 because of predation by non-native trout, hybridization, overfishing, and siltation of spawning streams. No direct effects anticipated and indirect effects would be avoided through BMPs.
Aquatic invertebrates					
Great Basin rams-horn (<i>Helisoma newberryi newberryi</i>)	S	Currently found in and around the periphery of the northern Great Basin. Also found in Shasta and Lassen Counties of California. Known populations in the lower Truckee River. Found in cold and highly oxygenated water, large spring complexes, large lakes, and slow rivers with soft sediments and a muddy substrate.	Yes	no	Lake Tahoe may provide habitat for this species, but the project area is outside its known range. No direct effects anticipated because there is no project work in the lake, and indirect effects would be avoided through BMPs. BMPs in the SEZ would improve water quality, riparian, and aquatic habitat.

¹Legal status:

- E = Endangered species listed by the USFWS under the Endangered Species Act.
- T = Threatened species listed by the USFWS under the Endangered Species Act. The Delta smelt and Central Valley steelhead are threatened species for the LTBMU. The LTBMU is outside the current and historical range of these species, and would not be affected by this project.
- C = Candidate species for federal listing by the USFWS under the Endangered Species Act. The American wolverine, Pacific fisher, and Yosemite toad are candidate species for the LTBMU. An American wolverine was detected on the adjacent Tahoe National Forest in 2008 using bait stations with motion triggered cameras. DNA analysis concluded that the male originated from the Sawtooth Mountains in Idaho. A female American wolverine has not yet been detected. The LTBMU is outside the current and historical range of these species, and would not be affected by this project. No federally listed wildlife species would require technical assistance from the USFWS.
- D = Delisted species by the USFWS under the Endangered Species Act. Species would be monitored for 5 years.
- S = Sensitive species listed by Region 5, US Forest Service. Regional Forester sensitive species list was revised on October 15, 2007.
- MIS = Management indicator species listed by Region 5, US Forest Service. Sierra Nevada MIS amendment on December 14, 2007.
- SI = Special interest species listed by the TRPA. Regional plan of Lake Tahoe Basin, code of ordinances, 1987.
- MB = Migratory bird.

² Known to occur in or within 0.5 mile of the project area to account for potential direct and indirect effects according to TRPA guidelines.

Management Indicator Species

Management Indicator Species (MIS) for the LTBMU are identified in the 2007 SNF MIS Amendment (USDA Forest Service 2007a). Habitats, ecosystem components, and MIS to analyze for this project were selected from this list of MIS in Table 1. The table identifies the habitat or ecosystem component, the CWHR types defining each habitat or ecosystem component, the associated MIS, and whether or not the habitat of the MIS is affected by the project.

Table 3-4. Selection of MIS for project-level analysis

Habitat or ecosystem component	California wildlife habitat relationship types which define the habitat component ¹	Sierra Nevada Forests management indicator species	Analysis category ²
Riverine & lacustrine	Riverine, and lacustrine or lake.	Aquatic macroinvertebrates ³	2
Riparian	Montane riparian, and valley foothill riparian.	Yellow warbler (<i>Dendroica petechia</i>)	3
Wet meadow	Wet meadow, freshwater emergent wetland.	Pacific tree frog (<i>Pseudacris regilla</i>)	1
Early seral coniferous forest	Ponderosa pine, Sierran mixed conifer, white fir, red fir, and eastside pine. Tree sizes 1, 2, and 3. All canopy closures.	Mountain quail (<i>Oreortyx pictus</i>)	1
Mid seral coniferous forest	Ponderosa pine, Sierran mixed conifer, white fir, red fir, and eastside pine. Tree size 4. All canopy closures.	Mountain quail (<i>Oreortyx pictus</i>)	3
Late seral open canopy coniferous forest	Ponderosa pine, Sierran mixed conifer, white fir, red fir, and eastside pine. Tree size 5. Sparse and open canopy.	Blue grouse (<i>Dendragapus obscurus</i>)	1
Late seral closed canopy coniferous forest	Ponderosa pine, Sierran mixed conifer, white fir, and red fir. Tree size 5 (moderate and dense canopy) and 6.	California spotted owl (<i>Strix occidentalis occidentalis</i>)	1
		American marten (<i>Martes americana</i>)	
		Northern flying squirrel (<i>Glaucomys sabrinus</i>)	
Snags in green forest	Medium and large snags in green forest.	Hairy woodpecker (<i>Picoides villosus</i>)	2
Snags in burned forest	Medium and large snags in forest burned by a stand-replacing fire.	Black-backed woodpecker (<i>Picoides arcticus</i>)	1

¹ All California wildlife habitat relationship size classes and canopy closures are included (Mayer and Laudenslayer, 1988). DBH = diameter at breast height. Tree size classes and canopy closure classifications are:

1 = seedling less than 1" DBH.

2 = sapling from 1" to 5.9" DBH.

3 = pole from 6" to 10.9" DBH.

4 = small tree from 11" to 23.9" DBH.

5 = medium to large tree over 24" DBH.

6 = multi-layered tree in pine and Sierran mixed conifer.

S = sparse cover, 10% to 24% canopy

P = open cover, 25% to 39% canopy

M = moderate cover, 40% to 59% canopy

D = dense cover, 60% to 100% canopy

² Category of management indicator species habitat for project analysis:

1 = habitat is not in or adjacent to the project area, and would not be affected by the project.

2 = habitat is in or adjacent to project area, but would not be directly or indirectly affected by the project. Habitat would be buffered or fenced off, there would be no reduction in acres of forest or understory shrub cover, or there would be no removal of designated nest trees, perch trees, or down woody debris.

3 = habitat would be directly or indirectly affected by the project.

³ Aquatic macroinvertebrates include worms, clams, snails, shrimp, crayfish, mayflies, caddisflies, stoneflies, diving beetles, and other invertebrates that are highly sensitive to changes in water quality and condition of aquatic habitat. Gravel and cobble substrates provide interstitial spaces that trap organic particles, habitat for aquatic macroinvertebrates, and prey for fish and riparian birds. The index of biotic integrity was last monitored at 17 sites in the Lake Tahoe Basin from 2000-2001. The ratio of observed to expected macroinvertebrate species = 0.89, which is a very good score of aquatic sensitive species richness (Sierra Nevada Forests bioregional management indicator species report, January 2008). The management indicator species list was last revised in August 2006.

Migratory Birds

In late 2008, a *Memorandum of Understanding between the USDA Forest Service and the USDI Fish and Wildlife Service to Promote the Conservation of Migratory Birds* was signed. The intent of the MOU is to strengthen migratory bird conservation through enhanced collaboration and cooperation between the Forest Service and the Fish and Wildlife Service as well as other federal, state, tribal and local governments. Within the National Forests, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales, and ensuring that bird conservation is addressed when planning for land management activities.

3.2.3 Direct and Indirect Effects

Alternative 1 - No Action

There are no known special status wildlife species currently present on the site, but suitable habitat for multiple species does exist. There would be no change to the habitat, timing of nesting, denning, or foraging for special status species, migratory birds, or waterfowl. Existing sediment levels contributed by hill slope and channel bank erosion would not measurably change. Shade provided by riparian vegetation along stream reaches would not change. There would be no change in stream temperatures and no effect on any aquatic species. There would be no reduction in impervious coverage within the SEZ. Black bear would continue to knock over the perimeter fence on their migratory paths.

Alternative 2 - Proposed Action

There are no known special status wildlife species currently present on the site, but suitable habitat for multiple species does exist. Special status wildlife may be temporarily disturbed by construction during the breeding season. LOPs for special status wildlife species would be implemented as necessary unless surveys confirm that special status wildlife species are not nesting. Project activities could alter the timing of nesting, denning, and foraging. However, the scale of this reduction is small, and design features and mitigation measures would reduce both direct and indirect impacts. Direct effects during construction may include short term displacement of migratory bird individuals to suitable habitat adjacent to the project area. Short term displacement would not cause any substantial negative impacts to wildlife species. Disturbance from the project activity would not be greater than disturbance from existing road traffic, commercial, residential, and recreational activity.

Direct effects to individual waterfowl may occur during construction. Disturbance from the project activity is not greater than disturbance from existing road traffic,

commercial, residential, and recreational activity. There is a minor potential for disturbance to individuals during construction but improved habitat conditions in the long term.

Tree removal associated with construction activities would increase soil moisture, improve resistance to drought, disease, and insects; decrease competition, allow big trees to grow faster, enhance habitat quality for species that prefer a more open understory, and protect wildlife habitat by developing stands that are more resistant to catastrophic wildfires.

Indirect effects after construction include an initial reduction in canopy cover as some trees are removed during campground reconfiguration, followed by improved habitat conditions over the long term. Old forest characteristics that are lacking include a multilayered canopy, species diversity, structural complexity, abundant snags, and large amount of down woody debris. Late successional habitat characteristics would be accelerated. Compacted soil and areas of disturbance would be reduced, and vegetative diversity would be improved.

Alternative 3 - Alternative Action

Effects to special status wildlife, migratory birds, and waterfowl would be to the same as Alternative 2. Riparian habitat would be enhanced to a greater degree under this alternative because impervious coverage in the SEZ would be reduced by 90% from 0.6 acres to 0.06 acres in the campground area.

3.2.4 Cumulative Effects

Alternative 1

Current management including past, present, and reasonably foreseeable actions on all ownerships would cause very little change in sedimentation, stream shade, and water temperature. No cumulative effects would result from the No Action alternative, because current conditions in the project area would continue.

Alternative 2

Projects considered include the Sierra Pacific power line upgrade Environmental Impact Statement (EIS), and the Carnelian fuels reduction and healthy forest restoration Environmental Assessment (EA). Phased construction over more than one construction season would keep the campground open during the summer, would reduce the disturbed area at any one time, and would allow individuals to find refuge in adjacent suitable habitat.

No cumulative effects to waterfowl or their population sites are expected as the result of the incremental impact of the proposed action when added to other past, present, or reasonably foreseeable future actions, because of the limited scope and anticipated impacts of the project.

The proposed action when combined with past, present, and reasonably foreseeable future actions are not expected to have a cumulative effect to migratory birds, because effects to survival are unlikely, and because effects to reproduction are not expected. The suitability of migratory bird habitat would increase in the long term, because soil decompaction would increase the prey base.

Alternative 3

Cumulative effects to special status wildlife, migratory birds, and waterfowl would be similar to Alternative 2. Riparian habitat would be enhanced to a greater degree under this alternative because impervious coverage in the SEZ would be reduced by 90% from 0.6 acres to 0.06 acres in the campground area.

3.2.5 Analytical Conclusions

The following determinations were found based on the description of the proposed alternatives and the analysis considered. The No Action Alternative would have **no effect** on all special status wildlife species, because current conditions in the project area would continue. The Proposed Action and Alternative Action would have **no effect** on the **great gray owl, willow flycatcher, Townsend's big-eared bat, American marten, Sierra Nevada red fox, California wolverine, Sierra Nevada (mountain) yellow-legged frog, northern leopard frog, Lahontan Lake tui chub, Lahontan cutthroat trout, and Great Basin rams-horn**, because the proposed action is outside the current range of these species or because there is no suitable habitat in or within 0.5 miles of the project area. The Proposed Action and Action Alternative of the William Kent Project **may affect individuals, but is not likely to result in a trend toward Federal listing or loss of viability** for the **bald eagle, northern goshawk, and California spotted owl**.

The project **would not affect riverine and lacustrine habitat, wet meadow, early seral coniferous forest, late seral open canopy coniferous forest, late seral closed canopy coniferous forest, snags in green forest, and snags in burned forest MIS habitat**. The William Kent BMP project would affect **riparian and mid seral coniferous forest MIS habitat, but these effects would be less than significant**.

The proposed action will have no effect, or will not likely adversely affect migratory landbird species.

The project **Will Not Affect** the golden eagle, peregrine falcon, mule deer, Lahontan cutthroat trout, lake habitat, stream habitat, and instream flow. The William Kent BMP project **May Affect** the northern goshawk, osprey, bald eagle, and waterfowl.

3.3 Botanical Resources

3.3.1 Introduction

The most recent species list for the LTBMU was obtained from the US Fish and Wildlife Service (USFWS) Sacramento Fish and Wildlife Office website on March 11, 2011, which had been updated on April 29, 2010. This list fulfills the requirements of the USFWS to provide a current species list pursuant to section 7 of the Endangered Species Act (ESA). The LTBMU does not currently support any plant species listed as threatened or endangered under the ESA; however, *Rorippa subumbellata* (Tahoe yellow cress), a candidate species for listing, does occur on lands administered by the LTBMU, but there is no population in the vicinity of the proposed project.

A pre-field review of existing information from the LTBMU flora atlases and available GIS coverages was performed to evaluate the extent of potential habitat and known populations of sensitive plants within the proposed project areas.

Botanical surveys conducted in July 2006 in proposed project areas focus on species with potential habitat; however, surveys are floristic in nature and attempts are made to identify all plants encountered in the field. Many species have specific habitat preferences (such as wet meadows, fens, granite scree), and botanists search for these as well as their constituent species.

3.3.2 Existing Condition

There is pebble-size rocky habitat on the beach area, which is limited suitable habitat for Tahoe yellow cress. The campground campsite loop road has an overstory of *Pinus jeffreyi* (Jeffrey pine), *Abies concolor* (white fir), and *Calocedrus decurrens* (incense cedar). The shrub layer consists of *Arctostaphylos patula* (Greenleaf Manzanita), *Ceanothus cordulatus* (mountain whitethorn), *Ceanothus prostratus* (Squaw carpet), *Prunus emarginata* (bitter cherry), and *Salix scouleriana* (Scouler's willow). There is a seasonal rain runoff SEZ running through the middle of the campground with a lot of forbs (herbaceous plants) and graminoids (grasses). There are sections dominated by herbaceous layer of *Artemisia douglasiana* (Douglas' sagewort), *Lotus nevadensis* (Nevada's bird's-foot trefoil), and *Wyethia mollis* (woolly mule's ear). Species are diverse near the stream channel and less diverse away from it.

The William Kent Campground and administrative site was surveyed by the LTBMU Botany Department for sensitive plants and noxious weeds in July 2006. No sensitive species were located at that time. However, this survey expired July, 2011, and the project area would be resurveyed prior to project implementation. Any sensitive species found would be flagged and avoided. No sensitive species habitat other than *Hulsea brevifolia*, *Lewisia kelloggii* ssp. *hutchisonii*, *Lewisia kelloggii* ssp. *kelloggii*, and *Rorippa subumbellata* occur in the project area. No noxious weeds were found on the site, however there are St. Johns Wort and bull thistle infestations adjacent to the project area.

Table 3-3 lists all candidate and sensitive plant and fungi species that are known to occur or have potential to occur on the LTBMU as of March 2011. No other

threatened, endangered, proposed, or sensitive plant species have known occurrences or potential habitat on the LTBMU. Species that do not have potential habitat in the project area, based on the reasons given in Table 3-3, are not further analyzed in this document.

Table 3-5. Candidate and sensitive plant and fungi species with potential habitat in the proposed project area and are known or suspected to occur on the LTBMU.

Species	Legal Status ¹	Suitable habitat in project area	Known to occur in project area	Distribution and Comments
Galena Creek rock cress (<i>Arabis rigidissima</i> var. <i>demota</i>)	S	No	No	Species is found in open, rocky areas along forest edges of conifer and/or aspen stands. Usually found on northerly aspects above 7,500 feet (ft). Project is below elevational habitat.
Tiehm's rock cress (<i>Arabis tiehmii</i>)	S	No	No	Species is known from open rocky soils in the Mt. Rose Wilderness. No rocky outcrops in the project area.
Upswept moonwort (<i>Botrychium ascendens</i>)	S	No	No	<i>Botrychium</i> species share similar preferences in habitat, i.e. wet or moist soils such as marshes, meadows, and along the edges of lakes and streams at elevations between 4,700 and 9,000 ft. They generally occur with mosses, grasses, sedges, rushes, and other riparian vegetation. SEZ is present in the project area but no suitable habitat was detected during the 2006 survey.
Scalloped moonwort (<i>Botrychium crenulatum</i>)	S	No	No	See <i>Botrychium ascendens</i>
Slender moonwort (<i>Botrychium lineare</i>)	S	No	No	See <i>Botrychium ascendens</i>
Common moonwort (<i>Botrychium lunaria</i>)	S	No	No	See <i>Botrychium ascendens</i>
Mingan moonwort (<i>Botrychium minganense</i>)	S	No	No	See <i>Botrychium ascendens</i>
Western goblin (<i>Botrychium montanum</i>)	S	No	No	See <i>Botrychium ascendens</i>
Bolander's candle moss (<i>Bruchia bolanderi</i>)	S	No	No	Montane meadows and stream banks are favored habitat. This moss tends to grow on bare, slightly eroding soil where there is little competition from other vegetation. The eroded banks are too dry for potential habitat for this species. Erosion may be too extreme.

Species	Legal Status ¹	Suitable habitat in project area	Known to occur in project area	Distribution and Comments
Branched collybia (<i>Dendrocollybia racemosa</i>)	S	No	No	This species is a mycoparasite growing on old decayed or blackened mushrooms or occasionally in coniferous duff, usually within old growth stands. There are no areas with coniferous duff in old growth.
Tahoe draba (<i>Draba asterophora</i> var. <i>asterophora</i>)	S, SI	No	No	Species is found in rock crevices and open granite talus slopes at high elevations between 8,000 to 10,200 ft on north-east facing slopes. Outside elevation, species was not seen during 2006 surveys.
Cup Lake draba (<i>Draba asterophora</i> var. <i>macrocarpa</i>)	S, SI	No	No	This species is found on steep, gravelly or rocky slopes at elevations of 8,400 to 9,235 ft. Outside elevation, species was not seen during 2006 surveys.
Subalpine fireweed (<i>Epilobium howellii</i>)	S	No	No	Plants are known from wet meadows and mossy seeps at 6,500 to 9,000 ft in subalpine coniferous forest. No meadows or seeps in project area.
Starved daisy (<i>Erigeron miser</i>)	S	No	No	Plants are known from high elevation granitic rock outcrops above 6,000 ft. No rocky outcrops in the project area.
Torrey's or Donner Pass buckwheat (<i>Eriogonum umbellatum</i> var. <i>torreyanum</i>)	S	No	No	This species grows in dry gravelly or stony sites, often on harsh exposures such as ridge tops or steep slopes. Project area is outside ridge top or steep slopes.
Blandow's bog-moss (<i>Helodium blandowii</i>)	S	No	No	Habitat for this moss is in bogs and fens, wet meadows, and along streams under willows. There are no fens, bogs, or wet meadows in project area.
Short-leaved hulsea (<i>Hulsea brevifolia</i>)	S	Yes	No	This species is known primarily from red fir forests, but has also been found in mixed conifer forests. The elevational range of the plant is between 4,920 ft to 8,860 ft. The project area is a campground surrounded by a neighborhood. Conifer forest is sparse in the area.
Kellogg's lewisia (<i>Lewisia kelloggii</i> ssp. <i>Hutchisonii</i>)	S	Yes	No	Habitat for this plant occurs on ridge tops or flat open spaces with widely spaced trees and sandy granitic to erosive volcanic soil from about 5,000 to 7,000 ft. Project area was determined suitable during 2006 survey.
Kellogg's lewisia (<i>Lewisia kelloggii</i> ssp. <i>Kelloggii</i>)	S	Yes	No	See <i>Lewisia kelloggii</i> ssp. <i>Hutchisonii</i>

Species	Legal Status ¹	Suitable habitat in project area	Known to occur in project area	Distribution and Comments
Long-petaled lewisia (<i>Lewisia longipetala</i>)	S, SI	No	No	This species occurs on the northerly exposures on slopes and ridge tops at elevations between 8,000 and 12,500 ft where snow banks persist throughout the summer. The plants are often found near the margins of the snow banks in wet soils. The project area is not found in areas where late snow persists.
Three-ranked hump-moss (<i>Meesia triquetra</i>)	S	No	No	This moss prefers bogs and fen habitats, but is also found in very wet meadows. There are no fens, bogs, or wet meadows in project area.
Broad-nerved hump-moss (<i>Meesia uliginosa</i>)	S	No	No	This moss prefers bogs and fen habitats, but is also found in very wet meadows. There are no fens, bogs, or wet meadows in project area.
Veined water lichen (<i>Peltigera hydrothyria</i>)	S	No	No	This species is found in cold unpolluted streams in mixed conifer forests. Dry stream in project area is result of drainage from neighborhood.
Tahoe yellow cress (<i>Rorippa subumbellata</i>)	C, S, SI	Yes	No	This species is endemic to the shorezone around Lake Tahoe in CA and NV. Typically found in back beach areas between elevations of 6,223 and 6,230 ft. Habitat present.

^aStatus explanations

- No species in LTBMU are currently listed as “Endangered” by USFWS under ESA
- C = USFWS Candidate species for listing as threatened or endangered under ESA
- S = USFS LTBMU Sensitive Species, Regional Forester’s Sensitive Species List, Amended 2006
- SI = TRPA Special Interest Species, Regional Plan for the LTBMU: Goals and Policies (1986) and Code of Ordinances (1987)

3.3.3 Direct and Indirect Effects

Alternative 1 - No Action

There are no sensitive plants within the footprint of the proposed project. Therefore, no direct effects are anticipated from the No Action Alternative.

The following species may experience indirect insignificant effects from Alternative 1: *Hulsea brevifolia*, *Lewisia kelloggii* ssp. *hutchisonii*, *Lewisia kelloggii* ssp. *kelloggii* and *Rorippa subumbellata*

Indirect insignificant effects may occur as a result of “No Action” alternative within the proposed project area. It is anticipated that erosion of the stream channel would continue and damage to native soils from vehicles will continue to occur in the campground area. Any sensitive plants found within SEZ ecosystems may be impacted through habitat loss resulting from decreased soil moisture due to loss of topsoil to erosion. There may also be an increase in growth and density of the existing

shrub layer across the landscape. All these combined factors can result in the loss of potential habitat for all sensitive species with suitable habitat within the project area by decreasing the amount of available suitable acreage. This may occur in forest, meadow, riparian, and shrub dominated areas.

There are no known noxious weed sites on the site; however there is always a certain level of risk of introduction. The risk of introduction of noxious weeds to the site would not change under this alternative.

Alternative 2 - Proposed Action

There are no sensitive plants within the footprint of the proposed project. Therefore, no direct effects are anticipated from implementation of the proposed project.

Indirect effects include impacts on sensitive plant species habitat. It is anticipated that project activities would increase the vegetation health on the site, however there is also an increase in potential noxious weed invasions and subsequent changes in vegetation structure as a result of project implementation. There are no known noxious weed sites known on the site, but there are known noxious weed sites in the vicinity of the project area. Standard noxious weed management requirements would be used during project implementation, greatly minimizing the risk of noxious weed establishment or spread. (see William Kent Campground BMP Retrofit and Administrative Site Redevelopment Noxious Weeds Risk Assessment Summary).

Alternative 3 - Alternative Action

Direct and indirect effects for Alternative 3 would be to the same as Alternative 2.

3.3.4 Cumulative Effects

Alternative 1

Alternative 1 does not result in an increase in negative cumulative effects on the site. The existing resource damage and vegetation health issues would continue to contribute to an overall reduction in suitable habitat for sensitive plant species in the area around William Kent.

Alternative 2 and Alternative 3

It is anticipated that project activities would increase the vegetation health on the site, contributing positively to cumulative effects from other projects where vegetation is improved. However, disturbing the site increases the risk of colonization by invasive species, which could contribute negatively to the control of noxious weed populations in the area.

Noxious weed invasion can result in negative impacts to all ecosystems, although different habitats may be invaded by different noxious weed species. Noxious weed infestations can lead to changes in habitat characteristics that are detrimental to sensitive plant species. Once weeds have become established they can indirectly impact sensitive species through allelopathy (the production and release of chemical compounds that inhibit the growth of other plants), altering fire regimes, and competing for nutrients, light, and water. Because noxious weeds can be difficult to control or eradicate, weed control efforts that must be conducted on a regular basis, such as hand-pulling, digging, or use of herbicides could also negatively impact

sensitive plants. The risk of the spread of noxious weeds from project activities is considered moderate and it is anticipated that the project design features would ensure project activities would have a less than significant effect on the cumulative effects from noxious weeds.

3.3.5 Analytical Conclusions

Based on the description of the proposed action and the evaluation contained herein, it is the determination that the proposed project alternatives would not have a significant effect on botanical resources and that the project:

1. **will not affect** *Arabis rigidissima* var. *demota*, *Arabis tiehmii*, *Botrychium ascendens*, *Botrychium crenulatum*, *Botrychium lineare*, *Botrychium lunaria*, *Botrychium minganense*, *Botrychium montanum*, *Bruchia bolanderi*, *Dendrocollybia racemosa*, *Draba asterophora* var. *asterophora*, *Draba asterophora* var. *macrocarpa*, *Epilobium howellii*, *Eriogonum umbellatum* var. *torreyanum*, *Erigeron miser*, *Helodium blandowii*, *Lewisia longipetala*, *Meesia triquetra*, *Meesia uliginosa*, and *Peltigera hydrothyria*, because there is no suitable habitat for these species within the project area.
2. **may affect** individuals, but is not likely to result in a trend toward Federal listing or loss of viability for *Hulsea brevifolia*, *Lewisia kelloggii* ssp. *hutchisonii*, *Lewisia kelloggii* ssp. *kelloggii*, and *Rorippa subumbellata*. Due to the presence of suitable habitat for the above mentioned species, it is possible that isolated populations may occur within the project area and undiscovered individuals may be inadvertently affected. For this reason (potential impact to undiscovered individuals) a determination of “may impact individuals but not likely to cause a trend toward federal listing or loss of viability” has been made for these species.

The overall risk of noxious weed establishment as a result of the proposed action and alternative proposed action is moderate. This determination is based on the following:

1. There are St. Johns Wort and bull thistle infestations adjacent to the project area.
2. There will be considerable ground disturbance.
3. Design features are planned to reduce the potential spread of non-native invasives.

3.4 Scenic Resources

3.4.1 Introduction

The LTBMU Land and Resources Management Plan (LRMP) addresses visual concerns within this site. With respect to the developed recreation the plan “assure[s] an attractive and usable forest setting within and surrounding existing [developed recreation] sites” (LRMP IV-46). With respect to the administrative site, the management prescription directs the LTBMU to “make [administrative facilities] visually compatible with the surrounding setting. In some cases, administrative facilities may be combined with dispersed or developed recreation facilities” (LRMP IV-48).

Scenic Resource management on National Forest System lands in the Lake Tahoe Basin is directed by the Visual Quality Objectives (VQO) adopted in the LTBMU Land and Resource Management Plan (Forest Plan). The VQO describes objectives for maintaining different degrees of “naturally appearing” landscapes. Scenic stability is a measure of the likelihood of the valued scenic attributes of a place being perpetuated into the future. Additionally, the USFS Built Environment Image Guide (BEIG) provides direction for constructed facilities and features on National Forest System lands to ensure that they reflect the visual character and cultural identity of the landscape within which they are built. The BEIG describes the lands within the Lake Tahoe basin as belonging to the “North Pacific” design province, which includes the alpine architectural approaches and building designs that are commonly locally referred to as having “Tahoe Style”.

This analysis would consider the effects to scenic resources from the three alternatives, and would use VQO and BEIG compliance, in addition to scenic stability as the measures of effect.

3.4.2 Existing Condition

The site is consistent with the adopted Visual Quality Objective (VQO) of *Partial Retention* when viewed as middleground and *Modification* or better when viewed as foreground. The *Partial Retention* VQO allows for management activities which are visible in the landscape as long as they do not dominate the view of the naturally appearing landscape when viewed from a middleground distance of greater than one-half mile. The *Modification* VQO when viewed from a foreground distance allows for management activities, such as the construction of a campground, to be a dominant view compared to the naturally appearing setting.

The restroom buildings at the William Kent Campground and the Meeks Bay Fire Station do not meet the standards of the BEIG.

Scenic stability within this landscape is moderate. Tree density is currently high in some locations on the site, resulting in a condition in which individual trees compete for scarce resources.

Most of the campground is heavily vegetated and the campground living areas are fairly well screened. However, some campsites along the border of the campground are in close proximity to neighboring residences and the campsites currently situated

in the SEZ have less screening vegetation and feel more open. The administrative site currently contains very little screening vegetation. The William Kent House and Garage that were removed from the administrative site in 2011 were readily visible to the adjacent neighboring residences along the northern boundary. Currently there are no buildings on the administrative site and the view from the neighbors is that of parked employee vehicles and campground overflow vehicles.

3.4.3 Direct and Indirect Effects

Alternative 1 – No Action

There would be no direct effects to scenic resources resulting from the No Action alternative. Current scenic conditions within campground, administrative site, and beach area would remain consistent with the Partial Retention VQO. Scenic stability within this landscape would remain moderate. Tree density is currently high in some locations on the site, resulting in a condition in which individual trees compete for scarce resources. The valued scenic attributes of forested land may be reduced over time under the No Action alternative as individual trees become stressed under conditions such as drought or insect infestation. Flows of storm water through the ephemeral stream channel would continue to erode channel banks, undermining existing vegetation and development. The visual quality of the SEZ would continue to be negatively affected by the adjacent impervious surfaces. Negative effects to scenic stability and channel stability are considered indirect effects of the No Action alternative. The restrooms and Meeks Bay Fire Station would continue to not meet the guidelines outlined in the BEIG. The administrative site would continue to contain only an overflow parking area and no structures, and the residential neighbors would continue to be in proximity to an overflow parking area.

Alternative 2 – Proposed Action

Implementation of Alternative 2 would reduce the density of trees within the campground, however the valued scenic attribute of forested land would remain. Removal of roadway and drainage structures within the Stream Environment Zone (SEZ), and reestablishment of these areas with native plants would increase the scenic attractiveness of the area. The Proposal would result in an improvement in the visual quality of the campsite in a manner that maintains consistency with the VQO of Partial Retention. Elimination of the development and incised drainage channel within the SEZ would increase the scenic stability of the area. Additionally, the reduction in tree density within the campground is anticipated to result in individual trees with greater vigor and health compared to trees in competition for limited resources. These healthier trees may grow larger over time and may trend toward an additional valued scenic attribute of large diameter trees. These indirect effects to forested lands are considered an improvement in scenic stability as a result of this Alternative.

All of the existing campground restroom buildings would be replaced in this Alternative, as well as the campground check-in kiosk. These new structures would include steep roof pitches, and architectural detailing consistent with the Tahoe area, resulting in structures that meet the guidelines of the BEIG.

The construction of a fire station / administrative office building would represent an increase in building mass compared to the existing condition in this area. The design

of the administrative building is consistent with the BEIG, and includes rock bases and large wood posts. The design style and massing is not unlike many of the newer residences in the project area. The proximity of the proposed administrative building to neighboring residences would be increased from current conditions, but is consistent with local building regulations regarding setback from property lines. The proximity of this building to adjacent neighboring buildings is consistent with spacing between existing neighborhood structures.

Proposed work to expose the drainage channel through the beach site would alter the appearance of this portion of the project area. The proposal would result in an increase in topography in this area and elimination of the pipe outfall at the lakeshore. Picnic tables which exist at the site would be positioned in closer proximity to each other than exists in current conditions. Construction of an accessible path to the lake shore would include slope stabilization measures. These measures would include use of materials selected to reduce visual contrast with the surrounding landscape. Proposed work within the beach area would be consistent with the VQO.

Removal of the Meeks Bay Fire Station would positively impact the scenic integrity along that section of Highway 89. The developed footprint would decrease as a result of removing the building and restoring the site. In general that section of Highway 89 has a low level of development and removal of the building would improve the view from the highway.

Alternative 3 – Alternative Action

Actions under Alternative 3 are to the same as those in Alternative 2 with a few exceptions. The western-most campground restroom is proposed in closer proximity to the campground center compared to Alternative 2. Additionally, the fire station / administrative building is proposed for location further south within the property. This alternate facility locations increase the distance between the facilities and neighboring properties. Alternate configuration of roadways, traffic circulation routes and parking areas in Alternative 3 result in an improvement in the visual quality of the campsite in a manner than maintains consistency with the VQO of Partial Retention, increase compliance with the BEIG, and increase the scenic stability of the campground. Scenic integrity from Highway 89 would be improved with the removal of the Meeks Bay Fire Station.

3.4.4 Cumulative Effects

Redevelopment of the William Kent facilities under Alternatives 2 and 3 would result in a reduced density of trees within the property. This reduction would be consistent with the VQO and would increase the scenic stability within the property. Fuels reduction projects within the region that are considered for analysis would not result in any lasting negative cumulative effects to scenic resources when combined with the effects from this project. Similarly, shorezone work associate with this project would not result in negative cumulative effects when combined with effects from other shorezone projects on public and private lands.

3.4.5 Analytical Conclusions

Each of the proposals analyzed are consistent with the established VQO of Partial Retention. Alternatives 2 and 3 would increase the scenic stability of the area and

improve the consistency of built features on the property with the BEIG. Alternative 3 increases visual separation of constructed features from neighboring properties compared to Alternative 2. Management actions proposed at the beach site under both Alternatives 2 and 3 would improve the visual appearance of the area compared to existing conditions but would remain consistent with the VQO. The scenic stability will continue to decline under the No Action Alternative.

3.5 Transportation/Traffic

3.5.1 Introduction

The following are important definitions for analyzing effects to transportation and traffic, as defined by the TRPA (TRPA Code of Ordinances, Chapter 93):

Insignificant Increase: An insignificant increase is an increase of 100 or fewer daily vehicle trips, determined from the Trip Table (Subsection 32.2.H) or other competent technical information.

Minor Increase: A minor increase is an increase of more than 100, but not more than 200 daily vehicle trips, determined from the Trip Table or other competent technical information.

Significant Increase: A significant increase is an increase of more than 200 daily vehicle trips, determined from the Trip Table or other technical information.

Trip Table: TRPA shall adopt and maintain a trip table for the purpose of estimating the number of vehicle trips resulting from additional development or changes in operation. TRPA shall generate and update the data in the Trip Table by referring to recent publications on traffic and trip generation (for example, publications of the Institute of Transportation Engineers and California Department of Transportation) and field surveys conducted in the Tahoe Region by TRPA or other competent technical experts.

Vehicle Trip: A vehicle trip is a one directional vehicle movement to or from a project area. The number of vehicle trips assigned to a project shall be the total daily vehicle trips to or from the project at its maximum hours of full operation during the review period. When exact numbers of vehicle trips are not known for a use, they shall be determined from the Trip Table or other competent technical information.

3.5.2 Existing Condition

The William Kent Campground has 95 campsites with two vehicles allowed per site. The paved footprint of most of the campsites is too small to fit two vehicles, resulting in parking on non-paved surfaces. Visitors will often try to fit vehicles in between trees or have portions of vehicles hanging out into the roadway, causing problems with traffic flow. Larger RVs or trucks with trailers do not fit into most of the camp spurs. The small turning radii of the campground roads often result in vehicles having to back up on the one-way roads to complete a multi-point turn or drive off the pavement, resulting in soil compaction and damage to vegetation. The counter-intuitive circulation pattern sometimes results in vehicles driving the wrong way down the one-way roads, as well.

The administrative site has parking room for approximately 5 vehicles which are used by employees of the campground operator; overflow parking for campers with more than two vehicles; and occasionally visitors to the kiosk. The kiosk serves as the center for campground operations, visitor information, and the backcountry

permit office with a small pullout drive that can fit up to 3 small vehicles or one large vehicle with a trailer. Once this pullout becomes full, vehicles begin stacking up to wait for a spot, sometimes extending onto the highway shoulder and increasing congestion on the highway. The beach day use site has 9 parking spaces that are almost always full during the summer months.

The Meeks Bay Fire Station shares the highway entryway with the Meeks Bay Resort, which can result in confusion for visitors to the resort, as well as conflicts with the fire vehicles when responding to fire calls. The line-of-sight to the south on Highway 89 is poor in this location.

Traffic volumes are most commonly measured in vehicle daily vehicle trips (DVT). DVT for William Kent Campground and Administrative Site is 481 (see Table 3-6), with peak use during summer holiday weekends and no use during winter months when the campground is closed behind a gate.

3.5.3 Direct and Indirect Effects

Alternative 1 – No Action

There would be no direct or indirect effects from the No Action alternative. Traffic would continue periodically stacking up onto Hwy 89 during peak use times on summer weekends. The DVT for the campground and administrative site would remain at 481 (see Table 3-6). Confusion and congestion within the campground would continue. Existing traffic patterns and conflicts at the Meeks Bay Fire Station would remain. .

Alternative 2 – Proposed Action

There would be no significant direct or indirect effects from the Proposed Action. The DVT would increase by only one trip to 482 (see Table 3-6). The decrease in traffic as a result of 14 fewer campsites is offset by an increase in traffic due to the use of the administrative site. TRPA considers an increase of less than 100 trips-per-day as an “insignificant” increase. The reconfiguration of the entryway and circulation patterns in the campground should result in positive effects on the flow of traffic in and out of the site and eliminate vehicles stacking up onto Highway 89. Larger turning radii and efficiently designed roadways would decrease driver confusion and resource damage within the campground.

Impacts to congestion and traffic on Hwy 89 may temporarily increase during the construction period, but it is anticipated that this increase would be offset by the reduced visitor levels due to the closure of the campground during the construction of the campground elements of the proposed action; and the proposed timing of the administrative center construction, which is planned to occur during the non-peak season as much as possible. General traffic levels on Hwy 89 are reduced during this period, as well. Design features are planned to reduce the impacts from construction on traffic and circulation within the campground and on Hwy 89.

The use of the administrative site during winter months will increase traffic levels from the current winter use, however general traffic levels on Hwy 89 are already

reduced during this period and the resulting increase is considered less than significant.

Traffic from the Meeks Bay Fire Station would be eliminated at that site, resulting in reduced congestion and fewer conflicts with visitors to Meeks Bay Resort.

There is no proposed change to the parking or vehicle circulation at the beach day use site and no resulting direct or indirect effects.

Alternative 3 – Alternative Action

Direct and indirect effects from changes to the campground would be similar to Alternative 2 because the proposed change in the number of camping sites is the same under both alternatives.

In this alternative there is no public visitor information center associated with the administrative building. The proposed public parking will be used as parking for the administrative center. This results in an increase of only 2 DVT from Alternative 1.

All other effects from Alternative 3 to transportation are similar to Alternative 2 and result in no significant direct or indirect effects.

Table 3-6. Daily vehicle trips (DVT) generated by each alternative.

Category	Factor	Alternative 1 DVT	Alternative 2 DVT	Alternative 3 DVT
Visitor Information Center ¹	45.5/1,000 sf GFA ²	6 ¹	23	6 ¹
Developed Campground/RV Park	5/campsite	475	405	405
Employee parking	3.5/employee	0	42	42
Admin Center long term parking	2/parking space	0	0	18
Fire Vehicles	6/vehicle	0	12	12
Total		481	482	483

¹ The campground check-in kiosk currently serves as a small visitor information center. The 6 trips-per-day shown for Alternative 1 and 3 represent existing visitors to the kiosk for purposes other than campground check-in, such as for Desolation Wilderness permits.

² GFA = Gross Floor Area, which includes all areas that serve the public space, such as the restrooms and behind-the-counter space associated with the visitor information center.

3.5.4 Cumulative Effects

Alternative 1 – No Action

This alternative would not contribute to any cumulative effects to transportation and traffic in the region.

Alternative 2 – Proposed Action

This alternative would contribute to the overall increase of traffic on the Hwy 89 corridor during the winter months, but the cumulative effects are insignificant. The Homewood Resort Master Plan project is anticipated to increase congestion on Hwy 89. The William Kent project does not have any significant direct or indirect effects that would contribute to cumulative effects from the Homewood project. Caltrans is planning water quality improvements to the Highway 89 corridor, but it is not anticipated that the project timelines will overlap. No other large construction projects are currently known to occur during the same period as the planned project implementation that would cause cumulative impacts during construction.

Alternative 3 – Alternative Action

Cumulative effects from this alternative would be the same as Alternative 2.

3.5.5 Analytical Conclusions

Alternative 1 – No Action

This alternative would not contribute to any cumulative effects to transportation and traffic in the region.

Alternative 2 and 3

Both Alternative 2 and 3 will improve the circulation within the campground and reduce stacking onto Highway 89. There are no negative effects to traffic or congestion with either alternative. When comparing the alternatives, the circulation pattern of Alternative 3 is anticipated to improve circulation in the campground more than Alternative 2 due to the traffic circle and a separate drive “lane” for the kiosk that is removed from the main road.

3.6 Hydrology/Soils

3.6.1 Introduction

In the project area, water runoff and associated erosion/sedimentation or flooding is directly related to the condition of the soil resource. Onsite improvement of the soil-water interactions (hydrologic function) will result in reduced threats of overland flow, erosion/sedimentation, and flooding. As such, effects to the water resource will be discussed in the context of changes to properties of the soil resource. Effects to soil hydrologic function would occur primarily as an indirect effect of reduction in soil porosity, so these indicators are discussed together. The following soil quality objectives (USDA Handbook 25.09) are used as indicators for this analysis and are defined and discussed below.

Soil Porosity and Soil Hydrologic Function

This indicator is expressed as the change in the amount of compacted/impervious surface area. Soil hydrologic function describes the ability of water to move into and through soils. Infiltration is the movement of water *into* soils, while hydraulic conductivity (sometimes called permeability) is the movement of water *within* soils. Soil hydrologic function is primarily controlled by physical soil properties such as texture, structure, and porosity. Soil texture (the relative distribution of sand, silt, and clay) is not affected by forest management activities. Soil structure (the arrangement of individual soil particles into aggregates) and soil porosity can both be affected by forest management activities that cause compaction. Infiltration can also be reduced when the soil surface becomes hydrophobic (water repellent).

Effective Soil Cover

This indicator is expressed as a qualitative estimate of change. The presence of effective soil cover generally indicates that the soil surface is adequately protected from accelerated surface erosion. Accelerated erosion can impair site productivity and water quality. The topsoil (the A horizon of the soil profile) is the most fertile and biologically active part of the soil profile due to its enrichment by organic matter in varying stages of decomposition. Loss of all or part of this horizon through erosion impairs the ability of the soil to support natural vegetation communities and often imparts a competitive advantage to nonnative invasive species (weeds). When eroded soil is deposited in water bodies it can affect water quality and aquatic habitats.

As noted above, effects to water quality are closely associated with effects to soil characteristics. In addition, potential effects to water quality would be evaluated by the following indicators:

Tahoe Regional Planning Agency (TRPA) Land Capability. TRPA uses the Bailey Land Scoring System to assist in evaluating the level of development an area can tolerate without sustaining permanent damage through erosion and other causes (Bailey 1974).

- Category 1b: 6.4 acres
- Category 5: 15.6 acres

According to the TRPA Bailey Land Scoring System, Category 1b is allowed 1-5% impervious surfaces and Category 5 is allowed 25% impervious surfaces.

Effects to Stream Environment Zone.

This would be a qualitative discussion regarding the potential beneficial effects to the SEZ from the action alternatives, as compared to taking no action.

3.6.2 Existing Condition

Topography

The project area is gently rolling land with north-south slopes ranging from 2-15 percent. Elevation ranges from of 6,290 feet to 6,380.

Climate

The precipitation in the project area averages 20 to 30 inches per year. The area has summers that are dry and cool and winters that are wet and cold. About 80 percent of the annual precipitation occurs between October and April. Although winter precipitation falls primarily as snow, heavy winter rains can occur. Flooding can result from rain-on-snow events as well as from intense summer thunderstorms (Bailey 1974). The design storm used by regulatory agencies for Tahoe Basin BMPs is the 20-year/1-hour storm which is 1 inch of rain (USDA Forest Service 2007).

Hydrology

The project proposes restoration and improvement actions within 22 acres of the *Ward Creek Frontal* watershed. There are a total of 6,208 acres in the Ward Creek Frontal watershed. The proposed project encompasses less than one percent of the total watershed area. This sub-watershed is moderately developed with houses and roads, as well as development along the shore of Lake Tahoe. The only drainage with a clearly defined channel within the project area is an ephemeral channel that runs through the project area. The channel is incised and show signs of sedimentation.

Stream Environment Zone

The SEZ is approximately 6.4 acres in size with approximately 0.79 acres of existing project area coverage in the campground and administrative site (0.6 acres of which is in the campground only). Vegetative indicators were primary used to map the extent of SEZ. This channel is an ephemeral drainage, fed from urban runoff and ground water. Currently, there are 22 campsites located within the SEZ. There are 8 culvert crossings over the stream. Project Record G-4, Soil Scientist Specialist Report.

Beneficial Uses

Of the beneficial uses identified in the Lahontan Basin Plan for the Minor Surface Waters (LRWQCB 1995), one is applicable to the project site:

Non-contact Water Recreation. Beneficial uses of waters used for recreational activities involving proximity to water, but not normally involving body contact with water where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping,

boating, tide pool and marine life study, hunting, sightseeing, and aesthetic enjoyment in conjunction with the above activities.

Soils

The Tahoe Basin, a subset of the Sierra Nevada range, is underlain predominantly with granitic rocks. Areas not dominated by bedrock, such as along the lake shore and much of the southern portion of the basin; consist primarily of glacial moraine and outwash terrain. In general, the soils in the basin are shallow (3 feet or less) and rocky, with gravelly loamy sands overlying impervious bedrock. Being coarse textured and poorly aggregated, with resulting low water holding capacity, the soils are generally very permeable and are susceptible to erosion, particularly on slopes greater than 20 percent (Bailey 1974).

Currently, the site is covered by 169,490 square feet of paved surfaces, 134,897 ft² (1.4%) on high capability land and 34,563 ft² (3.6%) on low capability land. Current recreational use by vehicles, foot traffic, and campers has caused compaction of the soils and decreased vegetative cover throughout the 22-acre project area. There are approximately 207,098 square feet (4.75 acres) of impervious land surface coverage in the project area. The exposed soils in the camping areas, for the most part, are considered impervious surfaces due to the extensive past recreational use including unconstrained vehicle parking. This past use has resulted in decreased infiltration of precipitation and accelerated runoff from the area with an increased risk of potential for erosion and offsite deposition. The only documented riparian area within the project area is an ephemeral stream channel fed mainly by urban runoff.

Soil cover has been lost, rendering the exposed soil surface susceptible to accelerated runoff and erosion. Surface runoff drainage has also been severely altered, redirected, or obliterated as a result of vehicle and human traffic patterns and onsite camping.

The soil survey for the project area (USDA NRCS 2011a) indicates that 100 percent of the project area is Kneeridge gravelly sandy loam, moderately well drained to well-drained. There are three soil types evident within the project boundary. These are listed in Table 3-5.

Table 3-7. Acres of Soil Map Units in Project Area

Map Unit Symbol	Map Unit Name	% project area
7171	Kneeridge gravelly sandy loam, 2 to 9% slopes, extremely stony	38
7172	Kneeridge gravelly sandy loam, well drained, 5 to 15 % slopes, very stoney	38
7173	Kneeridge gravelly sandy loam, 2 to 5% slopes, very stoney	24

In addition to supporting native vegetation and wildlife, soils play a critical role in supporting watershed and ecosystem health through their functions of accepting, storing, and releasing water. Under natural conditions, the predominant soil types in the project area are very permeable in infiltration of water and are not subject to flooding. Table 3-6 displays key attributes of the soil types.

Table 3-8. Soil Characteristics

Soil Series (symbol)	Permeability	Runoff Potential	Flood Frequency
Kneeridge (7171, 7172 & 7173)	Moderately high to very high	Low	None
Source: USDA NRCS 2011b.			

The soil survey indicates that under undisturbed circumstances that most of this site (71%) is within Bailey's 1974 mapping capability classes 5. This class is identified as having a low disturbance hazard, having a slight erosion potential and allowing for an impervious cover of from 25 to 30 percent. The exception is the 6.4 acres of the project area in land Class 1b which are among the least tolerant to land use exhibiting high erosion and disturbance hazards and very poor drainage capacity (Fig. 1.4).

3.6.2 Direct and Indirect Effects

The temporal scope for assessment of soil, water, and riparian area resource environmental effects includes short term (1–10 years following project implementation) and long term (10–20+ years following project implementation) for this analysis. This timeframe would capture both the immediate effects of the proposed project activities and the expected effects to the point where they are no longer discernible from other activities. The action alternatives have the potential to affect soil, water, and riparian resources.

Alternative 1 - No Action

The campground, administrative site, and day use beach area would continue to not meet current BMP standards associated with developed recreational sites (USDA Forest Service 2011). The project site would continue to be at risk of ongoing soil damage and offsite erosion. Vehicle circulation and camp site locations are poorly defined, consisting mainly of unpaved surfaces with extensive soil compaction. The existing conditions would continue to have the potential to contribute sediment to the ephemeral drainage and SEZ. Soil porosity and hydrologic function would continue to degrade as current use continues. Soil cover would not be able to re-establish itself, and organic matter would continue to be lost by repeated vehicle and foot traffic in unmanaged camping areas. Approximately 37,600 square feet of essentially impermeable and compacted native surface soils would persist and may possibly increase above current recreational use in the future. This is an estimate of the amount of native soil that is compacted adjacent to the paved surfaces based upon site visits. Soils would continue to be compacted by users. The SEZ would continue to decline as a result of campsite use. The 8 stream crossing culverts within the campground would remain. No BMP or design features would be implemented to offset the environmental degradation in the project area.

Alternative 2 - Proposed Action

With implementation the BMPs and design features and because the William Kent project is situated on soils that have inherent high infiltration rates, the risks of deleterious runoff and associated erosion are minimal following project completion.

The elimination of existing campsites, roads, and impervious surfaces in the SEZ and creation of new, updated, and BMP-improved campsites, roads, and trails would have a net benefit to soil and water resources over both the short and long term.

Sedimentation and associated runoff from the existing campground sites and road and trail systems would be reduced, and soil structure and hydrologic function would be improved due to increases in ground cover, properly managed stormwater runoff, and reductions in impervious surfaces, which would allow greater onsite infiltration of precipitation. This alternative would manage stormwater runoff to infiltrate it on site, as close to its point of origin as possible. Paved surfaces in the campground and administrative site would reduce erosion and the generation of sediment by gathering and infiltrating runoff as part of a designed drainage system that includes the most current BMP guidelines. Stormwater would be directed to shoulders, micro-basins, drip-line trenches, and swales where appropriate for infiltration. Decompaction (where appropriate) of existing compacted soils not planned for campground use would allow for dispersed infiltration and a reduction in sheet flow of water through the site. These treatments would improve the porosity and hydrologic function of soils in the project area. Removal and improvement of campsites and roadways within the SEZ would reduce riparian area impervious surface coverage by 83 percent in the campground area, from 26,245 to 4,531 square feet (from 0.6 acres to 0.17 acres). Across the entire site the reduction of riparian area impervious surface coverage is by 63 percent; from 34,600 to 12,800 square feet (0.8 acres to 0.3 acres). See Table 2-4 for a summary of all coverage information.

Actual *paved* surface impervious coverage (across the entire site, not just in the SEZ) increases by 18 percent from existing paved surfaces due to the addition of the administrative site. However, as mentioned above, the estimation of *actual* existing impervious surface coverage includes areas compacted by pedestrian and off-pavement vehicular traffic. It is therefore estimated that the overall impervious surface coverage would actually decrease by 3% under this alternative. Reduction in the square footage of compacted area coverage via circulation management and campsite reduction in conjunction with soil de-compaction would accelerate the rate of hydrologic conductivity recovery (porosity-infiltration/permeability) in the project area. Increased infiltration, permeability, and soil cover would substantially decrease surface runoff and associated erosion. Dispersal of chipped material would increase soil protective cover and introduce surface organic matter. The added surface organic materials would hold moisture close to the surface for an extended period of time, affording re-vegetation of areas not planned for campground use.

With the implementation of design features and BMPs the proposed action is expected to improve the function and viability of the soil resources, protect the quality of water flowing from the site, and enhance riparian areas. The beneficial uses of the project site would also be fully protected.

As stated in the Water Quality Management Plan, TRPA's environmental threshold goal is to "preserve existing naturally functioning SEZ lands in their natural condition and restore 25% of the SEZ lands that have been identified as disturbed, developed, or subdivided, to attain a 5% total increase in the area of naturally functioning SEZ lands" (TRPA 1998). This project would contribute towards meeting the TRPA goal by improving the SEZ and reducing potential effects from the adjacent campgrounds and traffic infrastructure.

Alternative 3 - Action Alternative

The beneficial effects of Alternative 3 are slightly greater than Alternative 2 because there is a decrease in the amount of impervious surface remaining in the SEZ in the campground area as compared to Alternative 2 (2742 square feet as compared to 4531 square feet under Alternative 2, which is a 90% reduction versus 83%). Overall impervious surface coverage is reduced by 8% as compared to 3% in Alternative 2.

This alternative, like the proposed action, would improve the management of stormwater runoff to infiltrate it on site, as close to its point of origin as possible. The recreational and traffic facilities would be designed consistent with current BMPs, which would provide for effectively collecting and transporting of runoff to road shoulders, micro-basins, drip-line trenches, and swales for infiltration.

As compared to Alternative 2, smaller areas of soil would be disturbed because of the savings in coverage needed to construct the circulation pattern. Therefore, these treatments would improve the porosity and hydrologic function of soils on a greater portion of the project area. The extent of soil hydrologic conductivity (porosity-infiltration/ permeability) would be improved over this comparatively larger area.

With the implementation of design features and BMPs, Alternative 3 is expected to improve the function and viability of the soil resources, improve the quality of water flowing from the site, and enhance riparian areas within the William Kent site.

3.6.3 Cumulative Effects

Under the No Action alternative, existing conditions would continue to have the potential to contribute sediment to the ephemeral drainage and SEZ and ultimately contribute to the degrading water quality of Lake Tahoe. In Alternative 2 and Alternative 3, the ability of stormwater to infiltrate into the ground and be filtered by vegetation and the soil column is greatly increased, which decreases the negative cumulative effects to the lake clarity and water quality of Lake Tahoe that are currently occurring. The project would contribute to the positive cumulative effects from the reduction in sediment reaching Lake Tahoe when combined with other projects such as the Blackwood Creek Floodplain Restoration project. Because there are no negative direct or indirect impacts associated with either alternative 2 or 3, there are no negative cumulative effects.

3.6.4 Analytical Conclusions

Alternative 3 would have slightly more beneficial effects on soil and water resources than Alternative 2 because it would (1) allow a larger surface of the project area to be decompacted, (2) have less concentrated runoff from paved surfaces, and (3) still provide for the restoration of the SEZ area. The beneficial uses associated with the project area would be protected.

3.7 Air Quality

3.7.1 Introduction

This analysis is based in part upon the William Kent BMP Retrofit and Administrative Site Redevelopment Transportation Specialist Report (Project Record Document G-9). Most of the Lake Tahoe Basin air quality thresholds developed by the TRPA show a positive trend toward attainment. The most detrimental air pollutants in the area are greenhouse gasses (GHGs) such as nitrous oxides (NO_x), carbon monoxide (CO), and sulfur dioxide (SO₂). The most common source of GHGs is from vehicle emissions. Particulate matter less than 10 microns in diameter (PM10) is also studied to determine effects on air quality. Particulate matter is expelled into the atmosphere through exhaust and dust.

The project would have effects from vehicle emissions. Vehicle Miles Traveled (VMT) is used as a proxy for estimating the changes in vehicle emissions. The project may also have effects from temporary fugitive dust that would be generated during implementation of the project. No burning is proposed, so no smoke-related emissions would occur.

3.7.2 Direct and Indirect Effects

Alternative 1—No Action

Under this alternative, no increase in fugitive dust emission levels would be produced from construction activities.

Current vehicular use and emissions would remain the same. During the busy summer weekends there may be continued need for vehicles to idle as they wait to check-in at the kiosk.

Alternative 2—Proposed Action

Effects of fugitive dust caused by construction and use of unpaved roads during construction would be localized and would be mitigated by effective dust abatement methods on staging areas and construction areas using project design features and BMP's.

The Transportation Report identified an increase in 1 Daily Vehicle Trip (DVT) (Table 3-4) from the No Action Alternative. TRPA considers an increase of less than 100 DVT as an “insignificant” increase. The increase in trips-per-day under this alternative is not considered to have a significant effect on air quality or greenhouse gases in the basin.

The year-round administrative facilities would require snow removal following snow storms. Snow removal activities have the potential to increase air pollution above base-line conditions. In the context of the ongoing snow-removal in the surrounding area, this addition does not represent a significant increase in air pollutants.

Alternative 3 – Alternative Action

Direct and indirect effects from construction activities would be similar to Alternative 2. The estimated increase in DVT from the alternative proposed action is only 2 more (Table 3-4) than the No Action Alternative, which is substantially below the TRPA threshold for an insignificant increase in DVT.

3.7.3 Cumulative Effects

Alternative 1

Over 5 million people visit the basin each year. The distance between recreation sites and the many dispersed recreation activities means that most of these visitors travel to and within the basin in a motor vehicle. The *Transportation Monitoring Program 2008* document from the Tahoe Metropolitan Planning Organization (TMPO), states that 87% of summer visitors to a recreation site in the basin come in a private vehicle (data from the 2006 TRPA Transportation Survey). The remaining visitors walked (8%), rode a bike (4%), or took transit (1%). Leaving the William Kent site in its current configuration would maintain the status quo of private vehicles as the major mode of transportation in the basin.

Alternative 2

There is likely to be fugitive dust from recreational activities, nearby construction activities, and firewood cutting of local residents.

This alternative does not change the private vehicle as the major mode of transportation to and from the site. The increase in DVT under this alternative is considered insignificant and cumulative effects to increasing greenhouse gases and emissions in the basin are considered to be minimal.

Alternative 3

Cumulative effects would be the same as for Alternative 2.

3.7.4 Analytical Conclusion

The no-action alternative would not result in any change to direct, indirect, or cumulative effects to air quality. The use of recreation vehicles would continue to contribute to increased emission levels.

Effective dust abatement methods on staging areas and dirt-surfaced roads as required by the design features of the proposed action and alternative proposed action, and which would be included as contractual requirements, would ensure that there are minimal to no direct effects from Alternative 2 or 3.

4.0 Consultation and Coordination

The Forest Service consulted the following individuals, Federal, State, tribal, and local agencies during the development of this environmental assessment:

4.1 Interdisciplinary Team Members:

Ashley Sommer	Project Leader/Landscape Architect.
Michael Alexander	Assistant Forest Engineer.
Robert Becker	Recreation coordinator.
Gerrit Buma	Assistant NEPA Coordinator.
Daniel Cressy	Landscape Architect.
Stephanie Coppeto	Wildlife Biologist.
Rena Escobedo	Ecologist.
Tom Fuller	Archeologist.
Michael Gabor	Forest Engineer.
Stephanie Heller	Hydrologist.
Stanley Kot	Wildlife Biologist.
Duncan Leao	Vegetation Planner
Cheryl Schumacher	Civil Engineer.
Gina Thompson	Recreation Staff Officer.

4.2 Federal, State, and Local Agencies:

Tahoe Regional Planning Agency
Caltrans
Lahontan Regional Water Quality Control Board

4.3 Tribes:

Washoe Tribe of Nevada and California

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Chuck McCormick
Ken and Rebecca Burg
Ralph and Diana Davisson
Leslie Aldredge

4.5 Organizations

League to Save Lake Tahoe

California Land Management (site permittee)

Friends of the West Shore

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Appendix A

Best Management Practices for the William Kent Campground BMP Retrofit & Administrative Site Redevelopment

This appendix discusses the applicable BMPs for the proposed action's design features. Details are provided for application of the BMPs. These BMPs are designed to reduce or eliminate direct, indirect, and cumulative impacts to soil and hydrologic conditions and to reduce potential impacts (nutrient and sediment loads, affecting lake clarity) to Lake Tahoe, a unique national feature. Actual application of these BMPs is based on the proposed action and integration (further refinement) with project design features (Section 2.3.2 of the EA).

Sections 208 and 319 of the federal Clean Water Act, as amended, acknowledge land treatment measures as being an effective means of controlling non-point sources of water pollution and emphasize their development. Working cooperatively with the California State Water Quality Control Board (SWQCB), the Forest Service developed and documented non-point pollution control measures applicable to NFS lands. Following evaluations of the control measures by SWQCB personnel as they were applied on site during management activities, assessment of monitoring data, and the completion of public workshops and hearings, the Forest Service's measures were certified by the state and approved by the U.S. Environmental Protection Agency (EPA) as the most effective means the Forest Service could implement to control non-point source pollution. These measures were termed best management practices. BMP control measures are designed to accommodate site-specific conditions. They are tailor-made to account for the complexity and physical and biological variability of the natural environment.

In the 1981 Management Agency Agreement between the SWQCB and the Forest Service, the State agreed that "the practices and procedures set forth in the Forest Service document constitute sound water quality management and, as such, are the best management practices to be implemented for water quality protection and improvement on NFS lands." The implementation of BMPs is the performance standard against which the success of the Forest Service's non-point pollution water quality management efforts is judged.

The Clean Water Act provided the initial test of effectiveness of the Forest Service non-point pollution control measures because it required the evaluation of the practices by the regulatory agencies (SWQCB and EPA) and the certification and approval of the practices as the best measures for control. Another test of BMP effectiveness is the capability to custom fit the measures to a site-specific condition where non-point pollution potential exists. The Forest Service BMPs are flexible in that they are designed to account for diverse combinations of physical and biological environmental circumstances. A final test of the effectiveness of the Forest Service BMPs is their demonstrated ability to protect the beneficial uses of the surface waters in the state. The BMPs incorporate 75 years of erosion control and watershed protection experience and are based on sound scientific principles. The land treatment

measures incorporated into Forest Service BMPs evolved through research and development and have been monitored and modified over several decades with the expressed purpose of improving the measures and making them more effective. Onsite evaluations of the control measures by state regulatory agencies found the practices were effective in protecting beneficial uses and certifiable for Forest Service application as their means to protect water quality.

Implementation, effectiveness, and forensic monitoring would be performed to monitor project activity. Implementation monitoring consists of detailed visual monitoring of treated areas and roads/landings prior to the rainy season with emphasis placed on determining if management measures (such as erosion control measures or riparian buffers) were implemented.

Included within the Tahoe Regional Planning Agency (TRPA) 2008 Water Quality Management Plan for the Tahoe Basin (TRPA 2008) is a section devoted to SEZ protection and restoration. The term SEZ was developed by TRPA to denote perennial, intermittent, and ephemeral streams and drainages, as well as marshes and meadows. SEZs generally possess the following characteristics: riparian or hydric (wet site) vegetation; alluvial, hydric soils; and the presence of surface water or near-surface groundwater at least part of the year. SEZs are essential because they provide multiple resource benefits; provide natural treatment and conveyance of surface runoff; contain significant fish and wildlife habitat; improve and maintain environmental amenities of the Lake Tahoe region; and achieve TRPA's environmental thresholds for water quality, vegetation preservation, and soil conservation.

As stated in the Water Quality Management Plan, TRPA's environmental threshold goal is to "preserve existing naturally functioning SEZ lands in their natural condition and restore 25% of the SEZ lands that have been identified as disturbed, developed, or subdivided, to attain a 5% total increase in the area of naturally functioning SEZ lands" (TRPA 2008). BMPs, as described in this document, have been effective in protecting beneficial uses within the affected watersheds and have been applied in other projects within the Lake Tahoe Basin Management Unit. Where proper implementation has occurred, there have not been any substantive adverse impacts to cold-water fisheries habitat conditions or primary contact recreation use of the surface waters. The practices specified herein are expected to be equally effective in maintaining the identified beneficial uses.

The following management requirements are designed to address the watershed management concerns. BMPs are derived from the Forest Service publications *Nation Best Management Practices for Water Quality Management on National Forest System Lands* (USDA Forest Service 2012) and *Water Quality Management for National Forest System Lands in California* (USDA Forest Service 2001).

Table A-1. William Kent Campground BMP Retrofit & Administrative Site Redevelopment Soil and Hydrology Best Management Practices.

Nation Core BMPs	Best Management Practice Objective Description
Plan-1. Forest and Grassland Planning	Use the land management planning and decision making processes to incorporate direction for water quality management consistent with laws, regulation, and policy into land management plans.
Plan-2. Project Planning and Analysis	Use the project planning, environmental analysis, and decision making processes to incorporate water quality management BMPs into project design and implementation.
Plan-3. Aquatic Management Zone Planning	To maintain and improve or restore the condition of land around and adjacent to waterbodies in the context of the environment in which they are located, recognizing their unique values and importance to water quality while implementing land and resource management activities.
AqEco-1. Aquatic Ecosystem Improvement and Restoration Planning	Reestablish and retain ecological resilience of aquatic ecosystems and associated resources to achieve sustainability and provide a broad range of ecosystem services.
AqEco-2. Operations in Aquatic Ecosystems	Avoid, minimize, or mitigate adverse impacts to water quality when working in aquatic ecosystems.
AqEco-4. Stream Channels and Shorelines	Design and implement stream channel and lake shoreline projects in a manner that increase the potential for success in meeting project objectives and avoids, minimizes or mitigates adverse effects to soil, water quality and riparian resources.
Fac-1. Facilities and Nonrecreation Special Uses Planning	Use the applicable special use authorization and administrative facilities planning processes to develop measures to avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources during construction and operation of facilities and nonrecreation special uses activities.
Fac-2. Facility Construction and Stormwater Control	Avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources by controlling erosion and managing stormwater discharge originating from ground disturbance during construction of developed sites.

Nation Core BMPs	Best Management Practice Objective Description
Fac-3. Potable Water Supply Systems	Provide potable water supplies of sufficient quality and quantity to support the use at facilities.
Fac-4. Sanitation Systems	Avoid, minimize or mitigate adverse effects to soil and water quality from bacteria, nutrients and other pollutants resulting from collection, transmission, treatment and disposal of sewage and wastewater at facilities.
Fac-5. Solid Waste Management	Avoid, minimize or mitigate adverse effects to water quality from trash, nutrients, bacteria and chemicals associated with solid waste management at facilities.
Fac-6. Hazardous Materials	Avoid or minimize short- and long-term adverse effects to soil and water resources by preventing releases of hazardous materials.
Fac-7. Vehicle and Equipment Wash Water	Avoid or minimize contamination of surface water and groundwater by vehicle or equipment wash water that may contain oil, grease, phosphates, soaps, road salts, other chemicals, suspended solids, and invasive species.
Rec-1. Recreation Planning	Use the applicable recreation planning process to develop measures to avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources during recreation activities.
Rec-2. Developed Recreation Sites	Avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources at developed recreation sites by maintaining desired levels of ground cover, limiting soil compaction and minimizing pollutants entering waterbodies.
Rec-9. Recreation Special Use Authorizations	Avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources from physical, chemical and biological pollutants resulting from activities under recreation special use authorizations.
Road-2. Road Location and Design	Locate and design roads to avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources.
Road-3. Road Construction and Reconstruction	Avoid or minimize adverse effects to soil, water quality and riparian resources from erosion, sediment and other pollutant delivery during road construction or reconstruction.
Road-4. Road Operations and	Avoid, minimize, or mitigate adverse effects to soil, water quality and riparian resources by controlling road use and operations and providing adequate and appropriate maintenance to minimize

Nation Core BMPs	Best Management Practice Objective Description
Maintenance	sediment production and other pollutants during the useful life of the roads.
Road-6. Road Storage and Decommissioning	Avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources by storing closed roads not needed for at least 1 year and decommissioning unneeded roads in a hydrologically stable manner to eliminate hydrologic connectivity, restore natural flow patterns and minimize soil erosion.
Road-7. Stream Crossings	Avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources when constructing, reconstructing or maintaining temporary and permanent waterbody crossings.
Road-9. Parking Staging Ares	Avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources when constructing and maintaining parking and staging areas.
Road-10. Equipment Refueling and Servicing	Avoid or minimize adverse effects to soil, water quality and riparian resources from fuels, lubricants, cleaners and other harmful materials discharging into nearby surface waters or infiltrating through soils to contaminate groundwater resources during equipment refueling and servicing activities.
Veg-1. Vegetation Management Planning	Use the applicable vegetation management planning processes to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality and riparian resources during mechanical vegetation treatment activities.
Veg-2. Erosion Prevention and Control	Avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources by implementing measures to control surface erosion, gully formation, mass slope failure, and resulting sediment movement before, during and after mechanical vegetation treatments.
Veg-3. Aquatic Management Zones	Avoid, minimize, or mitigate adverse effects to soil, water quality and riparian resources when conducting mechanical vegetation treatment activities in the AMZ.
Veg-4. Ground-Based Skidding and Yarding Operations	Avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources during ground-based skidding and yarding operations by minimizing site disturbance and controlling the introduction of sediment, nutrients and chemical pollutants to waterbodies.
Veg-6. Landings	Avoid, minimize or mitigate adverse effects to soil, water quality and

Nation Core BMPs	Best Management Practice Objective Description
	riparian resources from the construction and use of log landings.
Veg-8. Mechanical Site Treatment	Avoid, minimize, or mitigate adverse effects to soil, water quality and riparian resources by controlling the introduction of sediment, nutrients, chemical or other pollutants to waterbodies during mechanical site treatment.
WatUses-1. Water Uses Planning	Use the applicable authorization and administrative planning processes to develop measures to avoid minimize or mitigate adverse effects to soil, water quality and riparian resources during construction, operation, maintenance and restoration of water use infrastructure.

Appendix B

Projects Considered for Cumulative Effects

Present Projects

No projects were considered in this category because there are no projects currently in construction in the area considered.

Projects in the Foreseeable Future

The following projects were considered for the overall cumulative effects analysis for this project. However, the scale and time frame was considered individually for each resource discussed in this chapter. Some projects were considered under certain resources and not others, and some projects considered for cumulative effects may not be listed below. This list was the master list from which analysis was further refined for each resource.

Table B-1. Future projects considered for cumulative effects.

Project	Description	Potential Cumulative Effects
Homewood Resort Master Plan	Proposed improvements to the existing ski area, both on-mountain and at the existing North and South Base Areas to include a 50-60 room lodge-hotel, small neighborhood retail village, a residential area on the South Base, upgrades to chairlifts and snowmakers, and a new mid-mountain lodge facility accessible year-round by a new 8-passenger high-speed gondola. The project also includes forest health and fire protection measures, watershed management, and storm water runoff management. Buildings are planned to be LEED certified and the North-Base neighborhood development is planned to be LEED ND (Neighborhood Development) certified.	This project will lead to increased congestion on Hwy 89, significantly during the winter and summer months. The William Kent project is not anticipated to have significant negative effects on congestion and therefore does not contribute to negative cumulative effects. Watershed management and storm water runoff management is planned, which could provide increased ecosystem resilience in combination with this project. Additional impacts to wildlife and botany are not anticipated from the William Kent project.
Caltrans Water Quality Improvement Project	Water quality improvement projects along the Hwy 89 corridor and within Tahoe City. The William Kent/Sunnyside portion is tentatively scheduled for 2015.	Positive cumulative effects to water quality. No negative cumulative effects during construction are expected because project timelines do no overlap.

Project	Description	Potential Cumulative Effects
64-Acres Transit Center	This project is currently under construction. The project includes construction and operation of a transit center and associated parking facilities on the NW portion of the tract (west of SR 89 just south of Fanny Bridge over the Truckee River in Tahoe City, California). Associated with the transit center is roadway system improvements and recreation trail alternation necessary to accommodate the new facility. The transit center will provide parking for 6 buses at a time. The facility will also provide an enclosed structure with a heated waiting area to serve 40 patrons. The parking area has 130 spaces to support the Intermodal Transit Center. Intermodal transportation includes bicycling, roller blading, and walking as well as bus, shuttle, and taxi transportation.	The Transit Center is expected to reduce congestion on Hwy 89, therefore there are no negative cumulative effects on congestion. Construction of the facility will not overlap with construction at William Kent, therefore there is not cumulative effects from construction.
Blackwood Creek Phase III, Stream and Floodplain Restoration Project	This final phase (Phase III) would address excessive bank erosion and channel incision as well as diminished nutrient uptake capacity along Blackwood Creek's main-stem. The approach involves installation of physical structures made of boulders and logs, re-contouring of existing floodplain surfaces and channel, plug and fill of existing gully channel, and new channel construction. Riparian vegetation transplant and planting of containerized riparian stock would occur where needed.	Cumulative effects involve an increase in SEZ vegetation health in the area, increased forest health, and possible increased habitat for plant and animals.
Camp Richardson Resort BMP Project	Upgrades to the campground, water quality BMPs. Reduction in campsites. Decision not yet published.	Reduction in campsites available to the public.

Waste Discharge Identification Number (WDID):

STORM WATER POLLUTION PREVENTION PLAN

for

William Kent BMP Retrofit Project

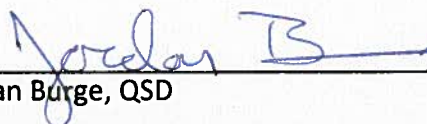
USDA Forest Service, Lake Tahoe Basin Management Unit

Legally Responsible Person (LRP)

**Nancy Gibson, Forest Supervisor
Lake Tahoe Basin Management Unit
530-543-2600**

Approved Signatory

**Jordan Burge, P.E.
Lake Tahoe Basin Management Unit
Office: 530-543-2670**



Jordan Burge, QSD

12/3/13

Date

Contents

I. Introduction and Certifications	1
I.A. SWPPP Objectives	1
I.B. SWPPP Implementation Schedule	1
I.C. Permit Registration Documents	1
I.D. Certification and Training Requirements	2
I.D.1. Qualified SWPPP Developer	2
I.D.2. SWPPP Certification and Approval	3
I.D.3. Qualified SWPPP Practitioner	4
I.D.4. Legally Responsible Person	6
I.E. Contractor List	7
I.F. Emergency contact person and 24-hour phone number	7
I.G. SWPPP Availability and Public Records Access	7
I.H. Required Changes	7
II. Project Information	8
II.A. Project Description, site address and driving directions	9
II.A.2 Beach Day-use Site Improvements	11
III. Best Management Practices	14
III.A. Site Management Narrative	14
III.B. Sediment and Erosion/Stabilization Control Narrative	16
III.B.1. Erosion Control	16
III.B.2. Sediment Control	19
III.C. Non-Storm water and Material Management Narrative	22
III.D. Dewatering and Diversion Plan Narrative	24
III.E. Active Treatment System Plan Narrative	24
III.F. Post-Construction Storm Water Management Measures Narrative	25
III.G. Schedule for BMP Implementation	25
III.H. BMP and Disturbed Soil Area maps	25
IV. BMP Inspection, maintenance and Rain Event Action Plans	32
IV.A. BMP Inspection and Maintenance Narrative	32
IV.B. Rain Event Action Plan Narrative	32

V. Construction Site Monitoring and Reporting Plan (CSMRP).....	34
V.A. Purpose.....	34
V.B. Visual Monitoring	34
V.C. Water Quality Sampling and Analysis.....	35
V.D. Watershed Monitoring Option.....	36
V.E. Quality Assurance and Quality Control.....	36
V.F. Reporting Requirements and Records Retention	37
V.F.1. Record Keeping	37
V.G. Non-Compliance Reporting	37
V.G.1. 24-Hour Reporting.....	37
V.G.2. Planned Changes	37
V.G.3. Anticipated Noncompliance	38
V.H. Annual Report	38
V.I. Final Report.....	38

Appendices.....	i
Appendix A – SWPPP Amendment Forms	i
Appendix B – CASQA BMP Standard Specifications.....	i
Appendix C – Engineering Plans and Specifications (EPS)	i
Appendix D - Visual Monitoring/BMP Inspection Form.....	i
Appendix E - Rain Event Action Plan Template.....	i
Appendix F – Permit Documents	i
Appendix G – Training Logs.....	i
Appendix H – Prohibition Exemption Information	i

I. Introduction and Certifications

I.A. SWPPP Objectives

This SWPPP has been developed for the William Kent BMP Retrofit Project to comply with the requirements to implement BMPs to achieve compliance with effluent limits and receiving water objectives as directed by the Construction General Permit for the Lake Tahoe Hydrologic Unit (Board Order R6T-2011-0019, NPDES No. CAG616002). This SWPPP has been developed and will be amended, when necessary, to meet the following objectives:

1. Identify, construct, implement and maintain BMPs to reduce or eliminate pollutants in storm water discharges and authorized non-storm water discharges from construction sites.
2. Identify pollutant sources including sediment sources that may affect the quality of storm water discharges associated with construction activity.
3. Identify non-storm water discharges.
4. Identify all effluent discharge outfall locations, sampling and analysis strategy and protocols, and a sampling schedule for discharges from the identified outfalls from the project area.

I.B. SWPPP Implementation Schedule

The specific construction schedule will be determined by the contractor when a contractor is selected for this work. There are several aspects of the construction that will be controlled by the Forest Service, including:

- Construction will occur between May 1 and October 15.
- Micro-basins will be one of the first features constructed. They will be used as a BMP to capture storm water flows from open graded or impervious surfaces.
- Temporary BMPs (such as straw wattles) will be required to be on site prior to any grading.
- The new channel in the day-use site shall be constructed only when the water level elevation of Lake Tahoe is 6226 feet or lower. In addition, the final connection from storm drain pipes to new channel will be made when there is less than a 30% prediction of precipitation in the forecast (see Section II.A.2 of the Project Description for more details).

I.C. Permit Registration Documents

Required Permit Registration Documents (PRD) shall be submitted to the State Water Board via the Storm water Multi Application and Report Tracking System (SMARTS) by the Legally Responsible Person (LRP), or authorized personnel (i.e., Approved Signatory) under the direction of the LRP. The project specific PRDs include:

- Notice of Intent (NOI);
- 401 (subject to decision of ACOE);
- Site Maps;
- Annual Fee;
- Signed Certification Statement (LRP Certification is provided electronically with SMARTS PRD submittal); and
- SWPPP

Site maps can be found on Figures 1 – 7. A copy of all other submitted PRDs shall be kept in Appendix F, along with the Waste Discharge Identification (WDID) confirmation.

I.D. Certification and Training Requirements

The SWPPP must be prepared, signed and certified by a QSD. Additionally, the SWPPP must identify the QSP. See the following sections for the identification and qualifications of the QSD/QSP.

I.D.1. Qualified SWPPP Developer

The QSD shall certify and amend the SWPPP. Jordan Burge is the QSD and meets the certification requirement of Section VII.B.1 of the Construction General Permit based on:

- Registered Professional Civil Engineer, State of California # 78252
- Qualified SWPPP Developer (QSD) Registration # 01217

The QSD has received the following training:

- California Construction General Permit Training, June 2011

I.D.2. SWPPP Certification and Approval

Qualified SWPPP Developer

Project Name: William Kent BMP Retrofit Project

"This Stormwater Pollution Prevention Plan and Appendices were prepared under my direction to meet the requirements of the Construction General Permit for Storm Water discharge in the Lake Tahoe Hydrologic Unit (Board Order No R6T-2001-0019). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below."

Jordan B
QSD Signature

12/3/13
Date

I.D.3. Qualified SWPPP Practitioner

The QSP shall meet the certification requirement of Section VII.B.3 of the Construction General Permit. Jordan Burge will also be the QSP for this project. For Jordan Burge's information, see section I.D.1. Qualified SWPPP Developer. If another QSP is identified for this project, his/her qualifications will be given to LRWQCB, and the SWPPP will be amended.

The QSP shall have primary responsibility and significant authority for the implementation, maintenance, and inspection/monitoring of SWPPP requirements.

Duties of the above QSP, including a QSP designated in a future amendment, include but are not limited to:

- Ensuring full compliance with the SWPPP and the Construction General Permit
- Implementing all elements of the SWPPP, including but not limited to:
 - Ensuring all BMPs are implemented, inspected and properly maintained;
 - Preparing weekly, pre-storm, during storm, and post-storm BMP inspection reports;
 - Performing non-storm water visual observations and inspections;
 - Performing non-storm water sampling and analysis, as required;
 - Performing routine inspections and observations;
 - Implementing non-storm water management, and materials and waste management activities such as: monitoring discharges; general Site clean-up; vehicle and equipment cleaning, fueling and maintenance; spill control; ensuring that no materials other than storm water are discharged in quantities which will have an adverse effect on receiving waters; etc.;
 - Conducting pre-storm inspections for storm events;
 - Conducting daily inspections during storm events;
 - Conducting post-storm inspections for storm events;
 - Monitoring weather forecasts for both likely precipitation events and rain events;
 - Preparing and implementing Rain Event Action Plans for likely precipitation events;
 - Submitting numeric effluent limitations (NELs) exceedence data, including storm water effluent limits and receiving water limits and reports to the QSD and Approved Signatory. Following receipt of QSD's and/or Approved Signatory's approval, QSP shall upload the NEL exceedence data or report to the SWRCB's SMARTS;
 - Ensuring elimination of all unauthorized discharges;
 - Mobilizing crews in order to make immediate repairs to the control measures;

- Notifying the LRP or Authorized Signatory immediately of off-site discharges or other non-compliance events;
- Submitting Notices of Discharge and reports of Illicit Connections or Illegal Discharges;
- Preparing Annual Report summarizing corrective actions, sampling and analyses, and any corrective actions not implemented.

The QSP may delegate the inspections and activities to an appropriately trained employee, but shall ensure adequacy and adequate deployment.

The QSP shall also be responsible for providing training of project personnel on SWPPP implementation procedures. Before construction operations commence the QSP will conduct an on-site training with project personnel to review the SWPPP, construction operations and necessary BMPs. Additionally, trainings will be held as necessary on specific tasks as the project progresses and tasks change. Training logs (Appendix G) will be filled out for each training and kept with the SWPPP.

I.D.4. Legally Responsible Person

Approval and Certification of the Storm Water Pollution Prevention Plan

Project name: William Kent BMP Retrofit Project

"I certify that this document and all Appendices were prepared under my direction in accordance with a system designed to ensure that qualified personnel properly gather and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, to the best of my knowledge and belief, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information."

Nancy Gibson

Legally Responsible Person


LRP Signature

Lake Tahoe Basin Management Unit

Organization

12/5/13
Date

Forest Supervisor

Title

530-543-2600

Telephone Number

I.E. Contractor List

A contractor has not yet been selected for this project. When a contractor is selected, the SWPPP will be amended with the updated information.

I.F. Emergency contact person and 24-hour phone number

Owner:	US Forest Service, LTBMU 35 College Drive South Lake Tahoe, CA 96150 530-543-2600
QSD/QSP:	Jordan Burge, P.E. Civil Engineer Office: 530-543-2670
Hazardous Spill:	Genevieve Villemaire Forest Spill Coordinator, LTBMU 530-543-2783

I.G. SWPPP Availability and Public Records Access

A copy of the SWPPP will be kept on the project site at all times. Additionally, the SWPPP will be available for view in the SMARTS database.

I.H. Required Changes

The SWPPP shall be maintained such that it reflects the actual site conditions for the duration of the project. This will require the QSD to amend the SWPPP whenever a qualifying change is made. The SWPPP shall be revised when:

- There is a change in construction, or operations, which may affect the discharge or pollutants to surface waters or ground waters as determined using the criteria outlined under section V.G.2. "Planned Changes;"
- There is an increase in the disturbed acreage;
- BMPs do not meet the objectives of reducing or eliminating pollutants in storm water discharges;
- There is a General Permit violation. If the LRWQCB determines that a Permit violation has occurred, the SWPPP shall be amended and implemented within 72 hours of notification, or as soon as additional materials can be obtained, if needed.
- When deemed necessary by the QSD or project engineer.

The following items shall be included in each amendment:

- Who requested the amendment;
- The location of proposed change;
- The reason for change;
- The original BMP proposed, if any;
- The new BMP proposed

Approved amendments shall be uploaded into the SMARTS database and inserted into the appropriate section of the SWPPP or Appendix and a SWPPP Amendment Certification shall be kept with the SWPPP. The SWPPP text shall be revised, replaced, and/or hand-annotated as necessary to properly convey the amendment. Additionally, LRWQCB staff will be notified by email of all SWPPP amendments once uploaded into SMARTS.

A blank copy of the SWPPP Amendment Certification and Approval form is in Appendix A. A SWPPP amendment log will be kept on-site with the SWPPP during construction operations. The SWPPP amendment log form can be found in Appendix A.

Table 1 displays the changes that have been designated by the QSD as “to be field determined” and constitute minor changes that the QSP may implement based on field conditions. The QSP shall document these change in the SWPPP amendment log and document the reason they don’t need QSD approval.

Table 1. List of Changes to be Field Determined	
Candidate changes for field location or determination by QSD¹	Changes that can be field located or field determined by QSP
Increase quantity of an Erosion or Sediment Control Measure	√
Reduction in disturbed acres	√
Relocate/Add stockpiles or stored materials in mapped area	√
Locate and add portable toilets	√
Relocate storage and/or fueling locations within mapped area	√
Relocate areas for waste storage	√
Locate water drafting areas	√
Minor changes to schedule or phases	√

¹Any field changes not identified for field location or field determination by QSP must be approved by QSD.

II. Project Information

II.A. Project Description, site address and driving directions

The William Kent Facilities BMP Retrofit project will renovate a Forest Service campground and day-use site to improve water quality and protect the clarity of Lake Tahoe. The project is scheduled for implementation beginning May 01, 2014 and will be completed by October 15, 2014. The campground is scheduled to be closed to the public during 2014 and will reopen in 2015. Project funding will include a number of option items which will be awarded based on final construction contract negotiations. All option items are included in the description and permit for this project.

The project is located approximately two miles south of Sunnyside-Tahoe City on Hwy 89 West Lake Blvd, Section 24 Township 15N, Range 16E. The project covers approximately 25 acres and consists of the campground and administrative site west of the highway, and the day-use site located east of the highway. All facilities within the project area are federally owned and managed by the US Forest Service. The campground is bounded by private, mostly residential properties to the north, south, and west.

II.A.1. Campground Improvements

The campground originally dates back to 1924, however current development and infrastructure dates to 1963. The current campground consists of 95 campsite spurs and a paved road system that provides vehicle access to them. Six flush toilet restroom buildings are located within the campground. A small campground check-in kiosk building is located near the facility entrance. A sewer dump for use by RV campers is located near the southern-most restroom building. Fencing separates the campground from adjacent properties.

A conifer-dominated Stream Environment Zone (SEZ) begins near the north-west corner of the property and stretches toward the southern boundary before terminating near the north-east corner of the property. Surface storm water from adjacent private property flows into the campground and is carried through the SEZ in a shallow man-made drainage ditch. Nine crossings over this ditch exist within the current campground. A portion of the southern-most campground road and campsites are located within an area of the SEZ that is dominated by grasses and shrubs. Recent neighborhood BMP improvements have substantially reduced the amount of surface water that flows through the campground, and soil/vegetation/hydrology investigations following US Army Corps Wetland Delineation Guidelines do not show evidence of seasonal groundwater near the surface, and find that no wetlands or navigable waters are present within the project area. Moist surface soils exist during late spring snow melt periods.

A catch basin is located near the highway campground entry which is connected via a pipe

under the highway to another basin. Storm water flow from the campground and surrounding land uses that does not infiltrate from this current system flows through a large buried pipe before being discharged to Lake Tahoe.

This project will remove a total of 16,117 square feet of impervious coverage from the project area, including the removal of approximately 1,060 linear feet of road and 12 campsites from delineated SEZ, totaling 15,816 square feet of impervious coverage removed from these sensitive soil areas. In addition to removal of pavement surface, prism, and structures (including 5 culverts), these areas will be decompacted and revegetated/restored. The anthropogenic drainage channel within the lower portion of the SEZ (see Figure 2) will be re-contoured to mimic conditions that existed prior to facility development in the past century. Areas in which impervious coverage has been removed or in which the drainage channel has been re-contoured will be hydromulched with native seed to stabilize and protect the newly reclaimed areas from potential surface water flows that could cause erosion. Asphalt surfaces located outside of delineated SEZ areas may be pulverized for use as road base elsewhere within the project. Temporary water quality protection BMPs will be installed consistent with *Section III. Best Management Practices*, prior to project ground disturbing work and will be maintained until implementation is complete.

New roadways and campsite spurs will be constructed in high capability soils. This includes 15 new campsite spurs and 9 reconstructed and/or reoriented campsite spurs. In order to maintain facility circulation in light of the project's SEZ restoration, a new segment of road will be constructed which crosses SEZ soils and includes one new culvert. Approximately 160 cubic yards of fill will be placed in SEZ to construct this crossing. New impervious coverage within the SEZ associated with this project element totals 1,400 square feet. Approximately 150 trees with their stumps will be removed from the campground to accommodate the facility retrofit and reconfiguration. Barriers may be placed to prevent vehicles from travelling or parking off of paved surfaces. New paved areas will be constructed to direct storm water run-off to infiltration micro-basins designed to accommodate volumes associated with storm intensities of 2-inches of rain within 24-hours, consistent with Environmental Protection Agency standards. Micro-basins will also be constructed in areas of the campground that will be unaffected by the project, to capture and slow surface water runoff where it currently concentrates. The permanent BMP micro-basins will be constructed early during project implementation to help provide water quality protection while the facility retrofit is underway, in association with temporary BMPs.

Other project elements which will occur on high capability soils include the replacement of the campground check-in kiosk building. The new building will be a pre-manufactured unit which will be placed on a newly constructed concrete pad with new utility connections approximately

100-feet west of its current location, in an area currently disturbed. The current check-in building will be removed. A code-compliant sewer dump station will be constructed approximately 30-feet north of its current location to allow public visitors in RVs to empty vehicle waste chambers. The existing station will be decommissioned in compliance with plumbing code safety standards. Two campground host sites closest to the campground entry will be renovated with code-compliant water, sewer, and electrical utility services, and water spigots within the campground will be replaced with units that meet requirements for use by people with disabilities. Upon completion of this project the campground will have a capacity of 81 campsites which will include 24 reconstructed sites that meet current USFS standards for universal accessibility, including 2 host sites.

II.A.2 Beach Day-use Site Improvements

The one-half-acre William Kent Day-use site is located east of Highway 89 and includes approximately 150 linear feet of pebble beach on the shore of Lake Tahoe. A small parking area along with a bike path that connects north and south of the site provides access to the site. A 6-unit flush toilet building is located on the site, as are several picnic tables and an informational sign board. The elevation change from the picnic area to the beach occurs rapidly, resulting in a steep slope that is not accessible to people with disabilities and that is prone to erosion.

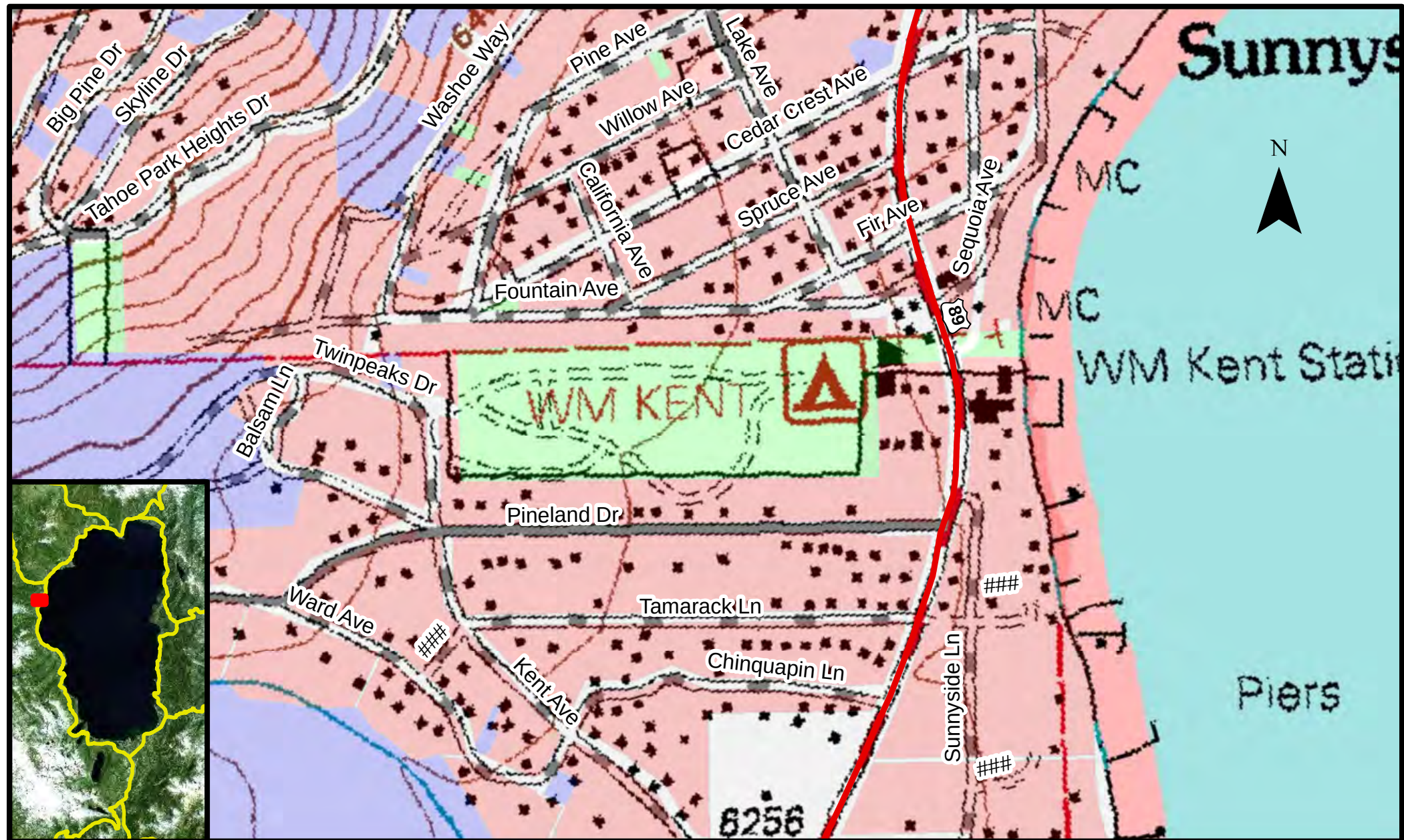
Storm water runoff from upland areas west of the highway, in addition to the residential and commercial areas surrounding the day-use site, flows through a series of catch basins before being collected in an underground pipe which flows to Lake Tahoe. The outfall of this pipe is below the lake's high water elevation, and may be considered "jurisdictional water of the US" by the US Army Corp of Engineers (ACOE). A wetland delineation was performed by LTBMU staff in 2013 and a request for determination was sent to the ACOE on November 25, 2013. If the ACOE determines portions of the project are jurisdictional, LTBMU will apply to the LRWQCB for Section 401 Water Quality Certification.

Work within the Day-use site, between Highway 89 and Lake Tahoe, will consist of excavating and removing approximately 80-linear feet of the underground pipe including the concrete headwall at the pipe's terminus (see Figure 7). In its place, the project will construct a sinuous channel approximately 110 feet in length that provides opportunity for storm water to infiltrate before it reaches the surface waters of Lake Tahoe. The bottom of the open channel will be 5 feet wide, ensuring the volume capacity will not change from the current storm pipe system. Channel slopes will be stabilized with a combination of riprap rock and granite boulders with slopes varying between 1:1 and 3:1. A compacted, aggregate surface, accessible path will be constructed to the north of the channel to provide access to Lake Tahoe from the day-use site.

This path will be located north of the storm water channel and above the high water of Lake Tahoe. The path may include dry-stacked boulders to stabilize slopes while maintaining a visual character consistent with Lake Tahoe shorezone scenic values. The path construction will include a cross-slope that prevents surface water concentration and erosion. Removal of 5 trees, including two cottonwood trees will be associated with this element of the facility retrofit. Day-use site grading activity will include approximately 450 cubic yards of cut and 70 cubic yards of fill. The fill in this area will consist of boulders, riprap, and rounded gravel similar to existing rock on site.

The construction of the new channel will only occur when the elevation of Lake Tahoe is at 6226 feet or lower. Because the outlet of the new channel will be at the same elevation of the invert of the current pipe (6227.2 feet), this will allow for minimal disturbance during construction. To prevent uphill storm water from flowing through the channel during construction, the current storm drain pipes will remain functioning in place as long as possible. The final channel connection will be the last thing constructed, and will be executed quickly, preferably during dry weather conditions. The final connection will be made when there is less than 30% chance of precipitation in the predicted forecast, according to the National Atmospheric and Oceanic Administration. Prior to completion, a sandbag/plastic barrier will be constructed at the end of the channel, and the channel will be “seasoned” by washing the new channel, and pumping the water to an area it will infiltrate.

Figure 1: Project Location Map



0 0.125 0.25 0.5 Miles

Contours are in 40 ft. increments. The construction site is the whole of the green area in the center of the map. For more detailed information on surface water within the construction area, see Figures 2 through 7.

III. Best Management Practices

III.A. Site Management Narrative

Construction site management shall consist of controlling potential sources of pollution before they come in contact with storm water systems or watercourses. Potential sources of pollution may include storm water over newly graded areas, asphalt grindings, uncompacted pavement, concrete waste, open sewer piping, or stockpiles. Other potential pollutants may include improperly functioning portable restrooms, fluids from mechanical equipment used on site, or excessive dust. See Tables 2 – 5 for specific CASQA BMPs used to mitigate these possible pollutants. Appropriate site management measures shall be implemented to control material pollution and manage waste by implementing effective handling, storage, use and disposal practices. Additionally, many non-storm water pollution control BMPs (below) are necessary for proper site management.

Waste management and materials pollution control BMPs shall be implemented to minimize storm water contact with construction materials, wastes and service areas and to prevent materials and wastes from being discharged off-site. The primary mechanisms for storm water contact that shall be addressed include:

- Direct contact with precipitation
- Contact with storm water run-on and runoff
- Wind dispersion of loose materials
- Direct discharge to the streams and watercourse through spills or dumping

The following Waste Management and Materials Pollution Control BMPs Table indicates the BMPs that shall be implemented to handle materials and control construction site wastes associated with these construction activities. See Appendix B for identified CASQA specifications.

Table 2. CONSTRUCTION SITE MANAGEMENT WASTE MANAGEMENT AND MATERIALS POLLUTION CONTROL BMPs				
CASQA Fact	BMP Name	BMP Used		If Not Used, Why
		YES	NO	
WM-1	Material Delivery and Storage	√		
WM-2	Material Use	√		
WM-3	Stockpile Management	√		
WM-4	Spill Prevention and Control	√		
WM-5	Solid Waste Management	√		
WM-6	Hazardous Waste Management	√		

WM-7	Contaminated Soil Management		√	No contaminated soil on site
WM-8	Concrete Waste Management	√		
WM-9	Sanitary/Septic Waste Management	√		
WM-10	Liquid Waste Management		√	No liquid waste on site

The following list of BMPs and narrative explain how the selected BMPs will be incorporated into the project. Where CASQA fact sheets contradict information contained in the Technical Specifications or the Drawings, the QSD shall determine which criteria applies. Selection criteria will be documented in a SWPPP Amendment.

WM-1, WM-2 Materials Delivery, Storage and Use

In general, BMPs shall be implemented to help prevent discharges of construction materials during delivery, storage and use. See Figure 2 for specific staging areas. Materials, equipment, stockpiles, spoils, and waste will be limited to new or existing asphalt, unless otherwise noted on Figure 2. A barrier shall be provided along the downslope edge of the staging areas to prevent runoff leaving the area. If the QSP determines there is a risk of run-on, a barrier shall be provided along the upslope edge of the staging area.

WM-3 Stockpile Management

Stockpile Management shall be implemented to reduce or eliminate pollution of storm water from stockpiles of soil and rock materials. Any stockpiles will be located in already disturbed and flat areas, typically on existing asphalt (see Figure 2 for exceptions). All stockpiles will be located to avoid run-on. Stockpiles shall be surrounded with sediment controls, and if a stockpile is inactive for 14 days it will be stabilized with hydraulic mulch or geotextile. If any soil or other erodible material is stockpiled over the winter, it will be covered with hydraulic mulch by October 15

WM-4 Spill Prevention and Control

Spill Prevention and Control shall be implemented to contain and clean up spills, and to prevent material discharge to waterways.

WM-5, WM-6 Solid and Hazardous Waste Management

Solid Waste Management and Hazardous Waste Management BMPs shall be implemented to minimize storm water contact with waste materials and prevent waste discharges. Solid wastes (trash) shall be disposed of offsite daily. If onsite storage is necessary, solid wastes shall be stored inside a locked storage container.

Liquid hazardous waste shall be disposed of offsite the same day it is generated. If it is necessary to store liquid hazardous waste, it will be stored in the same storage container referenced above. Hazardous wastes shall be contained in appropriate and clearly marked containers and segregated from other non-waste materials. All hazardous waste shall be stored, transported and disposed as required.

WM-8 Concrete Waste Management

All concrete waste, including concrete washout, shall be collected and taken offsite. A majority of concrete will be underground (gate and sign posts, etc.).

WM-9 Sanitary and Septic Wastes

Portable toilets shall be located and maintained at the staging areas for the duration of the project. Specific locations will be determined in the field by the QSD. Weekly maintenance shall be provided and wastes shall be disposed offsite. The toilets shall be located away from concentrated flow paths. Toilet location shall not interfere with traffic flow.

III.B. Sediment and Erosion/Stabilization Control Narrative

III.B.1. Erosion Control

Erosion control is any source control practice that protects the soil surface and prevents soil particles from being detached by rainfall, flowing water or wind. Erosion control consists of using project scheduling and planning to reduce soil and/or vegetation disturbance, controlling drainage in disturbed areas and preparing and stabilizing disturbed soil areas.

This construction project will implement the following practices to provide effective temporary and final erosion control during construction:

- Preserve existing vegetation; disturbed soil areas are displayed on Figures 2 – 7, existing vegetation will be preserved outside of these boundaries;
- The area of soil disturbing operations shall be controlled such that either erosion control BMPs (Table 3) can be quickly and effectively implemented or the site can be permanently stabilized in that area;
- Non-active areas will be stabilized within 14 days of cessation of construction activities;
- Prior to the completion of construction, apply permanent stabilization to disturbed soil areas.

Sufficient erosion control materials shall be maintained onsite to allow implementation in conformance with this SWPPP. This includes implementation requirements for active and non-active areas that require deployment of BMPs before the onset of rain. If precipitation occurs, and before runoff develops within disturbed areas of the new channel and/or demolition of the

storm drain pipes in the day-use site, any open grading will be covered with plastic to avoid direct erosion into Lake Tahoe. As a secondary measure, fiber rolls or silt fence will be staged within the day-use site and will be placed at the outlet of the channel before runoff from disturbed areas develops.

The following erosion control BMP selection table indicates the BMPs that shall be implemented to control erosion on during construction. CASQA Fact Sheets for temporary erosion control BMPs are provided in Appendix B.

Table 3. EROSION CONTROL BMPs				
CASQA Fact Sheet	BMP Name	BMP Used		If Not Used, Why
		YES	NO	
EC-1	Scheduling	√		
EC-2	Preservation of Existing Vegetation	√		
EC-3	Hydraulic Mulch	√		
EC-4	Hydroseed	√		
EC-5	Soil Binders		√	Not necessary
EC-6	Straw Mulch		√	Using wood mulch
EC-7	Geotextiles and Mats		√	Not necessary
EC-8	Wood Mulching	√		
EC-9	Earth Dikes and Drainage Swales	√		
EC-10	Velocity Dissipation Devices	√		
EC-11	Slope Drains		√	Not necessary
EC-12	Stream Bank Stabilization	√		
EC-14	Compost Blankets		√	Not necessary
EC-15	Soil Preparation- Roughening	√		
EC-16	Non-Vegetated Stabilization	√		
WE-1	Wind Erosion Control	√		

The following list of BMPs and narrative explain how the selected BMPs will be incorporated into the project. Where CASQA fact sheets contradict information contained in the Technical Specifications or the Drawings, the more stringent criteria (as determined by the QSD) shall apply. Selection criteria will be documented in a SWPPP Amendment.

EC-1, EC-2 Scheduling, Preservation of Existing Vegetation

Surface disturbance activities will begin after May 1 and continue no later than October 15, depending on stream flow, ground water levels and weather conditions. Grading activities are scheduled to be completed by October 3 with winterization taking place from October 3 to October 15. A grading ordinance exemption may be requested from TRPA and LRWQCB if the QSD and Project Engineer deem it necessary and appropriate to work past October 15. When there is a 30 percent or greater chance of precipitation in the project area as predicted by the National Oceanographic and Atmospheric Administration (NOAA), further actions may be taken (see section IV.B. Rain Event Action Plan Narrative).

The project schedule will sequence construction activities with the installation of both soil stabilization and sediment control measures. Micro-basins will be constructed before major grading begins, in order to capture stormwater flows from open graded or impervious surfaces. BMPs will be deployed in a sequence to follow the progress of grading and construction. The construction schedule will be arranged as much as practicable to leave existing vegetation and other ground cover undisturbed until immediately prior to grading. See Figures 2 – 7 for disturbed soil areas; existing vegetation will be preserved outside of these displayed boundaries. Construction fencing may be used as a safety precaution within the day-use site during construction.

EC-3, EC-4 Hydraulic Mulch, Hydroseed

Hydraulic mulch and hydroseeding will be used to stabilize and revegetate areas within the SEZ disturbed by construction and channel restoration.

Hydraulic mulch may also be used to stabilize any soil stockpile area that is inactive for more than 14 days. If any soil or other erodible material is stockpiled over the winter, it will be covered with hydraulic mulch by October 15.

EC-8, EC-16 Wood Mulching, Non-Vegetated Stabilization

Decompaction of soils and application of wood mulch will be used in combination with slash material as long-term stabilization for disturbed areas that will not be revegetated upon completion of the project. These areas include staging and stockpile areas as well as disturbed areas outside the SEZ.

Wood mulch may be used to cover small exposed soil areas that have the potential to release sediment discharge to a live waterbody prior to a forecast storm event. If wood mulch is used in such an instance it shall be applied to depth that will protect soil and prevent movement to mulch (approximately 2"– 4").

EC-9 Drainage Swales

Drainage features, such as pavement outsloping and shoulder grading, will be used as permanent BMPs to convey water from travel surfaces. See Figures 2 – 7 for locations of infiltration basins, where water will be conveyed to.

EC-10 Velocity Dissipation Devices

A rock velocity dissipation device will be used at the outlet of the planned channel crossing shown on Figures 2 and 5.

EC-12 Stream Bank Stabilization

The banks of the new channel in the day-use site will be stabilized with riprap and large boulders. If precipitation occurs, and before runoff develops within disturbed soil areas, open graded areas of the new channel will be covered with plastic to avoid erosion of sediment into Lake Tahoe. As a secondary measure, fiber rolls or silt fence may be placed at the outlet of the channel. All material placed into the channel will be washed prior to placement, and temporary BMPs will be installed to capture any remaining fine sediment. The channel will also be “seasoned” to clean fine materials before completion.

EC-15 Soil Preparation / Roughening

Compacted areas to be restored will be decompacted to increase water infiltration capacity and prepare the surface for revegetation. A uniform decompaction of the soil will be accomplished to a depth of 6 to 12 inches.

WE-1 Wind Erosion Control

Water shall be applied to disturbed areas to control dust, and the water will be applied using water trucks. Water application rates will be minimized as necessary to prevent runoff and ponding. Water equipment leaks will be repaired as soon as possible. Material stockpiles may also be watered if wind erosion is evident.

Stockpiles that are not actively being used will be covered with hydraulic mulch or geotextile fabric.

III.B.2. Sediment Control

Sediment controls are structural measures that are intended to complement and enhance the selected erosion control measures and reduce sediment discharges from construction areas. Sediment controls are designed to intercept and settle out soil particles that have been detached and transported by the force of water. Additional temporary sediment control materials will be maintained onsite throughout the duration of the project, ready for

implementation in an anticipated precipitation event (see Section IV.B. Rain Event Action Plan Narrative for protocol during an anticipated precipitation event), rapid response to failures, or emergencies, as described below. This includes implementation requirements for active areas and non-active areas before the onset of rain. The following sediment control BMP selection table (Table 4) indicates the BMPs that shall be implemented to control sediment on the construction site.

If precipitation occurs, and before runoff develops within disturbed areas of the new channel and/or demolition of the storm drain pipes in the day-use site, any open grading will be covered with plastic to avoid direct erosion into Lake Tahoe. As a secondary measure, fiber rolls or silt fence will be staged within the day-use site and will be placed at the outlet of the channel before runoff from disturbed areas develops.

Table 4. SEDIMENT CONTROL BMPs				
CASQA Fact Sheet	BMP Name	BMP Used		If Not Used, Why
		YES	NO	
SE-1	Silt Fence	√		
SE-2	Sediment Basin	√		
SE-3	Sediment Trap		√	Not necessary
SE-4	Check Dam		√	Not necessary
SE-5	Fiber Rolls	√		
SE-6	Gravel Bag Berm		√	Not necessary
SE-7	Street Sweeping	√		
SE-8	Sandbag Barrier	√		
SE-9	Straw Bale Barrier		√	Not necessary
SE-10	Temporary Drain Inlet Protection		√	Not necessary
SE-11	ATS		√	Not necessary
SE-12	Temporary Silt Dike		√	Not necessary
SE-13	Compost Sock and Berm		√	Not necessary
SE-14	Biofilter Bags		√	Using other methods
TC-1	Stabilized Construction Entrance/Exit	√		
TC-2	Stabilized Construction Roadway		√	Using permanent roads
TC-3	Entrance Outlet Tire Wash	√		

The following list of BMPs and narrative explain how the selected BMPs will be incorporated into the project. Where CASQA fact sheets contradict information contained in the Technical Specifications or the Drawings, the more stringent criteria (as determined by the QSD) shall apply. Selection criteria will be documented in a SWPPP Amendment.

SE-1 Silt Fence

Within the day-use site, silt fence may be used at the outlet of the new channel, or at the outlet of the existing storm drain pipes during their removal. If precipitation occurs, and before disturbed soil area runoff occurs, silt fence may be installed to contain erosion from these openly graded areas.

SE-2 Sediment Basin

Permanent infiltration basins will be constructed before any major grading begins. The basins will be built to capture the eroded or disturbed soil that is washed off during storms, and protect the quality of all nearby surface water.

SE-5 Fiber Rolls

Fiber rolls will be used to surround any stockpile area that is inactive for more than 14 days or when there is an anticipated precipitation event (see Section IV.B. Rain Event Action Plan Narrative for a definition of an anticipated precipitation event). They may also be used to stabilize newly graded slopes during the threat of precipitation, such as the new channel within the day-use site. Additional fiber rolls will be kept on-site to be deployed as needed.

SE-7 Street Sweeping

If tracking is evident due to construction, the excess sediment from the project site will be broomed to an area where it won't be carried away by storm water flows.

SE-8 Sandbag Barrier

Sandbag barriers with plastic will be used to contain wash during channel construction at the day-use site. Additional installations may be required at the direction of the QSD or QSP.

TC-1, TC-2 Stabilized Construction Entrance/Exit, Entrance Outlet Tire Wash

Tracking will not occur off Forest Service property. Brooming will be the main BMP used to prevent tracking off of Forest Service property. If this is not sufficient as determined by the QSP, a stabilized exit and/or a tire wash may be used.

III.C. Non-Storm water and Material Management Narrative

The selection of non-storm water BMPs is based on the list of construction activities with a potential for non-storm water discharges identified above. The following non-storm water control BMP selection table (Table 5) indicates the BMPs that shall be implemented to prevent non-storm water discharges at the construction Site.

Table 5. NON-STORM WATER POLLUTION CONTROL BMPs				
CASQA Fact Sheet	BMP Name	BMP Used		If Not Used, Why
		YES	NO	
NS-1	Water Control and Conservation	√		
NS-2	Dewatering Operations	√		
NS-3	Paving & Grinding Ops	√		
NS-4	Temp Stream Crossing		√	Not necessary
NS-5	Clear Water Diversion	√		
NS-6	Illicit Connection & Illegal Discharge	√		
NS-7	Potable Water/ Irrigation	√		
NS-8	Vehicle and Equipment Cleaning	√		
NS-9	Vehicle and Equipment Fueling	√		
NS-10	Vehicle and Equipment Maintenance	√		
NS-11	Pile Driving Operations		√	No pile driving in project
NS-12	Concrete Curing	√		
NS-13	Concrete Finishing	√		
NS-14	Material & Equipment Used Over Water		√	Not necessary
NS-15	Demolition/ Removal Adjacent to Water	√		
NS-16	Temporary Batch Plants		√	Not necessary

The following list and narrative of BMPs explain how the selected BMPs will be incorporated into the project. Where CASQA fact sheets contradict information contained in the Technical Specifications or the Drawings, the more stringent criteria (as determined by the QSD) shall

apply. Selection criteria will be documented in a SWPPP Amendment.

NS-1, NS-7 Water Control and Conservation, Potable Water / Irrigation

Water application rates will be minimized as necessary to prevent runoff and ponding. Water equipment leaks will be repaired immediately. If irrigation is used to establish vegetation, irrigated areas within the construction limits will be inspected for excess watering and watering times and schedules will be adjusted to ensure that the appropriate amount of water is being used and runoff is being minimized.

NS-2, NS-5 Dewatering Operations, Clear Water Diversion

A sandbag barrier with plastic will be utilized to capture groundwater coming to the surface within the new channel in the day-use site. It will also be utilized to capture water used to wash the new construction and “season” the channel. This water will then be pumped to an upland area where it will not cause erosion and will infiltrate.

NS-3 Paving and Grinding Operations

Asphalt waste will be disposed of offsite. Any material produced from potential grinding operations may be used as base in non-SEZ areas. Micro-basins will be in place to capture storm water flow from paved surfaces.

NS-6 Illicit Connection and Illegal Discharge Connection

The LTBMU will implement the Illicit Connection/Illegal Discharge Detection Reporting BMP throughout the duration of the project.

NS-8, NS-9, NS-10 Vehicle and Equipment Operations

Vehicle and Equipment Fueling (NS-9), and Vehicle and Equipment Maintenance BMPs (NS-10) will be utilized to prevent discharges of fuel and other vehicle fluids. Vehicles will be cleaned and inspected (NS-8) prior to arrival on site. Vehicle cleaning will not be performed onsite, except as part of normal maintenance to remove excess dirt/mud from equipment. This type of cleaning will take place within the staging area (BMP area) and be performed such that runoff is not generated; wash water will be contained within the project area.

Fuel trucks, each equipped with absorbent spill clean-up materials, shall be used for all onsite fueling. Drip pans or absorbent pads shall be used during all vehicle and equipment maintenance activities that involve grease, oil, solvents, or other vehicle fluids. All vehicle maintenance shall be conducted at least 50 feet away from stream channels and on a level graded area. If mobile maintenance is necessary due to an equipment failure within the

construction area that prevents the equipment from be moved to a staging area, drip pans and/or absorbent pads shall be used to prevent any contamination of the site.

NS-12, 13 Concrete Curing, Concrete Finishing

There will be concrete used for the following portions of this project: building foundation, sign and post installation, and sewer and water underground utility relocations. A majority of placed concrete will be underground, and any surface concrete curing will be covered during predicted storms, and will not affect surface waters.

NS-15, Demolition/Removal Adjacent to Water

Fill material and storm drain pipes will be removed adjacent to Lake Tahoe. BMPs will be in place to avoid pollutants into surface waters. If precipitation occurs during culvert removal, and before runoff develops within disturbed soil areas, all disturbed areas will be covered with plastic to avoid erosion directly into Lake Tahoe. Silt fence and/or fiber rolls at the outlet may be used as a secondary measure if erosion is occurring. Spill kits will be in place for any equipment leaks, and equipment will be stored on asphalt, away from the shoreline. See NS-2, Dewatering Operations, and NS-5, Clear Water Diversion, for more information on BMPs during channel construction.

III.D. Dewatering and Diversion Plan Narrative

The only dewatering and diversion actions that may take place will be within the day-use site of the project. Scheduling will be an important piece of this plan. The channel construction and pipe removal within the day-use site will not take place unless the water level of Lake Tahoe is 6226 feet or lower. During construction of the new channel and the demolition of the existing storm drain pipes, and if groundwater is coming to the surface, a sandbag barrier with plastic will be utilized in order to capture the water before it comes into contact with the surface waters of Lake Tahoe, and pump it to an area it will not cause erosion and will infiltrate (see NS-2 and NS-5, Dewatering Operations and Clear Water Diversion). To prevent uphill storm water from flowing through the channel during construction, the current storm drain pipes will remain functioning in place as long as possible. This same type of sandbag barrier with plastic will be used towards the end of construction in order to “season” the channel by washing the new channel, and pumping the captured water to an area it will infiltrate and not cause erosion.

III.E. Active Treatment System Plan Narrative

No active treatment system operations are planned as part of this project.

III.F. Post-Construction Storm Water Management Measures Narrative

All features constructed during this project, including roads, camping spurs, and drainages are designed to function during storms. Micro-basins will be designed to handle the capacity of a one inch in one hour storm, and runoff from new asphalt will be collected in these basins. The newly constructed intermittent channel through the campground will be designed to handle the same flow capacity as the existing channel, and it will be monitored post construction for any unexpected erosion. This project will be monitored post-construction to determine if the roads, camping spurs, and drainages are functioning as designed. See Section V.B. Visual Inspections for further monitoring information. In addition, the Forest Service National BMPEP protocol will be used to evaluate this project. This national protocol can be found at the following website:

http://fsweb.wo.fs.fed.us/wfw/watershed/national_bmps/bmp_docs-recreation.html

III.G. Schedule for BMP Implementation

BMPs will be implemented, modified, and maintained appropriately for the site and weather conditions encountered during the project. Fiber rolls will be placed at the base of all material stockpiles, and material piles will be watered if excessive wind erosion is occurring.

III.H. BMP and Disturbed Soil Area maps

Figures 2 through 7 show the disturbed soil areas (DSAs), drainage crossings, and staging area BMPs for this project. Due to the large area of construction, orange construction fence is only planned to be installed to define project limits at the day-use site. Section IX. H. Mapping Requirements, of the R6T-2011-0019 requires that DSA maps be of a scale no smaller than 1 inch equals 50 feet (1:600). Figure 2 displays the entire project and does not meet this requirement. Because of the large area of this project, only key areas are shown on maps to this scale (Figures 3 – 7).

FIGURE 6

FIGURE 5

FIGURE 4

FIGURE 3

FIGURE 7

CAMPGROUND CONSTRUCTION LIMIT BOUNDARY

CONSTRUCTED INFILTRATION BASINS-

STOCKPILE AREA

END CHANNEL RECONSTRUCTION

BEACH SIDE CONSTRUCTION LIMIT-

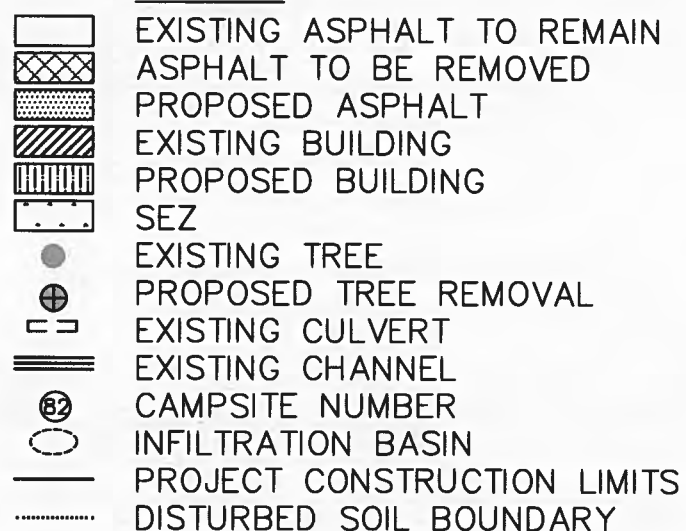
BEGIN CHANNEL RECONSTRUCTION-

EXISTING CHANNEL

REMOVE EXISTING ASPHALT

PROPOSED CHANNEL CROSSING-

LEGEND



GENERAL NOTES

1. MATERIALS, EQUIPMENT, STOCKPILES, SPOILS AND WASTES, INCLUDING CONCRETE MIXING AND WASHOUT WILL BE LIMITED TO EXISTING OR NEW ASPHALT OR WITHIN DISTURBED SOIL AREAS SHOWN ABOVE.
2. VEHICLE ACCESS WILL BE FROM EXISTING OR NEW ASPHALT OR BY GROUND DIRECTLY ADJACENT TO ASPHALT IN ORDER TO COMPLETE RECONSTRUCTION OF THE CHANNEL. VEHICLE FUELING, STORAGE AND SERVICE AREAS WILL BE LIMITED TO PAVED AREAS. VEHICLE CLEANING WILL NOT BE ALLOWED ON THE SITE.
3. DISTURBED SOIL AREAS WILL BE LIMITED TO APPROXIMATELY 10 FEET ON EITHER SIDE OF NEW AND EXISTING ASPHALT. DISTURBED CHANNEL AREAS WILL BE LIMITED TO APPROXIMATELY 10 FEET ON EITHER SIDE OF CHANNEL FOR LENGTH OF RECONSTRUCTION. OTHER DISTURBED AREAS WILL INCLUDE AREA AROUND CONSTRUCTION OF INFILTRATION BASINS, BUILDING CONSTRUCTION, AND BEACH CHANNEL CONSTRUCTION. ALL OTHER AREAS OF EXISTING VEGETATION WILL BE PRESERVED.
4. NEW CONSTRUCTED INFILTRATION BASINS WILL BE CONSTRUCTED FIRST AND SERVE AS TEMPORARY AND PERMANENT BMPS. FIBER ROLLS WILL BE STOCKPILED ON-SITE TO BE USED IN SPECIFIC APPLICATIONS AS NEEDS ARISE.

160 80 0 160 230

SCALE IN FEET



1141

1141

1

△

1



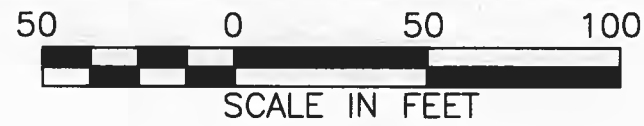
**UNITED STATES
DEPARTMENT
OF
AGRICULTURE
FOREST SERVICE**

LAKE TAHOE BASIN MANAGEMENT UNIT
WILLIAM KENT CAMPGROUND
BMP RETROFIT

FIGURE 2

SHEET NUMBER
FIG.2
2 OF 7 SHEET

PROJECT NO.



LEGEND

	EXISTING ASPHALT TO REMAIN
	ASPHALT TO BE REMOVED
	PROPOSED ASPHALT
	EXISTING BUILDING
	PROPOSED BUILDING
	SEZ
	EXISTING TREE
	PROPOSED TREE REMOVAL
	EXISTING CULVERT
	EXISTING CHANNEL
	CAMPSITE NUMBER
	INFILTRATION BASIN
	PROJECT CONSTRUCTION LIMITS
	DISTURBED SOIL BOUNDARY

• STATE HIGHWAY 89

CAMPGROUND ENTRANCE ROAD

DISTURBED SOIL
BOUNDARY

STOCKPILE AREA

EXISTING ASPHALT

NEW CONSTRUCTED
INFILTRATION BASIN

EXISTING CULVERT
TO REMAIN

EXISTING CULVERT
TO BE REMOVED

EXISTING ASPHALT TO BE REMOVED

DESCRIPTION

REV. DATE

DESIGNED BY

DRAWN BY

CHECKED BY

SCALE

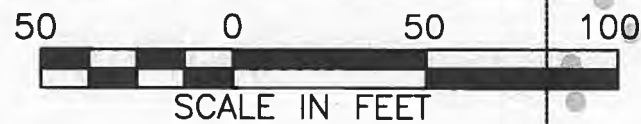


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FOREST SERVICE
The Pacific Southwest Region

LAKE TAHOE BASIN MANAGEMENT UNIT
WILLIAM KENT CAMPGROUND
BMP RETROFIT
FIGURE 3

SHEET NUMBER
FIG.3
3 OF 7 SHEETS

PROJECT NO.



PROPOSED ASPHALT

CONSTRUCTED
INFILTRATION BASIN

EXISTING CULVERT
TO REMAIN

EXISTING ASPHALT
TO BE REMOVED

EXISTING CULVERTS
TO BE REMOVED

SEZ

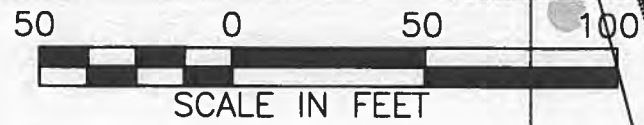
EXISTING CULVERTS
TO BE REMOVED

EXISTING CULVERT
TO REMAIN

LEGEND

-  EXISTING ASPHALT TO REMAIN
-  ASPHALT TO BE REMOVED
-  PROPOSED ASPHALT
-  EXISTING BUILDING
-  PROPOSED BUILDING
-  SEZ
-  EXISTING TREE
-  PROPOSED TREE REMOVAL
-  EXISTING CULVERT
-  EXISTING CHANNEL
-  CAMPSITE NUMBER
-  INFILTRATION BASIN
-  PROJECT CONSTRUCTION LIMITS
-  DISTURBED SOIL BOUNDARY

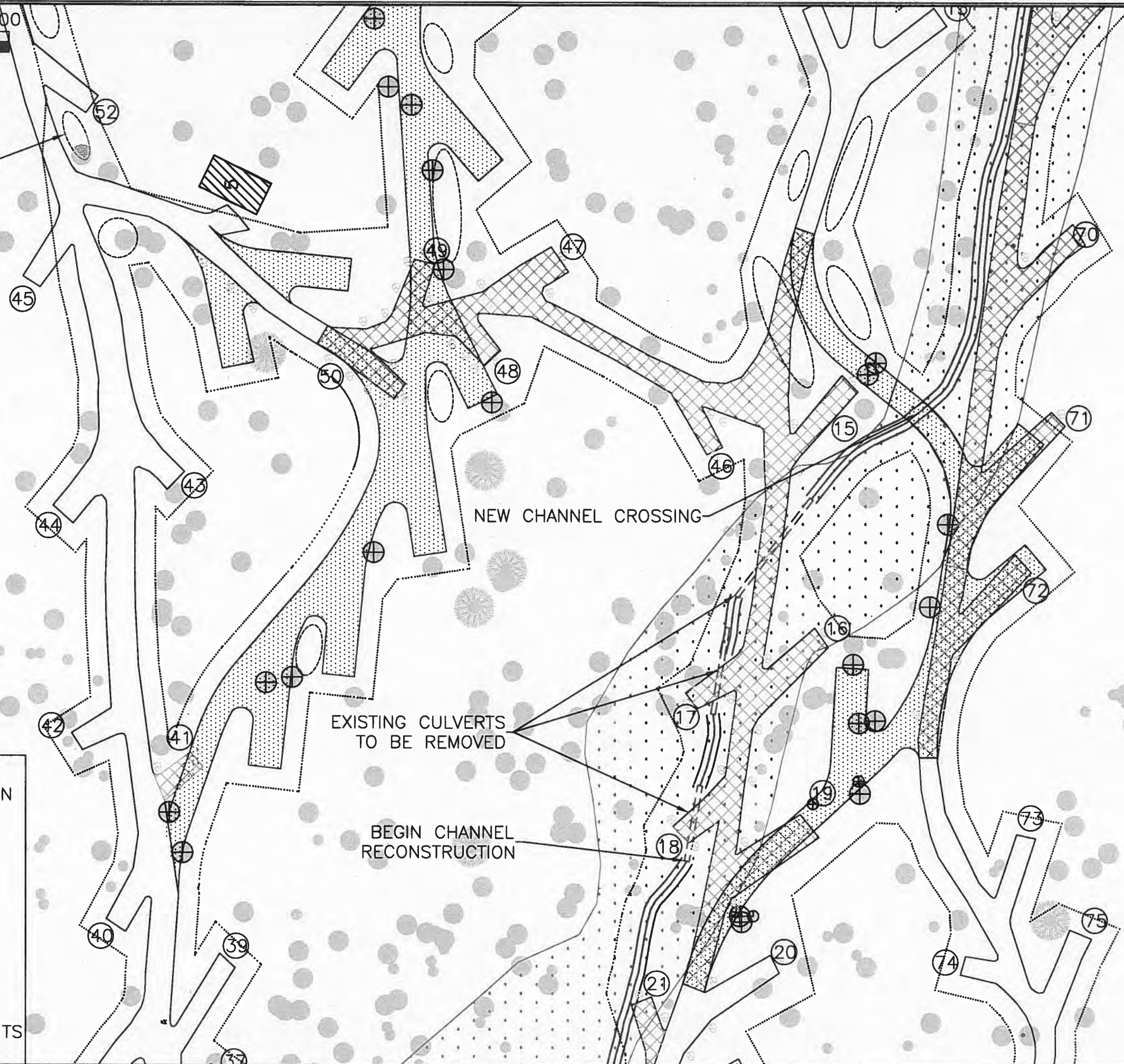
DESIGNED BY CHECKED BY DATE	DESCRIPTION
	
	
UNITED STATES DEPARTMENT OF AGRICULTURE FOREST SERVICE The Pacific Southwest Region	
LAKE TAHOE BASIN MANAGEMENT UNIT WILLIAM KENT CAMPGROUND BMP RETROFIT FIGURE 4	
SHEET NUMBER FIG.4 4 OF 7 SHEETS PROJECT NO.	



NEW CONSTRUCTED
INFILTRATION BASIN

LEGEND

	EXISTING ASPHALT TO REMAIN
	ASPHALT TO BE REMOVED
	PROPOSED ASPHALT
	EXISTING BUILDING
	PROPOSED BUILDING
	SEZ
	EXISTING TREE
	PROPOSED TREE REMOVAL
	EXISTING CULVERT
	EXISTING CHANNEL
	CAMPSITE NUMBER
	INFILTRATION BASIN
	PROJECT CONSTRUCTION LIMITS
	DISTURBED SOIL BOUNDARY



DESCRIPTION	
REV	DATE
DESIGNED BY	DRAWN BY
CHECKED BY	APPROVED BY
UNITED STATES DEPARTMENT OF AGRICULTURE FOREST SERVICE The Pacific Southwest Region	
LAKE TAHOE BASIN MANAGEMENT UNIT WILLIAM KENT CAMPGROUND BMP RETROFIT FIGURE 5	
SHEET NUMBER FIG.5 5 OF 7 SHEETS	
PROJECT NO.	



EXISTING CONSTRUCTED
INTERMITTENT CHANNEL

EXISTING CULVERTS
TO REMAIN

EXISTING CONSTRUCTED
INTERMITTENT CHANNEL

LEGEND

-  EXISTING ASPHALT TO REMAIN
-  ASPHALT TO BE REMOVED
-  PROPOSED ASPHALT
-  EXISTING BUILDING
-  PROPOSED BUILDING
-  SEZ
-  EXISTING TREE
-  PROPOSED TREE REMOVAL
-  EXISTING CULVERT
-  EXISTING CHANNEL
-  CAMPSITE NUMBER
-  INFILTRATION BASIN
-  PROJECT CONSTRUCTION LIMITS
-  DISTURBED SOIL BOUNDARY



DESCRIPTION

REV. DATE

DESIGNED BY

DRAWN BY

CHECKED BY

SCALE



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FOREST SERVICE
The Pacific Southwest Region

LAKE TAHOE BASIN MANAGEMENT UNIT
WILLIAM KENT CAMPGROUND
BMP RETROFIT

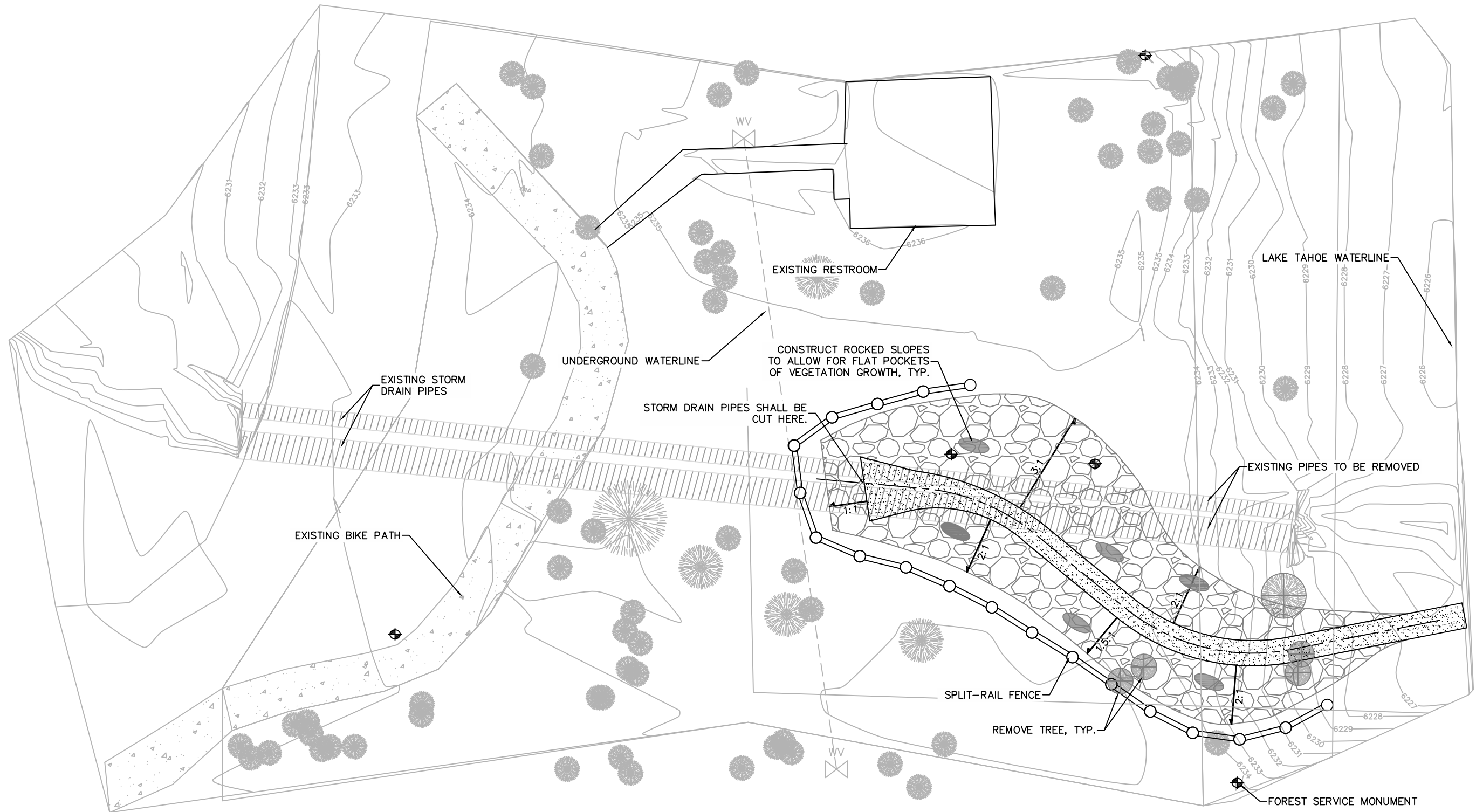
FIGURE 6

SHEET NUMBER

FIG.6

6 OF 7 SHEETS

PROJECT NO.



REV.	DATE	DESCRIPTION

DESIGNED BY:	DRAWN BY:	CHECKED BY:	SCALE:



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FOREST SERVICE
The Pacific Southwest Region

LAKE TAHOE BASIN MANAGEMENT UNIT
WILLIAM KENT
BMP RETROFIT
FIGURE 7

SHEET NUMBER
FIG. 7
7 OF 7 SHEETS

PROJECT NO.

IV. BMP Inspection, maintenance and Rain Event Action Plans

IV.A. BMP Inspection and Maintenance Narrative

The General Permit requires that an inspection of the construction site be made at the end of each work day and before, during, and after rain events. Additionally, during the winter or inactive periods, inspections must be conducted at least once per month during daylight hours. During some months, a visual inspection may not be possible because of excessive snow covering the ground. Monthly inspections will continue through the Spring following final construction to ensure permanent soil stabilization measures function through Spring runoff.

The purpose of the inspections is to discover potential water quality problems so that corrective measures can be implemented immediately. A BMP inspection checklist will be filled out for each inspection and maintained on-site with the SWPPP. A blank inspection checklist can be found in Appendix D. Completed checklists shall be kept with the SWPPP. Inspections of BMPs are conducted to identify and record:

- BMPs that are properly installed;
- BMPs that need maintenance to operate effectively;
- BMPs that have failed; or
- BMPs that could fail to operate as intended.

IV.B. Rain Event Action Plan Narrative

The Rain Event Action Plan (REAP) is a document designed to be used as a planning tool by the QSP to protect exposed portions of the project sites prior to and during precipitation events and to ensure that the discharger has adequate materials, staff and time to implement erosion and sediment control measures. These measures are intended to reduce the amount of sediment and other pollutants that could be generated during a rain event. It is the responsibility of the QSP to be aware of precipitation forecasts and to obtain and keep copies of forecasted precipitation from NOAA's National Weather Service Forecast Office (<http://srh.noaa.gov/forecast>).

The SWPPP includes REAP templates, but the QSP will need to customize them for each rain event, to reflect site conditions related to current phase of construction. A site-specific REAP template can be found in Appendix E. Completed REAPs shall be maintained on-site with the SWPPP. Additionally, a printed copy of the forecast for each day of forecast precipitation shall be kept with the SWPPP monitoring records.

The QSP will develop an event-specific REAP no later than the calendar day 24 hours prior to any anticipated precipitation event. An anticipated precipitation event is any weather pattern that is forecast to have a 30 percent or greater chance of producing precipitation as rainfall in the project area as predicted by the National Oceanographic and Atmospheric Administration

(<http://www.srh.noaa.gov/>). During periods when thunderstorm activity is anticipated, weather conditions shall be monitored during the course of the day. If the chance of thunderstorms becomes 30 percent or greater, or when visual observations indicate imminent precipitation, the QSP shall prepare and implement a REAP.

The REAP will be onsite and implemented no later than 24-hours in advance of a predicted precipitation event or if predicted less than 24-hours in advance, as soon as possible. At a minimum the REAP shall include the following site and phase-specific information:

- QSP name and contact number;
- The date(s) rain is predicted to occur, and predicted chance of rain;
- A description of all DSAs, material storage areas, stockpiles, vehicle and equipment storage and maintenance areas, and waste management areas. These areas must be cross-referenced to BMP plans or DSA maps by sheet or page number;
- For each area described above, list specific items to review and actions to perform prior to the rain event;
- A certification by the QSP that the REAP will be carried out as required by the General Permit; and
- A printout of the NOAA weather forecast

The REAP must be checked and updated daily for storms expected to last over a period of several days.

V. Construction Site Monitoring and Reporting Plan (CSMRP)

V.A. Purpose

This Construction Site Monitoring Plan was developed to address the following objectives:

- Demonstrate that the site is in compliance with the discharge prohibitions and applicable effluent limitations;
- Determine whether non-visible pollutants are present at the construction site and are causing or contributing to exceedence of water quality objectives;
- Determine whether immediate corrective actions, additional BMPs, or SWPPP revisions are necessary to reduce pollutants in storm water discharges and authorized non-storm water discharges;
- Determine whether BMPs included in the SWPPP/REAP are effective in preventing or reducing pollutants in storm water discharges and authorized non-storm water discharges; and
- Demonstrate that appropriate sample collection, handling and analysis procedures are implemented.

V.B. Visual Monitoring

During the active construction season, an inspection of the construction site shall be made at the end of each work day. Additionally, during the inactive period, inspections must be conducted at least once per month during daylight hours. Monthly inspections may not occur during winter months if site is covered in snow.

During both active and inactive periods, a construction site inspection shall also be performed within the 24-hour period prior to an anticipated rain event (chance of precipitation is forecasted at 30 percent or greater), daily during the event, and within 24 hours after actual storm events. This requirement does not apply during snow events. Inspections shall be documented on the BMP Inspection Checklist (Appendix D) and kept with the monitoring records with the SWPPP. If inspections cannot be completed within the specified time frames, the reason for the delay shall be recorded in writing and maintained with the next inspection report.

Visual observations will be made at all active areas of construction. In addition, visual observations must be made at all designated effluent outfalls and locations where storm water may discharge from the project boundary. Focus areas for these visual observations will take place in the drainage on the beach side of the project area, and at the outfall of the pipe at the northeast section of the campground near the entrance.

After the completion of construction, additional visual monitoring will take place at least once during the Spring, Summer, and Fall to ensure the restoration portions of the project were effective. Pre and post-construction photo-point locations will be established to determine this effectiveness at the following locations:

- The outlet of the new channel within the day-use site,
- The new channel crossing within the campground,
- The areas within SEZ where pavement will be removed, and
- The areas within SEZ where the existing channel will be recontoured.

These photo points will be monitored to determine the vegetative cover of the site, the survival of any new vegetation, and the success of the implemented erosion and sediment control measures. In addition, each micro-basin will be inspected to find evidence of its success. If evidence of failure of any of the above measures exists, the Forest Service will take further action. For example, if evidence of erosion is found circumventing the newly constructed micro-basins, these basins may be reconstructed to fully capture future storm flows. If vegetative cover is not adequate as determined by a Forest Service botanist, more vegetation may be planted or more native seed with hydromulch may be placed.

In addition, the Forest Service National BMPEP protocol will be used to evaluate this project. This national protocol can be found at the following website:

http://fsweb.wo.fs.fed.us/wfw/watershed/national_bmps/bmp_docs-recreation.html

V.C. Water Quality Sampling and Analysis

Storm water runoff generated from the project area which is discharged to surface waters must not contain constituents in excess of the following numeric effluent limitations (NELs):

Table 8. Storm Water Effluent Limitations		
Parameter	Units	Maximum Daily Effluent Limitation for Discharge
Total Nitrogen (N)	mg/L	0.5
Total Phosphorus (P)	mg/L	0.1
Total Iron	mg/L	0.5
Turbidity	NTU	20
Grease and Oil	mg/L	2

Total Nitrogen, Total Phosphorus, Total Iron, and Grease and Oil will only be sampled if there is reason to believe it is present in excess amount as a result of project activities, or there are visual indicators (Grease and Oil) that a substance is present in the storm water runoff.

Additionally, waters generated within the project area that are discharged to surface waters must not contain the following:

- Substances in concentrations that are toxic to, or produce detrimental physiological responses in human, plant or animal life; and
- Coliform organisms attributable to human wastes.

Samples will not take place for these substances unless there is reason to believe they are present.

For protection of receiving waters the pH of effluent samples should not fall outside of the range of 6.0 to 9.0. Concrete placement is extremely minor, and no impact is expected to occur on receiving waters. Because no activity of the project is expected to affect pH, samples will not be taken unless there is reason to believe that pH levels are adversely impacted.

In addition, storm water runoff samples will be taken from visible surface water discharge locations deriving from newly constructed areas. Water samples will be collected by the Forest Service during the first two hours of discharge from rain events or as soon as staff are able to get to the site if rain event occurs outside of normal construction time. A minimum of three samples will be collected each day storm water that is derived from new construction is discharged off site to receiving waters. These water samples will document BMP effectiveness and ensure ambient water quality is not degraded. Water samples will be collected during daylight hours (sunrise to sunset) during the event and cease when turbidity falls to background levels. Water samples will not be collected if unsafe conditions exist.

V.D. Watershed Monitoring Option

This project consists of routine road construction and drainage restoration and does not require additional monitoring of the watershed.

V.E. Quality Assurance and Quality Control

For initial verification of field analysis, duplicate samples shall be collected at a rate of 10 percent or one minimum duplicate per sampling event for the first three days of the project or whenever there is an addition of a sampler. The duplicate samples shall be collected, handled and analyzed using the same protocols as primary samples. A duplicate sample shall be collected at each location immediately after the primary sample has been collected. Duplicate samples shall not influence any evaluations or conclusions; however, they will be used as a check on quality assurance.

V.F. Reporting Requirements and Records Retention

V.F.1. Record Keeping

The following shall be retained for a minimum of three years:

- Approved SWPPP document and amendments;
- Site Inspection Reports;
- Site Inspection Report Corrections Summary;
- Rain Event Action Plans;
- Notice of Discharge reports;
- Numeric Effluent Limit (NEL) Exceedance Reports;
- Sampling records and analysis reports;
- Annual Compliance Certifications; and
- Copies of all applicable permits.

V.G. Non-Compliance Reporting

V.G.1. 24-Hour Reporting

The discharger shall immediately notify the Lahontan Water Board orally within 24 hours whenever an adverse condition occurs as a result of a discharge. An adverse condition includes, but is not limited to, a violation or threatened violation of the conditions of this General Permit, significant spills of petroleum products or toxic chemicals, or damage to control facilities that could affect compliance pursuant to Section 13267(b) of the California Water Code, a written notification of the adverse condition shall be submitted to the Lahontan Water Board within 5 business days of occurrence. The written notification shall identify the adverse conditions, describe the actions necessary to remedy the condition, and/or the actions implemented to abate the problem from continuing, and specify a timeline, subject to the modifications of the Lahontan Water Board, for remedial actions.

In the event that sampling results exceed any applicable NEL, the dischargers shall orally notify the Lahontan Water Board within 24 hours after the NEL exceedance has been identified and electronically submit all storm event sampling results through the SMARTS within 5 business days after the NEL exceedance has been identified.

V.G.2. Planned Changes

The LTBMU shall notify the LRWQCB of planned changes, as well as upload SWPPP Amendments into SMARTS. This will include any planned physical alterations or additions to the permitted project. Notice is required when the alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants that are not subject to effluent limitation under this permit (40 CFR 122.41 (I)(1)(ii)).

V.G.3. Anticipated Noncompliance

The LTBMU shall give advance notice to the LRWQCB and upload a SWPPP Amendment describing planned changes in the permitted facility of activity that may result in noncompliance.

V.H. Annual Report

On or before November 30 of each year, an Annual Report shall be prepared and electronically submitted through SMARTS. The Annual Report shall cover the time period from Oct 16 of the previous year through October 15 of the current year. The SMARTS reporting module requests the following information for the Annual Report:

- The project name and location
- Any significant problem(s) that occurred during project construction and remedial measures planned or implemented.
- A summary and evaluation of all sampling and analysis results, including copies of laboratory reports and rain gauge measurements, from monitoring activities conducted.
- A certified statement indicating whether or not the site has been winterized in accordance with BMPs for erosion prevention and sediment control.
- Documentation of required QSP certifications and personnel training.
- A certified statement, signed by the QSD, indicating whether or not the project site is in compliance with the conditions of the general permit and the SWPPP.

V.I. Final Report

Following completion of the project, the LTBMU shall prepare and electronically submit through SMARTS a final report containing the information required under the Annual Report as well as the following information:

- Details of any modification to the construction plans for the proposed restoration work.
- Details on any change in the amount of impervious coverage for the project site.
- Records of all inspections (including the inspection log book), compliance certificates, monitoring reports and noncompliance reporting must be maintained by the LTBMU for a period of at least three years.

The final monitoring report shall be certified by the LRP, or the approved signatory of the LRP, and submitted within 30 days of project completion.

Appendices

Appendix A – SWPPP Amendment Forms

SWPPP Amendment Log				
Amendment No.	Date	Requested by:	Brief Description	Date

SWPPP Amendment Certification and Approval

SWPPP Amendment #

Project Name: William Kent BMP Retrofit Project

WDID #:

Change requested by:

Description of and reason for change:

Location of change:

Original BMP, if any:

New BMP:

SWPPP Amendment Certification and Approval

SWPPP Amendment #

Qualified SWPPP Developer's Certification of the Storm water Pollution Prevention Plan Amendment

"This Storm water Pollution Prevention Plan and attachments were prepared under my direction to meet the requirements of the California Construction General Permit (Order No R6T-2011-0019). I certify that I am a Qualified SWPPP Developer in good standing as of the date signed below."

QSD's Signature

Date

QSD Name

QSD Certification Number

Title

Telephone

Appendix B – CASQA BMP Standard Specifications

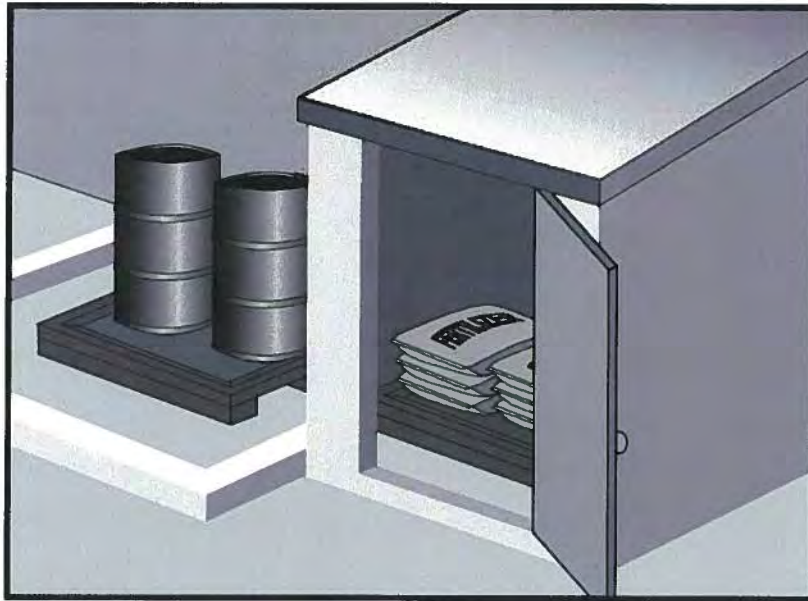
Index of CASQA Fact Sheets*

WM-1	Material Delivery and Storage
WM-2	Material Use
WM-3	Stockpile Management
WM-4	Spill Prevention and Control
WM-5	Solid Waste Management
WM-6	Hazardous Waste Management
WM-8	Concrete Waste Management
WM-9	Sanitary/Septic Waste Management
EC-1	Scheduling
EC-2	Preservation of Existing Vegetation
EC-3	Hydraulic Mulch
EC-4	Hydroseed
EC-8	Wood Mulching
EC-9	Earth Dikes and Drainage Swales
EC-10	Velocity Dissipation Devices
EC-12	Stream Bank Stabilization
EC-15	Soil Preparation-Roughening
EC-16	Non-Vegetated Stabilization
WE-1	Wind Erosion Control
SE-1	Silt Fence
SE-2	Sediment Basin
SE-5	Fiber Rolls
SE-7	Street Sweeping
SE-8	Sandbag Barrier
TC-1	Stabilized Construction Entrance/Exit
TC-3	Entrance Outlet Tire Wash
NS-1	Water Control and Conservation
NS-2	Dewatering Operations
NS-3	Paving & Grinding Ops
NS-5	Clear Water Diversion
NS-6	Illicit Connection and Illegal Discharge
NS-7	Potable Water/Irrigation
NS-8	Vehicle and Equipment Cleaning
NS-9	Vehicle Equipment Fueling
NS-10	Vehicle and Equipment Maintenance
NS-12	Concrete Curing
NS-13	Concrete Finishing
NS-15	Demolition/Removal Adjacent to Water

*The CASQA fact sheets referenced above are not included in this document, but they will be available on site during construction.

Material Delivery and Storage

WM-1



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in watertight containers and/or a completely enclosed designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease

Targeted Constituents

Sediment	☒
Nutrients	☒
Trash	☒
Metals	☒
Bacteria	
Oil and Grease	☒
Organics	☒

Potential Alternatives

None



- Asphalt and concrete components
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Chemicals must be stored in water tight containers with appropriate secondary containment or in a storage shed.
- When a material storage area is located on bare soil, the area should be lined and bermed.
- Use containment pallets or other practical and available solutions, such as storing materials within newly constructed buildings or garages, to meet material storage requirements.
- Stack erodible landscape material on pallets and cover when not in use.
- Contain all fertilizers and other landscape materials when not in use.
- Temporary storage areas should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be available on-site for all materials stored that have the potential to effect water quality.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located away from waterways, if possible.
 - Avoid transport near drainage paths or waterways.
 - Surround with earth berms or other appropriate containment BMP. See EC-9, Earth Dikes and Drainage Swales.
 - Place in an area that will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.

- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- Keep ample spill cleanup supplies appropriate for the materials being stored. Ensure that cleanup supplies are in a conspicuous, labeled area.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose of materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Materials should be covered prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3, Stockpile Management.
- Materials should be stored indoors within existing structures or completely enclosed storage sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill clean up material should be kept near storage areas.
- Also see WM-6, Hazardous Waste Management, for storing of hazardous wastes.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.
- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.
- If spills or leaks of materials occur that are not contained and could discharge to surface waters, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Keep storage areas clean and well organized, including a current list of all materials onsite.
- Inspect labels on containers for legibility and accuracy.

- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

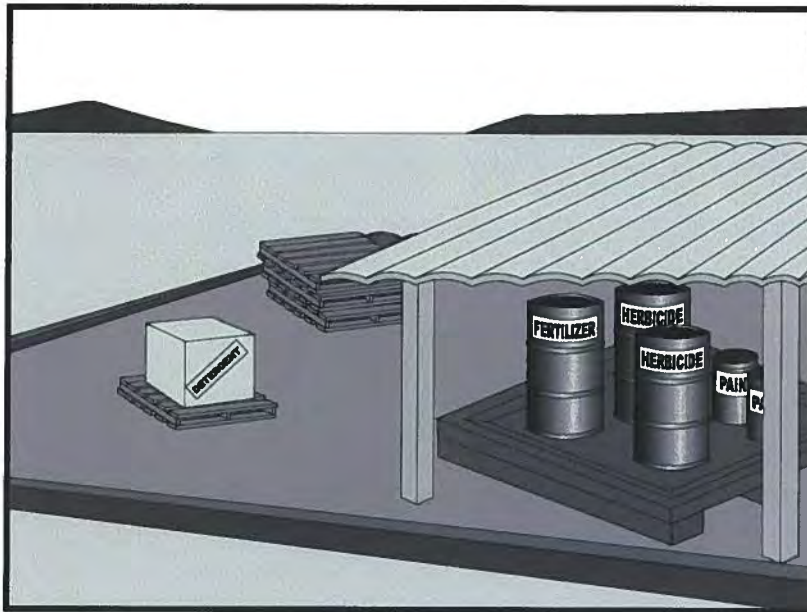
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Other materials that may be detrimental if released to the environment

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	☒
Trash	☒
Metals	☒
Bacteria	
Oil and Grease	☒
Organics	☒

Potential Alternatives

None



Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- The preferred method of termiticide application is soil injection near the existing or proposed structure foundation/slab; however, if not feasible, soil drench application of termiticides should follow EPA label guidelines and the following recommendations (most of which are applicable to most pesticide applications):
 - Do not treat soil that is water-saturated or frozen.
 - Application shall not commence within 24-hours of a predicted precipitation event with a 40% or greater probability. Weather tracking must be performed on a daily basis prior to termiticide application and during the period of termiticide application.
 - Do not allow treatment chemicals to runoff from the target area. Apply proper quantity to prevent excess runoff. Provide containment for and divert stormwater from application areas using berms or diversion ditches during application.
 - Dry season: Do not apply within 10 feet of storm drains. Do not apply within 25 feet of aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds).
 - Wet season: Do not apply within 50 feet of storm drains or aquatic habitats (such as, but not limited to, lakes; reservoirs; rivers; permanent streams; marshes or ponds; estuaries; and commercial fish farm ponds) unless a vegetative buffer is present (if so, refer to dry season requirements).
 - Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height.
 - Cover treatment site prior to a rain event in order to prevent run-off of the pesticide into non-target areas. The treated area should be limited to a size that can be backfilled and/or covered by the end of the work shift. Backfilling or covering of the treated area shall be done by the end of the same work shift in which the application is made.
 - The applicator must either cover the soil him/herself or provide written notification of the above requirement to the contractor on site and to the person commissioning the

application (if different than the contractor). If notice is provided to the contractor or the person commissioning the application, then they are responsible under the Federal Insecticide Fungicide, and Rodenticide Act (FIFRA) to ensure that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application, the treated soil is covered with a waterproof covering (such as polyethylene sheeting), and 2) the treated soil is covered if precipitation is predicted to occur before the concrete slab is scheduled to be poured.

- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydraulic application. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals before predicted rainfall.
- Train employees and subcontractors in proper material use.
- Supply Material Safety Data Sheets (MSDS) for all materials.
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or contain for proper disposal off site. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.
- Document the location, time, chemicals applied, and applicator's name and qualifications.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.
- Discontinue use of erodible landscape material within 2 days prior to a forecasted rain event and materials should be covered and/or bermed.

- Provide containment for material use areas such as masons' areas or paint mixing/preparation areas to prevent materials/pollutants from entering stormwater.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Ensure employees and subcontractors throughout the job are using appropriate practices.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

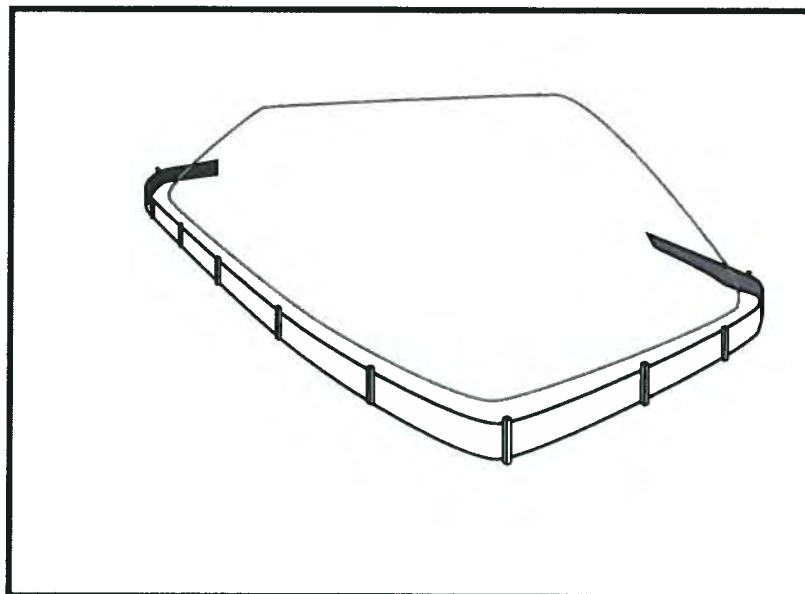
Comments on Risk Assessments Risk Reduction Options for Cypermethrin: Docket No. OPP-2005-0293; California Stormwater Quality Association (CASQA) letter to USEPA, 2006. Environmental Hazard and General Labeling for Pyrethroid Non-Agricultural Outdoor Products, EPA-HQ-OPP-2008-0331-0021; USEPA, 2008.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stockpile Management

WM-3



Description and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, soil amendments, sand, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other loose materials.

Limitations

- Plastic sheeting as a stockpile protection is temporary and hard to manage in windy conditions. Where plastic is used, consider use of plastic tarps with nylon reinforcement which may be more durable than standard sheeting.
- Plastic sheeting can increase runoff volume due to lack of infiltration and potentially cause perimeter control failure.
- Plastic sheeting breaks down faster in sunlight.
- The use of plastic materials should be avoided when feasible and photodegradable plastics should not be used.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	☒
Trash	☒
Metals	☒
Bacteria	
Oil and Grease	☒
Organics	☒

Potential Alternatives

None



- On larger sites, a minimum of 50 ft separation from concentrated flows of stormwater, drainage courses, and inlets is recommended.
- All stockpiles are required to be protected immediately if they are not scheduled to be used within 14 days.
- Protect all stockpiles from stormwater run-on using temporary perimeter sediment barriers such as compost berms (SE-13), temporary silt dikes (SE-12), fiber rolls (SE-5), silt fences (SE-1), sandbags (SE-8), gravel bags (SE-6), or biofilter bags (SE-14). Refer to the individual fact sheet for each of these controls for installation information.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.
- Ensure that stockpile coverings are installed securely to protect from wind and rain.
- Some plastic covers withstand weather and sunlight better than others. Select cover materials or methods based on anticipated duration of use.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles

- Cover and protect soil stockpiles with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- Consider temporary vegetation for topsoil piles that will be stockpiled for extended periods.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- Provide covers and protect these stockpiles with a temporary perimeter sediment barrier at all times.

Stockpiles of "cold mix"

- Cover cold mix stockpiles and place them on plastic sheeting (or comparable material) and surround the stockpiles with a berm at all times.

Stockpiles of fly ash, stucco, hydrated lime

- Cover stockpiles of materials that may raise the pH of runoff (i.e., basic materials) with plastic and surround the stockpiles with a berm at all times.

Stockpiles/Storage of wood (Pressure treated with chromated copper arsenate or ammoniacal copper zinc arsenate)

- Cover treated wood with plastic sheeting (or comparable material) and surround with a berm at all times.

Protection of Active Stockpiles

Active stockpiles of the identified materials should be protected as follows:

- All stockpiles should be covered and protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of “cold mix” and treated wood, and basic materials should be placed on and covered with plastic sheeting or comparable material and surrounded by a berm prior to the onset of precipitation.
- The downstream perimeter of an active stockpile should be protected with a linear sediment barrier or berm and runoff should be diverted around or away from the stockpile on the upstream perimeter.

Costs

For cost information associated with stockpile protection refer to the individual erosion or sediment control BMP fact sheet considered for implementation (For example, refer to SE-1 Silt Fence for installation of silt fence around the perimeter of a stockpile.)

Inspection and Maintenance

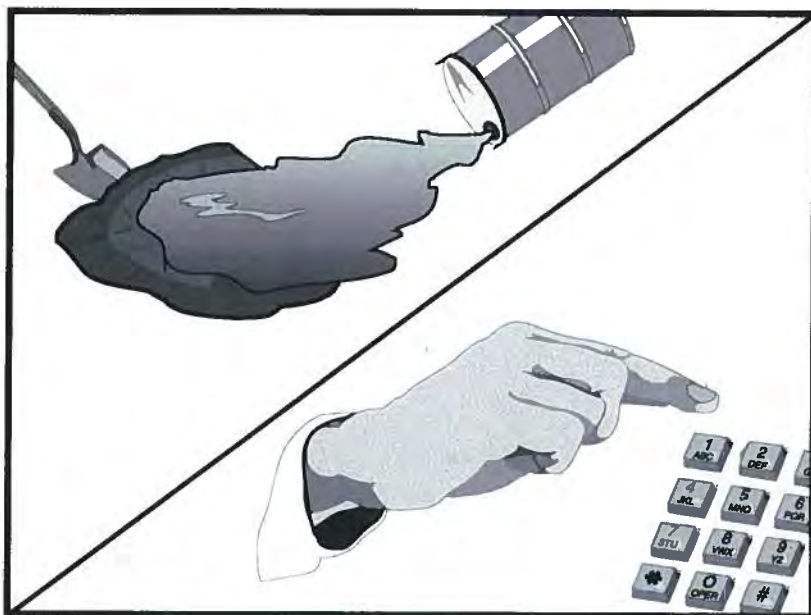
- Stockpiles must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- It may be necessary to inspect stockpiles covered with plastic sheeting more frequently during certain conditions (for example, high winds or extreme heat).
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.
- Sediment shall be removed when it reaches one-third of the barrier height.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Spill Prevention and Control

WM-4



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	☒
Trash	☒
Metals	☒
Bacteria	
Oil and Grease	☒
Organics	☒

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals



- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a “significant spill” is for each material they use, and what is the appropriate response for “significant” and “insignificant” spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor’s superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runoff during rainfall to the extent that it doesn’t compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
 - Contain the spread of the spill.
 - Recover spilled materials.
 - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
 - Contain spread of the spill.
 - Notify the project foreman immediately.
 - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
 - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
 - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
 - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
 - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
 - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110, 119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
 - Notification should first be made by telephone and followed up with a written report.
 - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
 - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runoff of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runoff of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

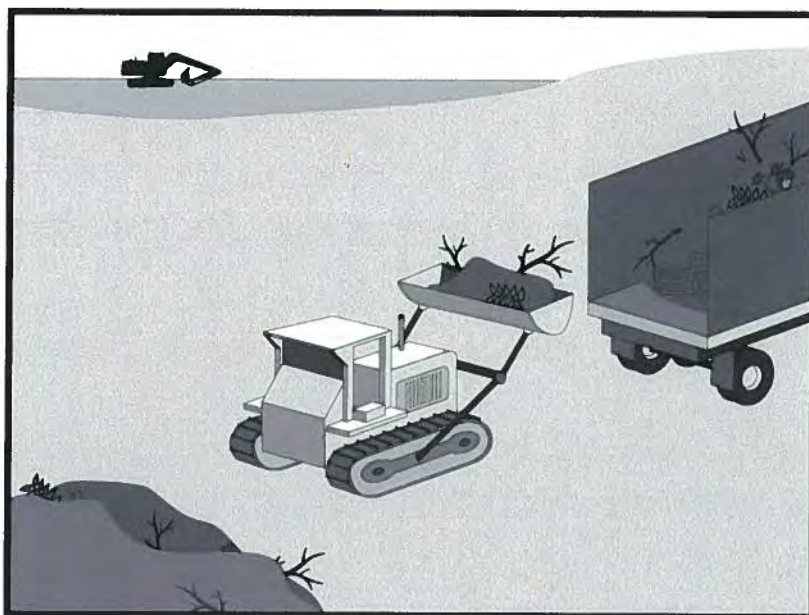
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



Description and Purpose

Solid waste management procedures and practices are designed to prevent or reduce the discharge of pollutants to stormwater from solid or construction waste by providing designated waste collection areas and containers, arranging for regular disposal, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for construction sites where the following wastes are generated or stored:

- Solid waste generated from trees and shrubs removed during land clearing, demolition of existing structures (rubble), and building construction
- Packaging materials including wood, paper, and plastic
- Scrap or surplus building materials including scrap metals, rubber, plastic, glass pieces, and masonry products
- Domestic wastes including food containers such as beverage cans, coffee cups, paper bags, plastic wrappers, and cigarettes
- Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials
- Highway planting wastes, including vegetative material,

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	☒
Trash	☒
Metals	☒
Bacteria	
Oil and Grease	☒
Organics	☒

Potential Alternatives

None



plant containers, and packaging materials

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Implementation

The following steps will help keep a clean site and reduce stormwater pollution:

- Select designated waste collection areas onsite.
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight.
- Locate containers in a covered area or in a secondary containment.
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy.
- Cover waste containers at the end of each work day and when it is raining.
- Plan for additional containers and more frequent pickup during the demolition phase of construction.
- Collect site trash daily, especially during rainy and windy conditions.
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor.
- Arrange for regular waste collection before containers overflow.
- Clean up immediately if a container does spill.
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.

- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly, regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.
- Construction material visible to the public should be stored or stacked in an orderly manner.
- Stormwater runoff should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 ft from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

- For disposal of hazardous waste, see WM-6, Hazardous Waste Management. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.
- Salvage or recycle useful vegetation debris, packaging and surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

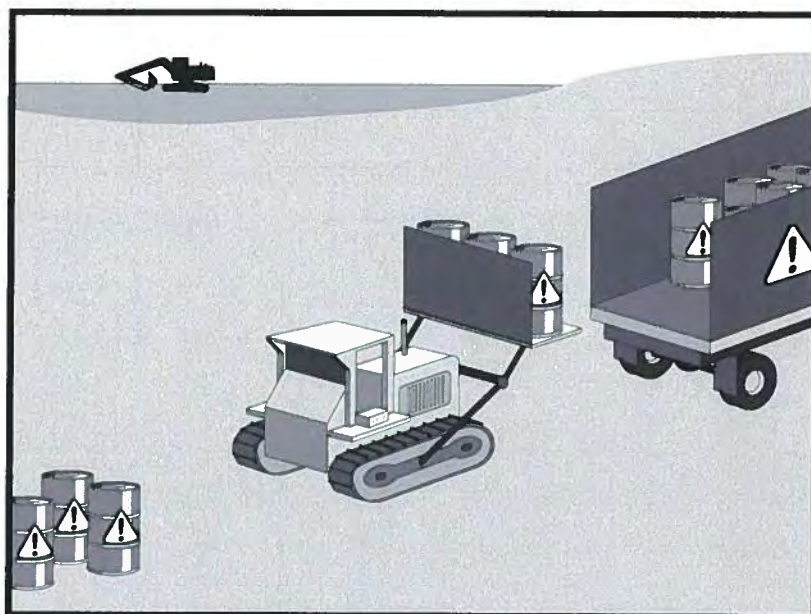
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Inspect construction waste area regularly.
- Arrange for regular waste collection.

References

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Description and Purpose

Prevent or reduce the discharge of pollutants to stormwater from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products
- Concrete Curing Compounds
- Palliatives
- Septic Wastes
- Stains
- Wood Preservatives
- Asphalt Products
- Pesticides
- Acids
- Paints
- Solvents
- Roofing Tar
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302

Targeted Constituents

Sediment	
Nutrients	☒
Trash	☒
Metals	☒
Bacteria	☒
Oil and Grease	☒
Organics	☒

Potential Alternatives

None



In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with federal, state, and local regulations. These wastes include:

- Sandblasting grit mixed with lead-, cadmium-, or chromium-based paints
- Asbestos
- PCBs (particularly in older transformers)

Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to WM-7, Contaminated Soil Management.

Implementation

The following steps will help reduce stormwater pollution from hazardous wastes:

Material Use

- Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172, 173, 178, and 179.
- All hazardous waste should be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
 - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.
 - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.
 - Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.
 - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Throughout the rainy season, temporary containment facilities should be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs.
- Drums should not be overfilled and wastes should not be mixed.
- Unless watertight, containers of dry waste should be stored on pallets.
- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to one large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying pesticides must be certified in accordance with federal and state regulations.
- Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.
- Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. "Paint out" brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.
- The following actions should be taken with respect to temporary contaminant:
 - Ensure that adequate hazardous waste storage volume is available.
 - Ensure that hazardous waste collection containers are conveniently located.
 - Designate hazardous waste storage areas onsite away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.
 - Minimize production or generation of hazardous materials and hazardous waste on the job site.
 - Use containment berms in fueling and maintenance areas and where the potential for spills is high.
 - Segregate potentially hazardous waste from non-hazardous construction site debris.
 - Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.
- Use all of the product before disposing of the container.
- Do not remove the original product label; it contains important safety and disposal information.

Waste Recycling Disposal

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes, this can cause chemical reactions, making recycling impossible and complicating disposal.
- Recycle any useful materials such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.

Disposal Procedures

- Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services certified laboratory should sample waste to determine the appropriate disposal facility.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events..
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.
- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302. Also notify the Governors Office of Emergency Services Warning Center at (916) 845-8911.
- A copy of the hazardous waste manifests should be provided.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

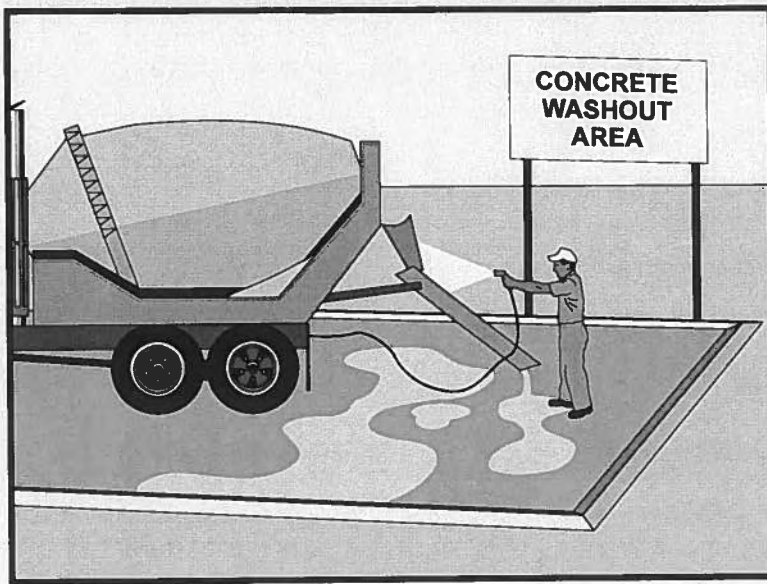
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Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Concrete Waste Management

WM-8



Description and Purpose

Prevent the discharge of pollutants to stormwater from concrete waste by conducting washout onsite or offsite in a designated area, and by employee and subcontractor training.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials, including mortar, concrete, stucco, cement and block and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows and raising pH to levels outside the accepted range.

Suitable Applications

Concrete waste management procedures and practices are implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Slurries containing portland cement concrete (PCC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	☒
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



- Concrete trucks and other concrete-coated equipment are washed onsite.
- Mortar-mixing stations exist.
- Stucco mixing and spraying .
- See also NS-8, Vehicle and Equipment Cleaning.

Limitations

- Offsite washout of concrete wastes may not always be possible.
- Multiple washouts may be needed to assure adequate capacity and to allow for evaporation.

Implementation

The following steps will help reduce stormwater pollution from concrete wastes:

- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements.
- Store dry and wet materials under cover, away from drainage areas. Refer to WM-1, Material Delivery and Storage for more information.
- Avoid mixing excess amounts of concrete.
- Perform washout of concrete trucks in designated areas only, where washout will not reach stormwater.
- Do not wash out concrete trucks into storm drains, open ditches, streets, streams or onto the ground. Trucks should always be washed out into designated facilities.
- Do not allow excess concrete to be dumped onsite, except in designated areas.
- For onsite washout:
 - On larger sites, it is recommended to locate washout areas at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary pit or bermed area large enough for liquid and solid waste.
 - Washout wastes into the temporary washout where the concrete can set, be broken up, and then disposed properly.
 - Washout should be lined so there is no discharge into the underlying soil.
- 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.
- See typical concrete washout installation details at the end of this fact sheet.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.

- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.
- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made.

Concrete Demolition Wastes

- Stockpile concrete demolition waste in accordance with BMP WM-3, Stockpile Management.
- Dispose of or recycle hardened concrete waste in accordance with applicable federal, state or local regulations.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.
- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below).
- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.
- Saw-cut concrete slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine or by sweeping. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3, Paving and Grinding Operations; and WM-10, Liquid Waste Management.
- Concrete slurry residue should be disposed in a temporary washout facility (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5, Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 ft from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Temporary washout facilities should be lined to prevent discharge to the underlying ground or surrounding area.
- Washout of concrete trucks should be performed in designated areas only.
- Only concrete from mixer truck chutes should be washed into concrete wash out.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of or recycled offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of or recycle hardened concrete on a regular basis.
- Temporary Concrete Washout Facility (Type Above Grade)
 - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft; however, smaller sites or jobs may only need a smaller washout facility. With any washout, always maintain a sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
 - Materials used to construct the washout area should conform to the provisions detailed in their respective BMPs (e.g., SE-8 Sandbag Barrier).
 - Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
 - Alternatively, portable removable containers can be used as above grade concrete washouts. Also called a “roll-off”; this concrete washout facility should be properly sealed to prevent leakage, and should be removed from the site and replaced when the container reaches 75% capacity.
- Temporary Concrete Washout Facility (Type Below Grade)
 - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 ft. The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations.
 - Lath and flagging should be commercial type.
 - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

- The base of a washout facility should be free of rock or debris that may damage a plastic liner.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and properly disposed or recycled in accordance with federal, state or local regulations. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and properly disposed or recycled in accordance with federal, state or local regulations..
- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures. Roll-off concrete washout facilities can be more costly than other measures due to removal and replacement; however, provide a cleaner alternative to traditional washouts. The type of washout facility, size, and availability of materials will determine the cost of the washout.

Inspection and Maintenance

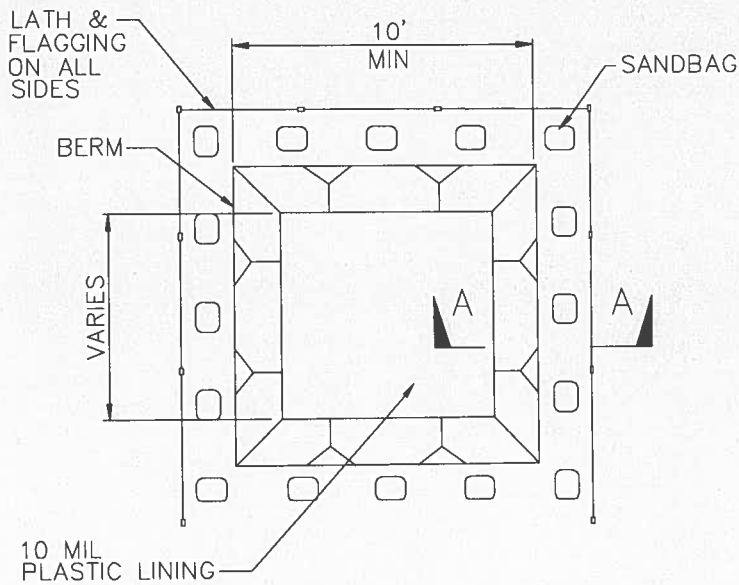
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 in. for above grade facilities and 12 in. for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and properly disposed or recycled in accordance with federal, state or local regulations.
- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.
- Inspect washout facilities for damage (e.g. torn liner, evidence of leaks, signage, etc.). Repair all identified damage.

References

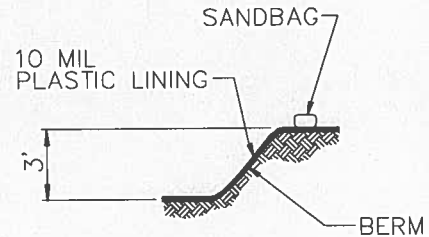
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000, Updated March 2003.

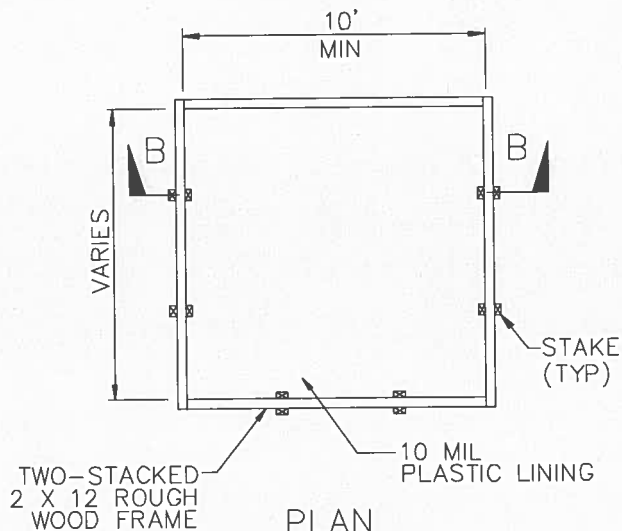
Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



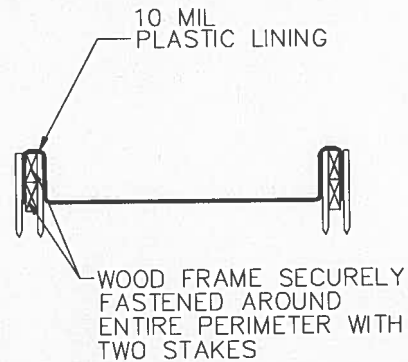
PLAN
NOT TO SCALE
TYPE "BELOW GRADE"



SECTION A-A
NOT TO SCALE



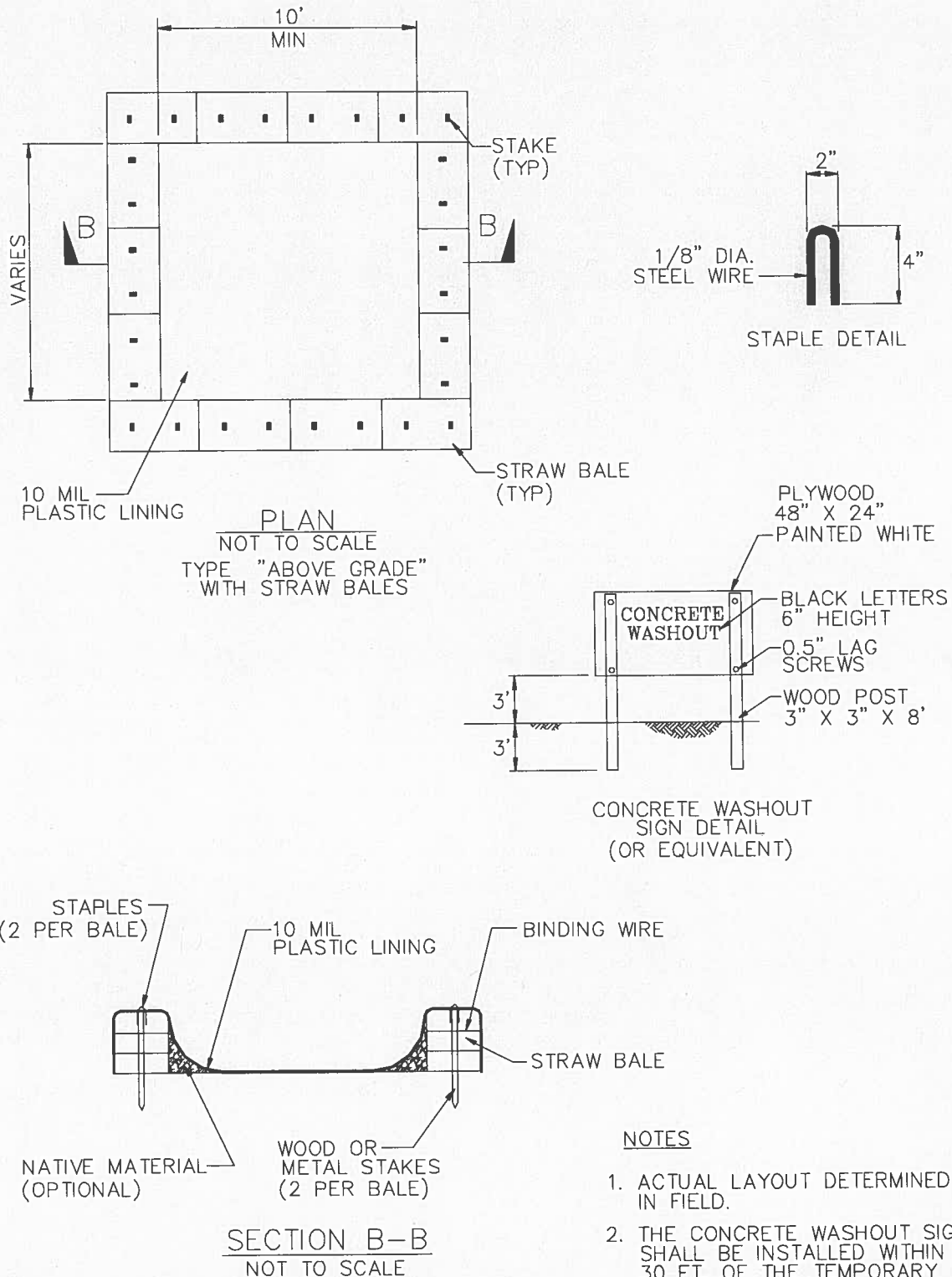
PLAN
NOT TO SCALE
TYPE "ABOVE GRADE"



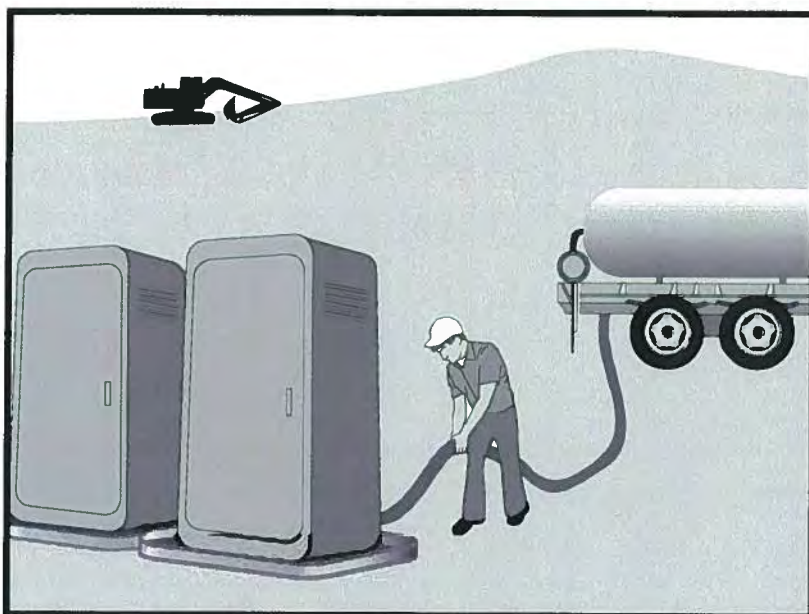
SECTION B-B
NOT TO SCALE

NOTES

1. ACTUAL LAYOUT DETERMINED IN FIELD.
2. THE CONCRETE WASHOUT SIGN SHALL BE INSTALLED WITHIN 30 FT. OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



Sanitary/Septic Waste Management WM-9



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to stormwater from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with state and local requirements. In many cases, one contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and from traffic circulation. If site conditions allow, place portable facilities a minimum of 50 feet from drainage conveyances and traffic areas. When subjected to high winds or risk of high winds, temporary sanitary facilities should be secured to prevent overturning.

Targeted Constituents

Sediment	
Nutrients	☒
Trash	☒
Metals	
Bacteria	☒
Oil and Grease	
Organics	☒

Potential Alternatives

None



Sanitary/Septic Waste Management WM-9

- Temporary sanitary facilities must be equipped with containment to prevent discharge of pollutants to the stormwater drainage system of the receiving water.
- Consider safety as well as environmental implications before placing temporary sanitary facilities.
- Wastewater should not be discharged or buried within the project site.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.
- Only reputable, licensed sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- If using an onsite disposal system (OSDS), such as a septic system, local health agency requirements must be followed.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a licensed service.
- Regular waste collection by a licensed hauler should be arranged before facilities overflow.
- If a spill does occur from a temporary sanitary facility, follow federal, state and local regulations for containment and clean-up.

Education

- Educate employees, subcontractors, and suppliers on sanitary and septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce the use of sanitary facilities (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

Sanitary/Septic Waste Management WM-9

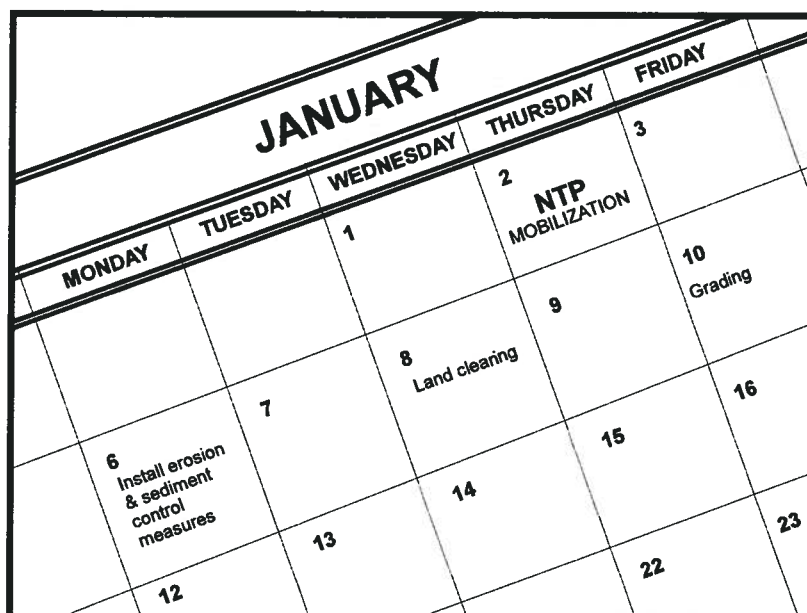
Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Arrange for regular waste collection.
- If high winds are expected, portable sanitary facilities must be secured with spikes or weighed down to prevent over turning.
- If spills or leaks from sanitary or septic facilities occur that are not contained and discharge from the site, non-visible sampling of site discharge may be required. Refer to the General Permit or to your project specific Construction Site Monitoring Plan to determine if and where sampling is required.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.



Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase

Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



of construction. Clearly show how the rainy season relates to soil disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
 - Erosion control BMPs
 - Sediment control BMPs
 - Tracking control BMPs
 - Wind erosion control BMPs
 - Non-stormwater BMPs
 - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
 - Sequence trenching activities so that most open portions are closed before new trenching begins.
 - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
 - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Inspection and Maintenance

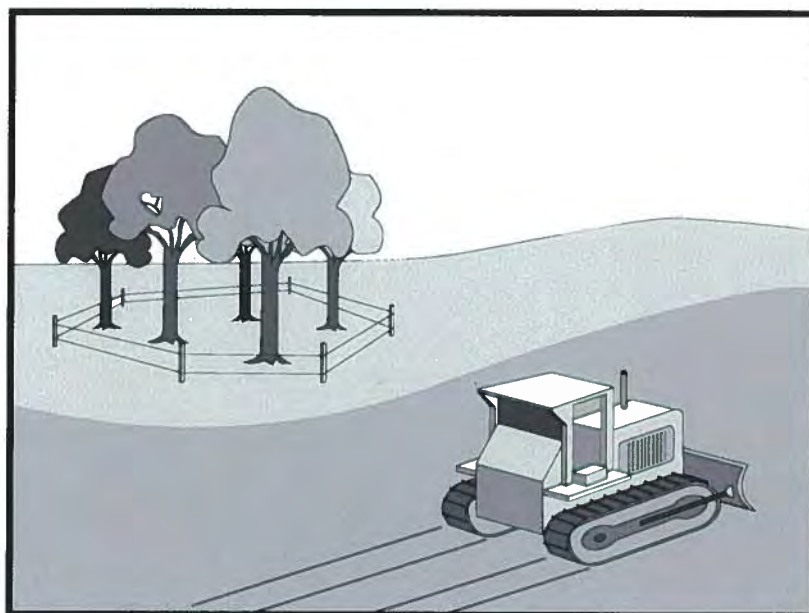
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Preservation Of Existing Vegetation EC-2



Description and Purpose

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs, and grasses that protect soil from erosion.

Suitable Applications

Preservation of existing vegetation is suitable for use on most projects. Large project sites often provide the greatest opportunity for use of this BMP. Suitable applications include the following:

- Areas within the site where no construction activity occurs, or occurs at a later date. This BMP is especially suitable to multi year projects where grading can be phased.
- Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.
- Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc. These areas are usually designated on the plans, or in the specifications, permits, or environmental documents.
- Where vegetation designated for ultimate removal can be temporarily preserved and be utilized for erosion control and sediment control.

Limitations

- Requires forward planning by the owner/developer,

Categories

EC	Erosion Control	☒
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



Preservation Of Existing Vegetation EC-2

contractor, and design staff.

- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.
- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

Implementation

The best way to prevent erosion is to not disturb the land. In order to reduce the impacts of new development and redevelopment, projects may be designed to avoid disturbing land in sensitive areas of the site (e.g., natural watercourses, steep slopes), and to incorporate unique or desirable existing vegetation into the site's landscaping plan. Clearly marking and leaving a buffer area around these unique areas during construction will help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to ensure the survival of desirable vegetation for shade, beautification, and erosion control. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. In addition, vegetation helps keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

Timing

- Provide for preservation of existing vegetation prior to the commencement of clearing and grubbing operations or other soil disturbing activities in areas where no construction activity is planned or will occur at a later date.

Design and Layout

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.
 - Orange colored plastic mesh fencing works well.
 - Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.
- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.
- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

Preservation Of Existing Vegetation EC-2

Costs

There is little cost associated with preserving existing vegetation if properly planned during the project design, and these costs may be offset by aesthetic benefits that enhance property values. During construction, the cost for preserving existing vegetation will likely be less than the cost of applying erosion and sediment controls to the disturbed area. Replacing vegetation inadvertently destroyed during construction can be extremely expensive, sometimes in excess of \$10,000 per tree.

Inspection and Maintenance

During construction, the limits of disturbance should remain clearly marked at all times. Irrigation or maintenance of existing vegetation should be described in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below should be followed:

- Verify that protective measures remain in place. Restore damaged protection measures immediately.
- Serious tree injuries shall be attended to by an arborist.
- Damage to the crown, trunk, or root system of a retained tree shall be repaired immediately.
- Trench as far from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching or tunneling near or under trees to be retained, place tunnels at least 18 in. below the ground surface, and not below the tree center to minimize impact on the roots.
- Do not leave tree roots exposed to air. Cover exposed roots with soil as soon as possible. If soil covering is not practical, protect exposed roots with wet burlap or peat moss until the tunnel or trench is ready for backfill.
- Cleanly remove the ends of damaged roots with a smooth cut.
- Fill trenches and tunnels as soon as possible. Careful filling and tamping will eliminate air spaces in the soil, which can damage roots.
- If bark damage occurs, cut back all loosened bark into the undamaged area, with the cut tapered at the top and bottom and drainage provided at the base of the wood. Limit cutting the undamaged area as much as possible.
- Aerate soil that has been compacted over a trees root zone by punching holes 12 in. deep with an iron bar, and moving the bar back and forth until the soil is loosened. Place holes 18 in. apart throughout the area of compacted soil under the tree crown.
- Fertilization
 - Fertilize stressed or damaged broadleaf trees to aid recovery.
 - Fertilize trees in the late fall or early spring.

Preservation Of Existing Vegetation EC-2

- Apply fertilizer to the soil over the feeder roots and in accordance with label instructions, but never closer than 3 ft to the trunk. Increase the fertilized area by one-fourth of the crown area for conifers that have extended root systems.
- Retain protective measures until all other construction activity is complete to avoid damage during site cleanup and stabilization.

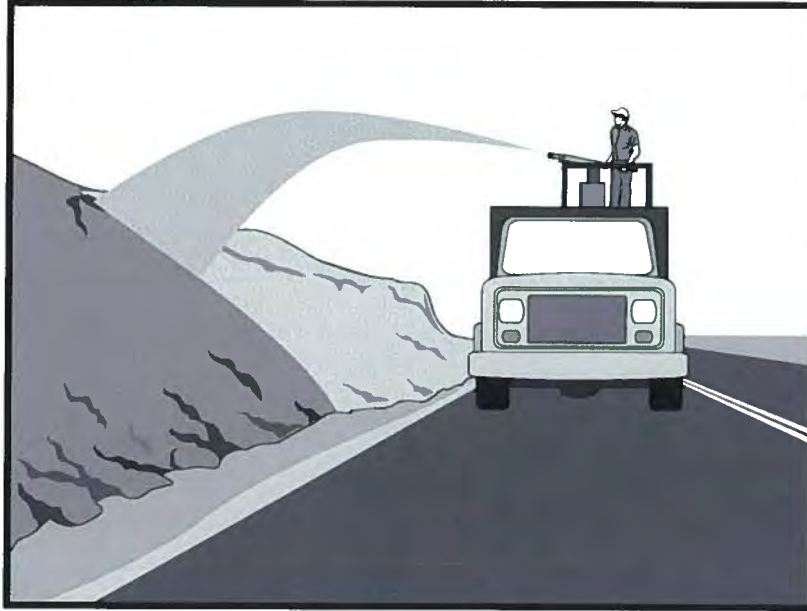
References

County of Sacramento Tree Preservation Ordinance, September 1981.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



Description and Purpose

Hydraulic Mulch consists of various types of fibrous materials mixed with water and sprayed onto the soil surface in slurry form to provide a layer of temporary protection from wind and water erosion.

Suitable Applications

Hydraulic mulch as a temporary, stand alone, erosion control BMP is suitable for disturbed areas that require temporary protection from wind and water erosion until permanent soil stabilization activities commence. Examples include:

- Rough-graded areas that will remain inactive for longer than permit-required thresholds (e.g., 14 days) or otherwise require stabilization to minimize erosion or prevent sediment discharges.
- Soil stockpiles.
- Slopes with exposed soil between existing vegetation such as trees or shrubs.
- Slopes planted with live, container-grown vegetation or plugs.
- Slopes burned by wildfire.

Hydraulic mulch can also be applied to augment other erosion control BMPs such as:

Categories

EC	Erosion Control	☒
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- EC-4 Hydroseeding
- EC-5 Soil Binders
- EC-6 Straw Mulch
- EC-7 Geotextiles and Mats
- EC-8 Wood Mulching
- EC-14 Compost Blanket
- EC-16 Non-Vegetative Stabilization



- In conjunction with straw mulch (see EC-6 Straw Mulch) where the rate of hydraulic mulch is reduced to 100-500 lbs per acre and the slurry is applied over the straw as a tackifying agent to hold the straw in place.
- Supplemental application of soil amendments, such as fertilizer, lime, gypsum, soil bio-stimulants or compost.

Limitations

In general, hydraulic mulch is not limited by slope length, gradient or soil type. However, the following limitations typically apply:

- Most hydraulic mulch applications, particularly bonded fiber matrices (BFMs), require at least 24 hours to dry before rainfall occurs.
- Temporary applications (i.e., without a vegetative component) may require a second application in order to remain effective for an entire rainy season.
- Treatment areas must be accessible to hydraulic mulching equipment.
- Availability of water sources in remote areas for mixing and application.
- As a stand-alone temporary BMP, hydraulic mulches may need to be re-applied to maintain their erosion control effectiveness, typically after 6-12 months depending on the type of mulch used.
- Availability of hydraulic mulching equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- Cellulose fiber mulches alone may not perform well on steep slopes or in coarse soils.

Implementation

- Where feasible, it is preferable to prepare soil surfaces prior to application by roughening embankments and fill areas with a crimping or punching type roller or by track walking.
- The majority of hydraulic mulch applications do not necessarily require surface/soil preparation (See EC-15 Soil Preparation) although in almost every case where re-vegetation is included as part of the practice, soil preparation can be beneficial. One of the advantages of hydraulic mulch over other erosion control methods is that it can be applied in areas where soil preparation is precluded by site conditions, such as steep slopes, rocky soils, or inaccessibility.
- Avoid mulch over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Hydraulic mulching is generally performed utilizing specialized machines that have a large water-holding/mixing tank and some form of mechanical agitation or other recirculation method to keep water, mulch and soil amendments in suspension. The mixed hydraulic slurry can be applied from a tower sprayer on top of the machine or by extending a hose to areas remote from the machine.

- Where possible apply hydraulic mulch from multiple directions to adequately cover the soil. Application from a single direction can result in shadowing, uneven coverage and failure of the BMP.
- Hydraulic mulch can also include a vegetative component, such as seed, rhizomes, or stolons (see EC-4 Hydraulic Seed).
- Typical hydraulic mulch application rates range from 2,000 pounds per acre for standard mulches (SMs) to 3,500 pounds per acre for BFMs. However, the required amount of hydraulic mulch to provide adequate coverage of exposed topsoil may appear to exceed the standard rates when the roughness of the soil surface is changed due to soil preparation methods (see EC-15 Soil Preparation) or by slope gradient.
- Other factors such as existing soil moisture and soil texture can have a profound effect on the amount of hydraulic mulch required (i.e. application rate) applied to achieve an erosion-resistant covering.
- Avoid use of mulch without a tackifier component, especially on slopes.
- Mulches used in the hydraulic mulch slurry can include:
 - Cellulose fiber
 - Thermally-processed wood fibers
 - Cotton
 - Synthetics
 - Compost (see EC-14, Compost Blanket)
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Categories of Hydraulic Mulches

Standard Hydraulic Mulch (SM)

Standard hydraulic mulches are generally applied at a rate of 2,000 pounds per acre and are manufactured containing around 5% tackifier (i.e. soil binder), usually a plant-derived guar or psyllium type. Most standard mulches are green in color derived from food-color based dyes.

Hydraulic Matrices (HM) and Stabilized Fiber Matrices (SFM)

Hydraulic matrices and stabilized fiber matrices are slurries which contain increased levels of tackifiers/soil binders; usually 10% or more by weight. HMs and SFMs have improved performance compared to a standard hydraulic mulch (SM) because of the additional percentage of tackifier and because of their higher application rates, typically 2,500 – 4,000 pounds per acre. Hydraulic matrices can include a mixture of fibers, for example, a 50/50 blend of paper and wood fiber. In the case of an SFM, the tackifier/soil binder is specified as a polyacrylamide (PAM).

Bonded Fiber Matrix (BFM)

Bonded fiber matrices (BFMs) are hydraulically-applied systems of fibers, adhesives (typically guar based) and chemical cross-links. Upon drying, the slurry forms an erosion-resistant blanket that prevents soil erosion and promotes vegetation establishment. The cross-linked adhesive in the BFM should be biodegradable and should not dissolve or disperse upon re-wetting. BFMs are typically applied at rates from 3,000 to 4,000 lbs/acre based on the manufacturer's recommendation. BFMs should not be applied immediately before, during or immediately after rainfall or if the soil is saturated. Depending on the product, BFMs typically require 12 to 24 hours to dry and become effective.

Mechanically-Bonded Fiber Matrices (MBFM)

Mechanically-bonded fiber matrices (MBFMs) are hydraulically applied systems similar to BFM that use crimped synthetic fibers and PAM and are typically applied to a slope at a higher application rate than a standard BFM.

Hydraulic Compost Matrix (HCM)

Hydraulic compost matrix (HCM) is a field-derived practice whereby finely graded or sifted compost is introduced into the hydraulic mulch slurry. A guar-type tackifier can be added for steeper slope applications as well as any specified seed mixtures. A HCM can help to accelerate seed germination and growth. HCMs are particularly useful as an in-fill for three-dimensional re-vegetation geocomposites, such as turf reinforcement mats (TRM) (see EC-7 Geotextiles and Mats).

Costs

Average installed costs for hydraulic mulch categories are provided in Table 1, below.

Table 1
HYDRAULIC MULCH BMPs
INSTALLED COSTS

BMP	Installed Cost/Acre
Standard Hydraulic Mulching (SM)	\$1,700 - \$3,600 per acre
Hydraulic Matrices (HM) and Stabilized Fiber Matrices	
Guar-based	\$2,000 - \$4,000 per acre
PAM-based	\$2,500 - \$5,610 per acre
Bonded Fiber Matrix (BFM)	\$3,900 - \$6,900 per acre
Mechanically Bonded Fiber Matrix (MBFM)	\$4,500 - \$6,000 per acre
Hydraulic Compost Matrix (HCM)	\$3,000 - \$3,500 per acre

Source: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

Inspection and Maintenance

- Maintain an unbroken, temporary mulched ground cover throughout the period of construction when the soils are not being reworked.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected

weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Compare the number of bags or weight of applied mulch to the area treated to determine actual application rates and compliance with specifications.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Controlling Erosion of Construction Sites, Agricultural Information #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

Guides for Erosion and Sediment Control in California, USDA Soils Conservation Service, January 1991.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

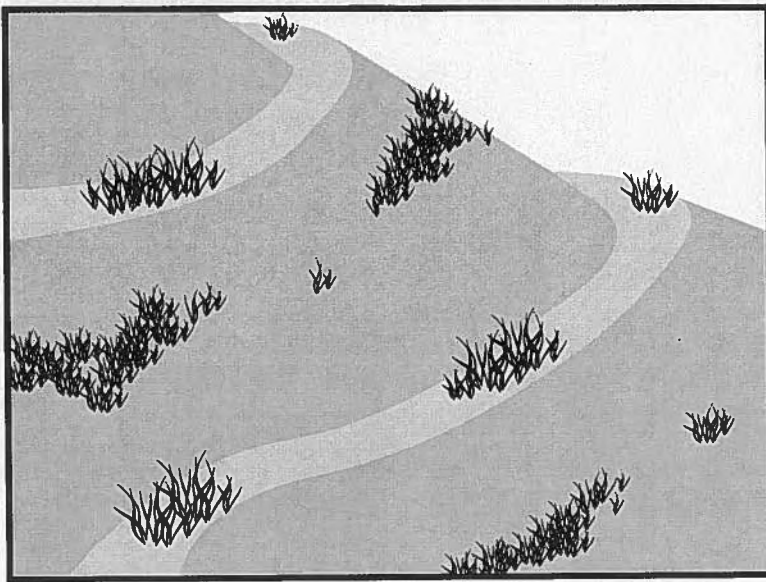
Soil Erosion by Water, Agriculture Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



Description and Purpose

Hydroseeding typically consists of applying a mixture of a hydraulic mulch, seed, fertilizer, and stabilizing emulsion with a hydraulic mulcher, to temporarily protect exposed soils from erosion by water and wind. Hydraulic seeding, or hydroseeding, is simply the method by which temporary or permanent seed is applied to the soil surface.

Suitable Applications

Hydroseeding is suitable for disturbed areas requiring temporary protection until permanent stabilization is established, for disturbed areas that will be re-disturbed following an extended period of inactivity, or to apply permanent stabilization measures. Hydroseeding without mulch or other cover (e.g. EC-7, Erosion Control Blanket) is not a stand-alone erosion control BMP and should be combined with additional measures until vegetation establishment.

Typical applications for hydroseeding include:

- Disturbed soil/graded areas where permanent stabilization or continued earthwork is not anticipated prior to seed germination.
- Cleared and graded areas exposed to seasonal rains or temporary irrigation.
- Areas not subject to heavy wear by construction equipment or high traffic.

Categories

EC	Erosion Control	☒
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- EC-3 Hydraulic Mulch
- EC-5 Soil Binders
- EC-6 Straw Mulch
- EC-7 Geotextiles and Mats
- EC-8 Wood Mulching
- EC-14 Compost Blanket
- EC-16 Non-Vegetative Stabilization



Limitations

- Availability of hydroseeding equipment may be limited just prior to the rainy season and prior to storms due to high demand.
- Hydraulic seed should be applied with hydraulic mulch or a stand-alone hydroseed application should be followed by one of the following:
 - Straw mulch (see Straw Mulch EC-6)
 - Rolled erosion control products (see Geotextiles and Mats EC-7)
 - Application of Compost Blanket (see Compost Blanket EC-14)

Hydraulic seed may be used alone only on small flat surfaces when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control.

- Hydraulic seed without mulch does not provide immediate erosion control.
- Temporary seeding may not be appropriate for steep slopes (i.e., slopes readily prone to rill erosion or without sufficient topsoil).
- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
- Temporary vegetation may have to be removed before permanent vegetation is applied.
- Temporary vegetation may not be appropriate for short term inactivity (i.e. less than 3-6 months).

Implementation

In order to select appropriate hydraulic seed mixtures, an evaluation of site conditions should be performed with respect to:

- Soil conditions	- Maintenance requirements
- Site topography and exposure (sun/wind)	- Sensitive adjacent areas
- Season and climate	- Water availability
- Vegetation types	- Plans for permanent vegetation

The local office of the U.S.D.A. Natural Resources Conservation Service (NRCS) is an excellent source of information on appropriate seed mixes.

The following steps should be followed for implementation:

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying (See EC-15, Soil Preparation) the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.

- Avoid use of hydraulic seed in areas where the BMP would be incompatible with future earthwork activities.
- Hydraulic seed can be applied using a multiple step or one step process.
 - In a multiple step process, hydraulic seed is applied first, followed by mulch or a Rolled Erosion Control Product (RECP).
 - In the one step process, hydraulic seed is applied with hydraulic mulch in a hydraulic matrix. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate should be increased to compensate for all seeds not having direct contact with the soil.
- All hydraulically seeded areas should have mulch, or alternate erosion control cover to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds should be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag should be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container should be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed should be pellet inoculated. Inoculant sources should be species specific and should be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer should conform to the requirements of the California Food and Agricultural Code, which can be found at http://www.leginfo.ca.gov/.html/fac_table_of_contents.html. Fertilizer should be pelleted or granular form.
- Follow up applications should be made as needed to cover areas of poor coverage or germination/vegetation establishment and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Costs

Average cost for installation and maintenance may vary from as low as \$1,900 per acre for flat slopes and stable soils, to \$4,000 per acre for moderate to steep slopes and/or erosive soils. Cost of seed mixtures vary based on types of required vegetation.

BMP	Installed Cost per Acre
Hydraulic Seed	\$1,900-\$4,000

Source: Caltrans Soil Stabilization BMP Research for Erosion and Sediment Controls, July 2007

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident should be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.
- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.
- Irrigation systems should be inspected for complete coverage and adjusted as needed to maintain complete coverage.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.



Description and Purpose

Wood mulching consists of applying a mixture of shredded wood mulch, bark or compost to disturbed soils. The primary function of wood mulching is to reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff.

Suitable Applications

Wood mulching is suitable for disturbed soil areas requiring temporary protection until permanent stabilization is established.

Limitations

- Not suitable for use on slopes steeper than 3:1 (H:V). Best suited to flat areas or gentle slopes or 5:1 (H:V) or flatter.
- Wood mulch and compost may introduce unwanted species.
- Not suitable for areas exposed to concentrated flows.
- May need to be removed prior to further earthwork.

Implementation

Mulch Selection

There are many types of mulches. Selection of the appropriate type of mulch should be based on the type of application, site conditions, and compatibility with planned or future uses.

Application Procedures

Prior to application, after existing vegetation has been

Categories

EC	Erosion Control	☒
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- EC-3 Hydraulic Mulch
- EC-4 Hydroseeding
- EC-5 Soil Binders
- EC-6 Straw Mulch
- EC-7 Geotextiles and Mats



removed, roughen embankment and fill areas by rolling with a device such as a punching type roller or by track walking. The construction application procedures for mulches vary significantly depending upon the type of mulching method specified. Two methods are highlighted here:

- **Green Material:** This type of mulch is produced by the recycling of vegetation trimmings such as grass, shredded shrubs, and trees. Methods of application are generally by hand although pneumatic methods are available.
 - Green material can be used as a temporary ground cover with or without seeding.
 - The green material should be evenly distributed on site to a depth of not more than 2 in.
- **Shredded Wood:** Suitable for ground cover in ornamental or revegetated plantings.
 - Shredded wood/bark is conditionally suitable. See note under limitations.
 - Distribute by hand or use pneumatic methods.
 - Evenly distribute the mulch across the soil surface to a depth of 2 to 3 in.
- Avoid mulch placement onto roads, sidewalks, drainage channels, existing vegetation, etc.

Costs

Average annual cost for installation and maintenance (3-4 months useful life) is around \$4,000 per acre, but cost can increase if the source is not close to the project site.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Areas where erosion is evident shall be repaired and BMPs reapplied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require reapplication of BMPs.
- Regardless of the mulching technique selected, the key consideration in inspection and maintenance is that the mulch needs to last long enough to achieve erosion control objectives. If the mulch is applied as a stand alone erosion control method over disturbed areas (without seed), it should last the length of time the site will remain barren or until final re-grading and revegetation.
- Where vegetation is not the ultimate cover, such as ornamental and landscape applications of bark or wood chips, inspection and maintenance should focus on longevity and integrity of the mulch.
- Reapply mulch when bare earth becomes visible.

References

Controlling Erosion of Construction Sites Agriculture Information Bulletin #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

Guides for Erosion and Sediment Control in California, USDA Soils Conservation Service, January 1991.

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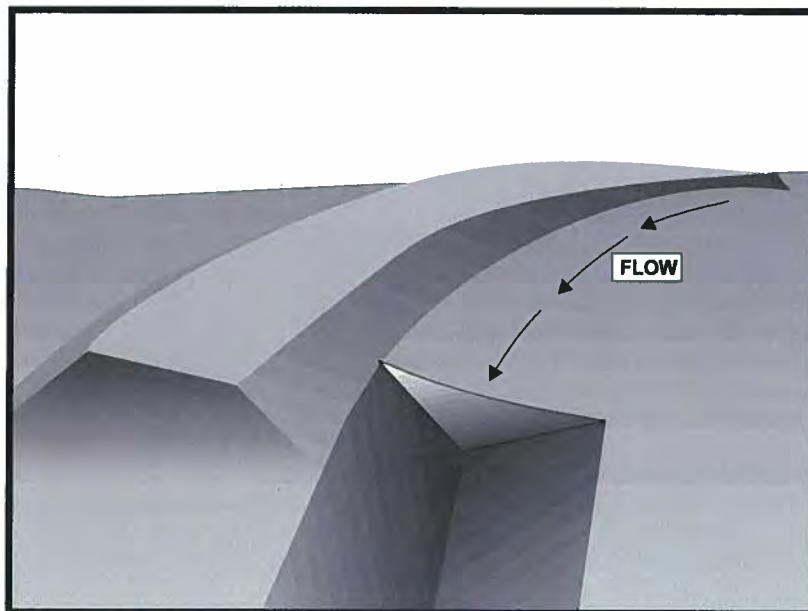
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Description and Purpose

An earth dike is a temporary berm or ridge of compacted soil used to divert runoff or channel water to a desired location. A drainage swale is a shaped and sloped depression in the soil surface used to convey runoff to a desired location. Earth dikes and drainage swales are used to divert off site runoff around the construction site, divert runoff from stabilized areas and disturbed areas, and direct runoff into sediment basins or traps.

Suitable Applications

Earth dikes and drainage swales are suitable for use, individually or together, where runoff needs to be diverted from one area and conveyed to another.

- Earth dikes and drainage swales may be used:
 - To convey surface runoff down sloping land
 - To intercept and divert runoff to avoid sheet flow over sloped surfaces
 - To divert and direct runoff towards a stabilized watercourse, drainage pipe or channel
 - To intercept runoff from paved surfaces
 - Below steep grades where runoff begins to concentrate
 - Along roadways and facility improvements subject to flood drainage

Categories

EC	Erosion Control	☒
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



- At the top of slopes to divert runoff from adjacent or undisturbed slopes
- At bottom and mid slope locations to intercept sheet flow and convey concentrated flows
- Divert sediment laden runoff into sediment basins or traps

Limitations

Dikes should not be used for drainage areas greater than 10 acres or along slopes greater than 10 percent. For larger areas more permanent drainage structures should be built. All drainage structures should be built in compliance with local municipal requirements.

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.
- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.
- Diverted stormwater may cause downstream flood damage.
- Dikes should not be constructed of soils that may be easily eroded.
- Regrading the site to remove the dike may add additional cost.
- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- Temporary drains and swales must conform to local floodplain management requirements.
- Earth dikes/drainage swales are not suitable as sediment trapping devices.
- It may be necessary to use other soil stabilization and sediment controls such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales, and ditches.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in drainage swales.

Implementation

The temporary earth dike is a berm or ridge of compacted soil, located in such a manner as to divert stormwater to a sediment trapping device or a stabilized outlet, thereby reducing the potential for erosion and offsite sedimentation. Earth dikes can also be used to divert runoff from off site and from undisturbed areas away from disturbed areas and to divert sheet flows away from unprotected slopes.

An earth dike does not itself control erosion or remove sediment from runoff. A dike prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversion dikes should not adversely impact adjacent properties and must conform to local floodplain management regulations, and should not be used in areas with slopes steeper than 10%.

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike at the top of a slope can divert

runoff to a location where it can be brought to the bottom of the slope (see EC-11, Slope Drains). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded and remain in place until post construction BMPs are installed and the slopes are stabilized.

Diversion practices concentrate surface runoff, increasing its velocity and erosive force. Thus, the flow out of the drain or swale must be directed onto a stabilized area or into a grade stabilization structure. If significant erosion will occur, a swale should be stabilized using vegetation, chemical treatment, rock rip-rap, matting, or other physical means of stabilization. Any drain or swale that conveys sediment laden runoff must be diverted into a sediment basin or trap before it is discharged from the site.

General

- Care must be applied to correctly size and locate earth dikes, drainage swales. Excessively steep, unlined dikes, and swales are subject to erosion and gully formation.
- Conveyances should be stabilized.
- Use a lined ditch for high flow velocities.
- Select flow velocity based on careful evaluation of the risks due to erosion of the measure, soil types, overtopping, flow backups, washout, and drainage flow patterns for each project site.
- Compact any fills to prevent unequal settlement.
- Do not divert runoff onto other property without securing written authorization from the property owner.
- When possible, install and utilize permanent dikes, swales, and ditches early in the construction process.
- Provide stabilized outlets.

Earth Dikes

Temporary earth dikes are a practical, inexpensive BMP used to divert stormwater runoff. Temporary diversion dikes should be installed in the following manner:

- All dikes should be compacted by earth moving equipment.
- All dikes should have positive drainage to an outlet.
- All dikes should have 2:1 or flatter side slopes, 18 in. minimum height, and a minimum top width of 24 in. Wide top widths and flat slopes are usually needed at crossings for construction traffic.
- The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a Sediment Trap (SE-3) or Sediment Basin

(SE-2) when either the dike channel or the drainage area above the dike are not adequately stabilized.

- Temporary stabilization may be achieved using seed and mulching for slopes less than 5% and either rip-rap or sod for slopes in excess of 5%. In either case, stabilization of the earth dike should be completed immediately after construction or prior to the first rain.
- If riprap is used to stabilize the channel formed along the toe of the dike, the following typical specifications apply:

Channel Grade	Riprap Stabilization
0.5-1.0%	4 in. Rock
1.1-2.0%	6 in. Rock
2.1-4.0%	8 in. Rock
4.1-5.0%	8 in. -12 in. Riprap

- The stone riprap, recycled concrete, etc. used for stabilization should be pressed into the soil with construction equipment.
- Filter cloth may be used to cover dikes in use for long periods.
- Construction activity on the earth dike should be kept to a minimum.

Drainage Swales

Drainage swales are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost effective diversion.

Standard engineering design criteria for small open channel and closed conveyance systems should be used (see the local drainage design manual). Unless local drainage design criteria state otherwise, drainage swales should be designed as follows:

- No more than 5 acres may drain to a temporary drainage swale.
- Place drainage swales above or below, not on, a cut or fill slope.
- Swale bottom width should be at least 2 ft
- Depth of the swale should be at least 18 in.
- Side slopes should be 2:1 or flatter.
- Drainage or swales should be laid at a grade of at least 1 percent, but not more than 15 percent.
- The swale must not be overtopped by the peak discharge from a 10-year storm, irrespective of the design criteria stated above.

- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built.
- Compact any fill material along the path of the swale.
- Stabilize all swales immediately. Seed and mulch swales at a slope of less than 5 percent, and use rip-rap or sod for swales with a slope between 5 and 15 percent. For temporary swales, geotextiles and mats (EC-7) may provide immediate stabilization.
- Irrigation may be required to establish sufficient vegetation to prevent erosion.
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- Permanent drainage facilities must be designed by a professional engineer (see the local drainage design criteria for proper design).
- At a minimum, the drainage swale should conform to predevelopment drainage patterns and capacities.
- Construct the drainage swale with a positive grade to a stabilized outlet.
- Provide erosion protection or energy dissipation measures if the flow out of the drainage swale can reach an erosive velocity.

Costs

- Cost ranges from \$15 to \$55 per ft for both earthwork and stabilization and depends on availability of material, site location, and access.
- Small dikes: \$2.50 - \$6.50/linear ft; Large dikes: \$2.50/yd³.
- The cost of a drainage swale increases with drainage area and slope. Typical swales for controlling internal erosion are inexpensive, as they are quickly formed during routine earthwork.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect ditches and berms for washouts. Replace lost riprap, damaged linings or soil stabilizers as needed.
- Inspect channel linings, embankments, and beds of ditches and berms for erosion and accumulation of debris and sediment. Remove debris and sediment and repair linings and embankments as needed.
- Temporary conveyances should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction

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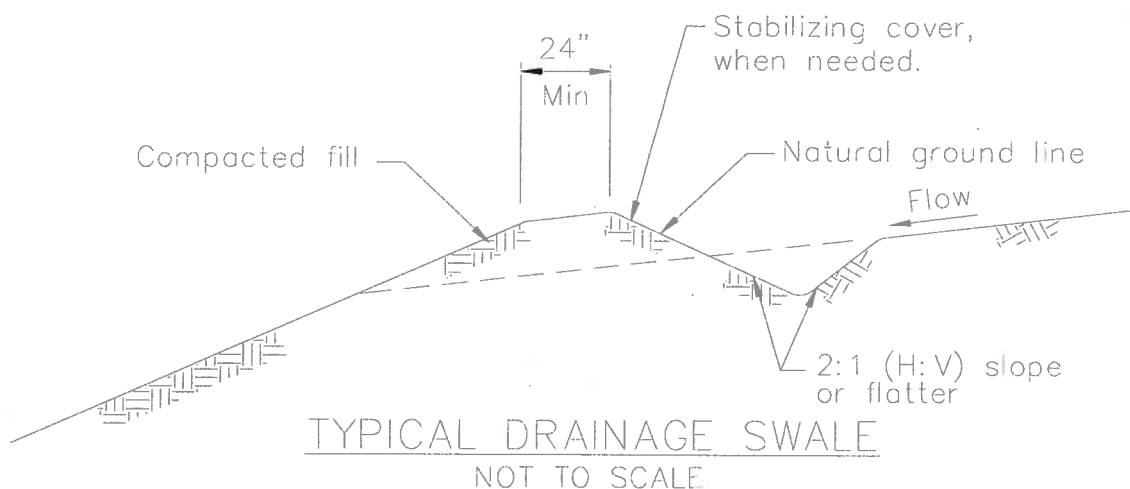
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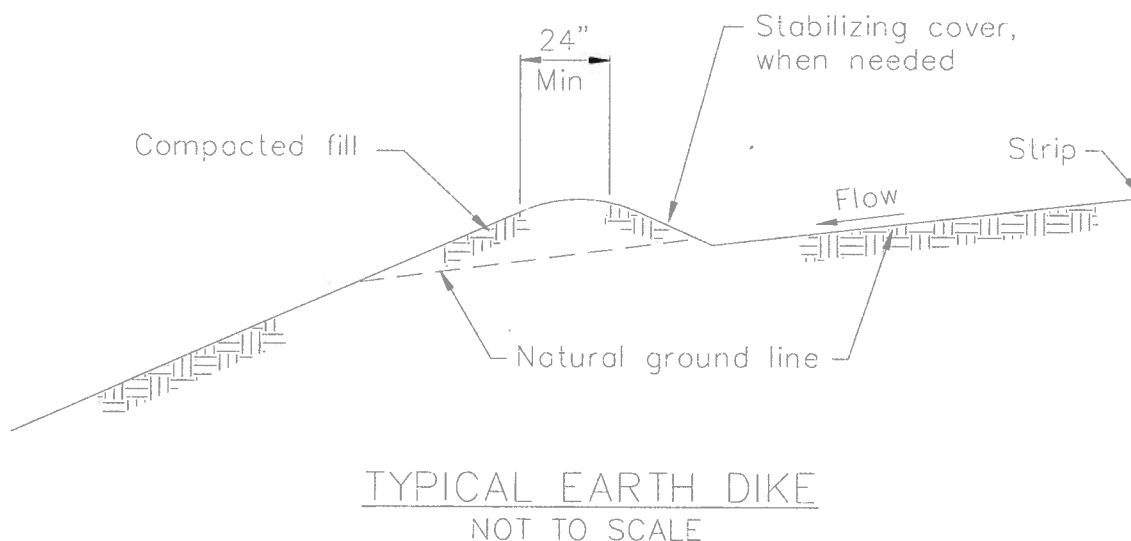
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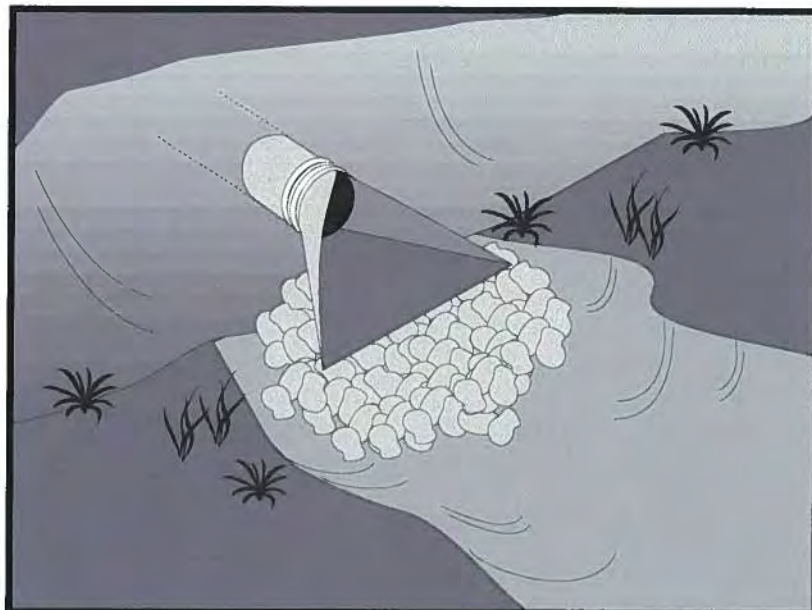
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NOTES:

1. Stabilize inlet, outlets and slopes.
2. Properly compact the subgrade.





Description and Purpose

Outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble, which is placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flows.

Suitable Applications

Whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This includes temporary diversion structures to divert runoff during construction.

- These devices may be used at the following locations:
 - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits, or channels.
 - Outlets located at the bottom of mild to steep slopes.
 - Discharge outlets that carry continuous flows of water.
 - Outlets subject to short, intense flows of water, such as flash floods.
 - Points where lined conveyances discharge to unlined conveyances

Limitations

- Large storms or high flows can wash away the rock outlet protection and leave the area susceptible to erosion.

Categories

EC	Erosion Control	☒
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.
- Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges can result in areas of standing water suitable for mosquito production in velocity dissipation devices.

Implementation

General

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plunge pools), and protects against gully erosion resulting from scouring at a culvert mouth.

Design and Layout

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvert or channel design flow but never the less than the peak 5 year flow for temporary structures planned for one rainy season, or the 10 year peak flow for temporary structures planned for two or three rainy seasons.

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.

- Stone 4 in. to 6 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.
 - Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.
 - Stone greater than 12 in. shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the D_{50} rock size, and the dump height limited to twice the depth of the gravel protection layer thickness.
- For proper operation of apron: Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.
 - Outlets on slopes steeper than 10 percent should have additional protection.

Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is \$150 per device.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur. Minimize areas of standing water by removing sediment blockages and filling scour depressions.
- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.
- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.
- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

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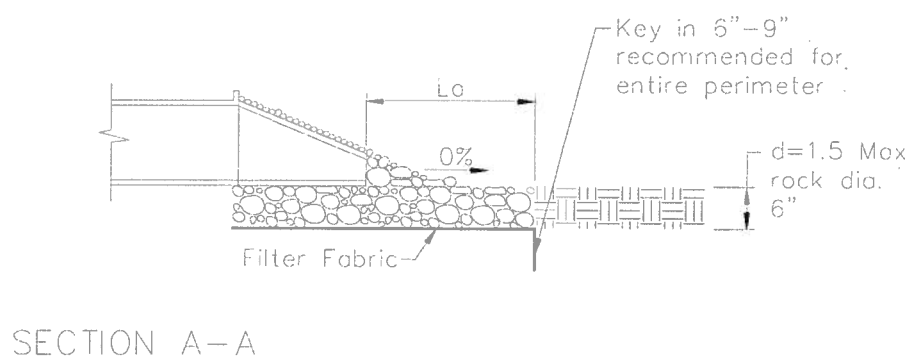
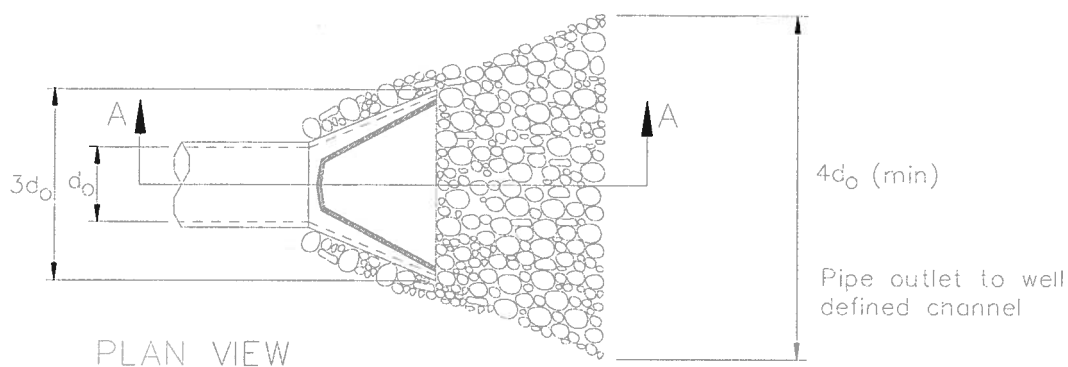
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Pipe Diameter inches	Discharge ft ³ /s	Apron Length, La ft	Rip Rap D ₅₀ Diameter Min inches
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

For larger or higher flows consult a Registered Civil Engineer
Source: USDA - SCS



Description and Purpose

Stream channels, streambanks, and associated riparian areas are dynamic and sensitive ecosystems that respond to changes in land use activity. Streambank and channel disturbance resulting from construction activities can increase the stream's sediment load, which can cause channel erosion or sedimentation and have adverse affects on the biotic system. BMPs can reduce the discharge of sediment and other pollutants to minimize the impact of construction activities on watercourses. Streams on the 303(d) list and listed for sediment may require numerous measures to prevent any increases in sediment load to the stream.

Suitable Applications

These procedures typically apply to all construction projects that disturb or occur within stream channels and their associated riparian areas.

Limitations

Specific permit requirements or mitigation measures such as Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game supercede the guidance in this BMP.

- If numerical based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required. Streams listed as 303(d) impaired for sediment, silt, or turbidity, are required to

Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

Combination of erosion and sediment controls.



conduct sampling to verify that there is no net increase in sediment load due to construction activities.

Implementation

Planning

- Proper planning, design, and construction techniques can minimize impacts normally associated with in stream construction activities. Poor planning can adversely affect soil, fish, wildlife resources, land uses, or land users. Planning should take into account: scheduling; avoidance of in-stream construction; minimizing disturbance area and construction time period; using pre-disturbed areas; selecting crossing location; and selecting equipment.

Scheduling

- Construction activities should be scheduled according to the relative sensitivity of the environmental concerns and in accordance with EC-1, Scheduling. Scheduling considerations will be different when working near perennial streams vs. ephemeral streams and are as follows.
- When in-stream construction is conducted in a perennial stream, work should optimally be performed during the rainy season. This is because in the summer, any sediment-containing water that is discharged into the watercourse will cause a large change in both water clarity and water chemistry. During the rainy season, there is typically more and faster flowing water in the stream so discharges are diluted faster. However, should in-stream work be scheduled for summer, establishing an isolation area, or diverting the stream, will significantly decrease the amount of sediment stirred up by construction work. Construction work near perennial streams should optimally be performed during the dry season (see below).
- When working in or near ephemeral streams, work should be performed during the dry season. By their very nature, ephemeral streams are usually dry in the summer, and therefore, in-stream construction activities will not cause significant water quality problems. However, when tying up the site at the end of the project, wash any fines (see Washing Fines) that accumulated in the channel back into the bed material, to decrease pollution from the first rainstorm of the season.
- When working near ephemeral or perennial streams, erosion and sediment controls (see silt fences, straw bale barriers, etc.) should be implemented to keep sediment out of stream channel.

Minimize Disturbance

- Minimize disturbance through: selection of the narrowest crossing location; limiting the number of equipment trips across a stream during construction; and, minimizing the number and size of work areas (equipment staging areas and spoil storage areas). Place work areas at least 50 ft from stream channel. Field reconnaissance should be conducted during the planning stage to identify work areas.

Use of Pre-Disturbed Areas

- Locate project sites and work areas in areas disturbed by prior construction or other activity when possible.

Selection of Project Site

- Avoid steep and unstable banks, highly erodible or saturated soils, or highly fractured rock.
- Select project site that minimizes disturbance to aquatic species or habitat.

Equipment Selection

- Select equipment that reduces the amount of pressure exerted on the ground surface, and therefore, reduces erosion potential and/or use overhead or aerial access for transporting equipment across drainage channels. Use equipment that exerts ground pressures of less than 5 or 6 lb/in², where possible. Low ground pressure equipment includes: wide or high flotation tires (34 to 72 in. wide); dual tires; bogie axle systems; tracked machines; lightweight equipment; and, central tire inflation systems.

Streambank Stabilization

Preservation of Existing Vegetation

- Preserve existing vegetation in accordance with EC-2, Preservation of Existing Vegetation. In a streambank environment, preservation of existing vegetation provides the following benefits.

Water Quality Protection

- Vegetated buffers on slopes trap sediment and promote groundwater recharge. The buffer width needed to maintain water quality ranges from 15 to 100 ft. On gradual slopes, most of the filtering occurs within the first 30 ft. Steeper slopes require a greater width of vegetative buffer to provide water quality benefits.

Streambank Stabilization

- The root system of riparian vegetation stabilizes streambanks by increasing tensile strength in the soil. The presence of vegetation modifies the moisture condition of slopes (infiltration, evapo transpiration, interception) and increases bank stability.

Riparian Habitat

- Buffers of diverse riparian vegetation provide food and shelter for riparian and aquatic organisms. Minimizing impacts to fisheries habitat is a major concern when working near streams and rivers. Riparian vegetation provides shade, shelter, organic matter (leaf detritus and large woody debris), and other nutrients that are necessary for fish and other aquatic organisms. Buffer widths for habitat concerns are typically wider than those recommended for water quality concerns (100 to 1500 ft).
- When working near watercourses, it is important to understand the work site's placement in the watershed. Riparian vegetation in headwater streams has a greater impact on overall water quality than vegetation in downstream reaches. Preserving existing vegetation upstream is necessary to maintain water quality, minimize bank failure, and maximize riparian habitat, downstream of the work site.

Limitations

- Local county and municipal ordinances regarding width, extent and type of vegetative buffer required may exceed the specifications provided here; these ordinances should be investigated prior to construction.

Streambank Stabilization Specific Installation

- As a general rule, the width of a buffer strip between a road and the stream is recommended to be 50 ft plus four times the percent slope of the land, measured between the road and the top of stream bank.

Hydraulic Mulch

- Apply hydraulic mulch on disturbed streambanks above mean high water level in accordance with EC-3, Hydraulic Mulch to provide temporary soil stabilization.

Limitations

- Do not place hydraulic mulch or tackifiers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication (eutrophication is an algal bloom caused by excessively high nutrient levels in the water).

Hydroseeding

- Hydroseed disturbed streambanks in accordance with EC-4, Hydroseeding.

Limitations

- Do not place tackifiers or fertilizers below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication.

Soil Binders

- Apply soil binders to disturbed streambanks in accordance with EC-5, Soil Binders.

Limitations

- Do not place soil binders below the mean high water level. Soil binder must be environmentally benign and non-toxic to aquatic organisms.

Straw Mulch

- Apply straw mulch to disturbed streambanks in accordance with EC-6, Straw Mulch.

Limitations

- Do not place straw mulch below the mean high water level, as this material could wash into the channel and impact water quality or possibly cause eutrophication.

Geotextiles and Mats

- Install geotextiles and mats as described in EC-7, Geotextiles and Mats, to stabilize disturbed channels and streambanks. Not all applications should be in the channel, for example, certain geotextile netting may snag fish gills and are not appropriate in fish bearing streams. Geotextile fabrics that are not biodegradable are not appropriate for in stream use. Additionally, geotextile fabric or blankets placed in channels must be adequate to sustain anticipated hydraulic forces.

Earth Dikes, Drainage Swales, and Lined Ditches

- Convey, intercept, or divert runoff from disturbed streambanks using EC-9, Earth Dikes and Drainage Swales.

Limitations

- Do not place earth dikes in watercourses, as these structures are only suited for intercepting sheet flow, and should not be used to intercept concentrated flow.
- Appropriately sized velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

Velocity Dissipation Devices

- Place velocity dissipation devices at outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits or channels in accordance with EC-10, Velocity Dissipation Devices.

Slope Drains

- Use slope drains to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device or stabilized area in accordance with EC-11, Slope Drains.

Limitations

- Appropriately sized outlet protection and velocity dissipation devices (EC-10) must be placed at outlets to minimize erosion and scour.

Streambank Sediment Control

Silt Fences

- Install silt fences in accordance with SE-1, Silt Fence, to control sediment. Silt fences should only be installed where sediment laden water can pond, thus allowing the sediment to settle out.

Fiber Rolls

- Install fiber rolls in accordance with SE-5, Fiber Rolls, along contour of slopes above the high water level to intercept runoff, reduce flow velocity, release the runoff as sheet flow and provide removal of sediment from the runoff. In a stream environment, fiber rolls should be used in conjunction with other sediment control methods such as SE-1, Silt Fence or SE-9 Straw Bale Barrier. Install silt fence, straw bale barrier, or other erosion control method along toe of slope above the high water level.

Gravel Bag Berm

- A gravel bag berm or barrier can be utilized to intercept and slow the flow of sediment laden sheet flow runoff in accordance with SE-6, Gravel Bag Berm. In a stream environment gravel bag barriers can allow sediment to settle from runoff before water leaves the construction site and can be used to isolate the work area from the live stream.

Limitations

- Gravel bag barriers are not recommended as a perimeter sediment control practice around streams.

Straw Bale Barrier

- Install straw bale barriers in accordance with SE-9, Straw Bale Barrier, to control sediment. Straw bale barriers should only be installed where sediment laden water can pond, thus allowing the sediment to settle out. Install a silt fence in accordance with SE-1, Silt Fence,

on down slope side of straw bale barrier closest to stream channel to provide added sediment control.

Rock Filter

Description and Purpose

Rock filters are temporary erosion control barriers composed of rock that is anchored in place. Rock filters detain the sediment laden runoff, retain the sediment, and release the water as sheet flow at a reduced velocity. Typical rock filter installations are illustrated at the end of this BMP.

Applications

- Near the toe of slopes that may be subject to flow and rill erosion.

Limitations

- Inappropriate for contributing drainage areas greater than 5 acres.
- Requires sufficient space for ponded water.
- Ineffective for diverting runoff because filters allow water to slowly seep through.
- Rock filter berms are difficult to remove when construction is complete.
- Unsuitable in developed areas or locations where aesthetics is a concern.

Specifications

- Rock: open graded rock, 0.75 to 5 in. for concentrated flow applications.
- Woven wire sheathing: 1 in. diameter, hexagonal mesh, galvanized 20gauge (used with rock filters in areas of concentrated flow).
- In construction traffic areas, maximum rock berm heights should be 12 in. Berms should be constructed every 300 ft on slopes less than 5%, every 200 ft on slopes between 5% and 10%, and every 100 ft on slopes greater than 10%.

Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Reshape berms as needed and replace lost or dislodged rock, and filter fabric.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.

K-rail

Description and Purpose

This is temporary sediment control that uses K-rails to form the sediment deposition area, or to isolate the near bank construction area. Install K-rails at toe of slope in accordance with procedures described in NS-5, Clear Water Diversion.

Barriers are placed end to end in a pre-designed configuration and gravel filled bags are used at the toe of the barrier and at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

Appropriate Applications

- This technique is useful at the toe of embankments, cuts or fills slopes.

Limitations

- The K-rail method should not be used to dewater a project site, as the barrier is not watertight.

Implementation

- Refer to NS-5, Clear Water Diversion, for implementation requirements.

Instream Construction Sediment Control

There are three different options currently available for reducing turbidity while working in a stream or river. The stream can be isolated from the area in which work is occurring by means of a water barrier, the stream can be diverted around the work site through a pipe or temporary channel, or one can employ construction practices that minimize sediment suspension.

Whatever technique is implemented, an important thing to remember is that dilution can sometimes be the solution. A probable “worst time” to release high TSS into a stream system might be when the stream is very low; summer low flow, for example. During these times, the flow may be low while the biological activity in the stream is very high. Conversely, the addition of high TSS or sediment during a big storm discharge might have a relatively low impact, because the stream is already turbid, and the stream energy is capable of transporting both suspended solids, and large quantities of bedload through the system. The optimum time to “pull” in-stream structures may be during the rising limb of a storm hydrograph.

Techniques to minimize Total Suspended Solids (TSS)

- **Padding** - Padding laid in the stream below the work site may trap some solids that are deposited in the stream during construction. After work is done, the padding is removed from the stream, and placed on the bank to assist in re-vegetation.
- **Clean, washed gravel** - Using clean, washed gravel decreases solid suspension, as there are fewer small particles deposited in the stream.
- **Excavation using a large bucket** - Each time a bucket of soil is placed in the stream, a portion is suspended. Approximately the same amount is suspended whether a small amount of soil is placed in the stream, or a large amount. Therefore, using a large excavator bucket instead of a small one, will reduce the total amount of soil that washes downstream.

- **Use of dozer for backfilling** - Using a dozer for backfilling instead of a backhoe follows the same principles – the fewer times soil is deposited in the stream, the less soil will be suspended.
- **Partial dewatering with a pump** - Partially dewatering a stream with a pump reduces the amount of water, and thus the amount of water that can suspend sediment.

Washing Fines

Definition and Purpose

- Washing fines is an “in-channel” sediment control method, which uses water, either from a water truck or hydrant, to wash stream fines that were brought to the surface of the channel bed during restoration, back into the interstitial spaces of the gravel and cobbles.
- The purpose of this technique is to reduce or eliminate the discharge of sediment from the channel bottom during the first seasonal flow. Sediment should not be allowed into stream channels; however, occasionally in-channel restoration work will involve moving or otherwise disturbing fines (sand and silt sized particles) that are already in the stream, usually below bankfull discharge elevation. Subsequent re-watering of the channel can result in a plume of turbidity and sedimentation.
- This technique washes the fines back into the channel bed. Bedload materials, including gravel cobbles, boulders and those fines, are naturally mobilized during higher storm flows. This technique is intended to delay the discharge until the fines would naturally be mobilized.

Appropriate Applications

- This technique should be used when construction work is required in channels. It is especially useful in intermittent or ephemeral streams in which work is performed “in the dry”, and which subsequently become re-watered.

Limitations

- The stream must have sufficient gravel and cobble substrate composition.
- The use of this technique requires consideration of time of year and timing of expected stream flows.
- The optimum time for the use of this technique is in the fall, prior to winter flows.
- Consultation with, and approval from the Department of Fish and Game and the Regional Water Quality Control Board may be required.

Implementation

- Apply sufficient water to wash fines, but not cause further erosion or runoff.
- Apply water slowly and evenly to prevent runoff and erosion.
- Consult with Department of Fish and Game and the Regional Water Quality Control Board for specific water quality requirements of applied water (e.g. chlorine).

Inspection and Maintenance

- None necessary

Costs

Cost may vary according to the combination of practices implemented.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events until final stabilization is achieved.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect and repair equipment (for damaged hoses, fittings, and gaskets).

References

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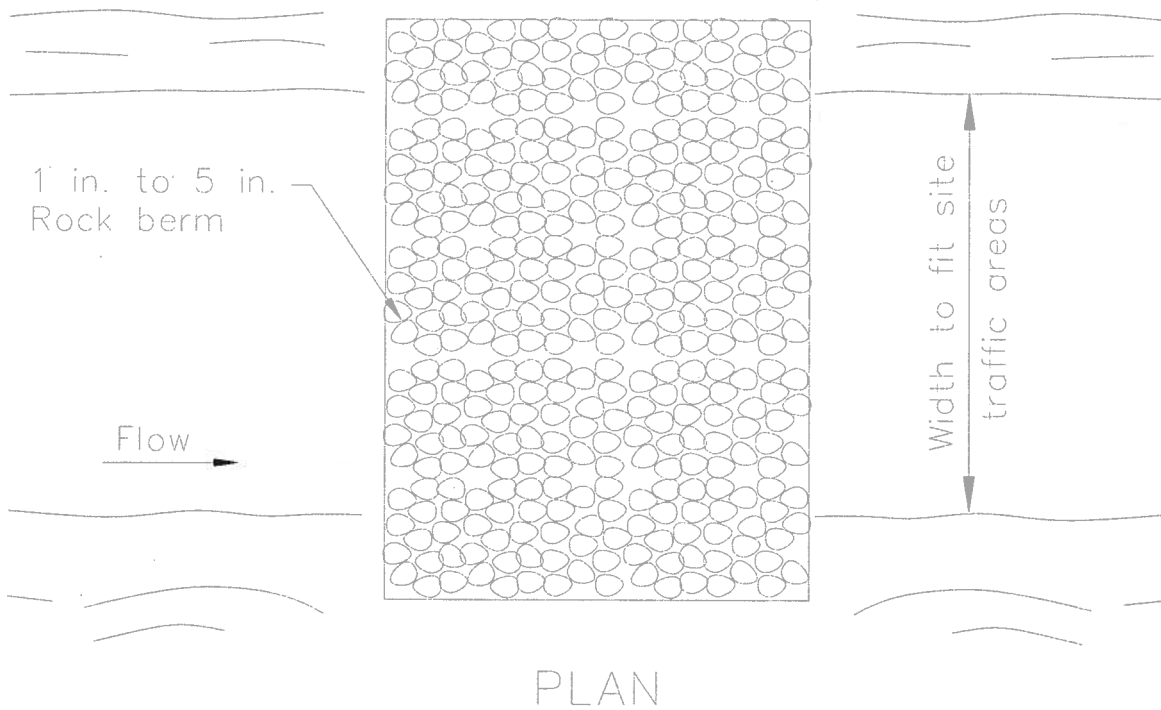
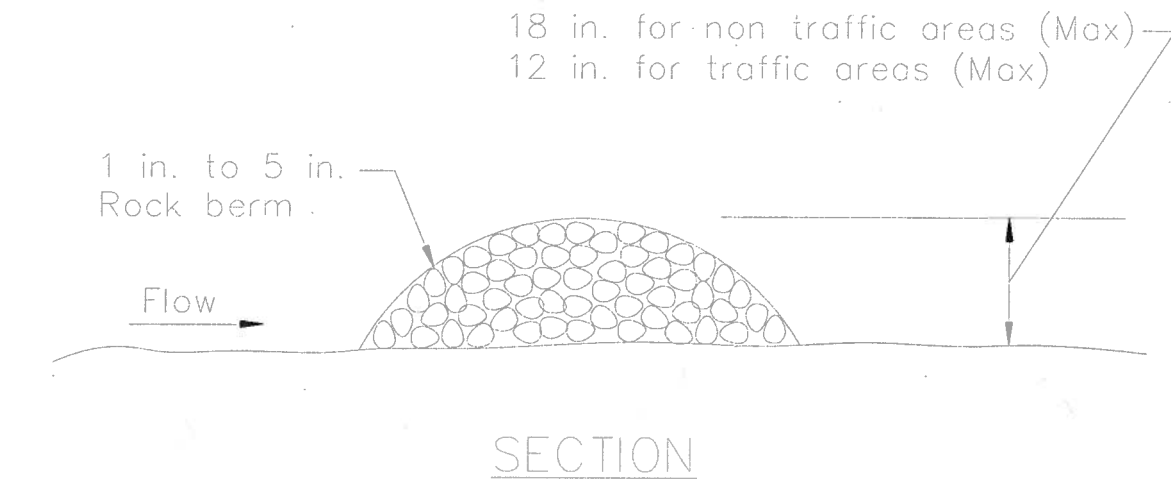
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Sedimentation and Erosion Control Practices, An Inventory of Current Practices (Draft), USEPA, 1990.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



TYPICAL ROCK FILTER
NOT TO SCALE



Description and Purpose

Soil Preparation/Roughening involves assessment and preparation of surface soils for BMP installation. This can include soil testing (for seed base, soil characteristics, or nutrients), as well as roughening surface soils by mechanical methods (including sheepsfoot rolling, track walking, scarifying, stair stepping, and imprinting) to prepare soil for additional BMPs, or to break up sheet flow. Soil Preparation can also involve tilling topsoil to prepare a seed bed and/or incorporation of soil amendments, to enhance vegetative establishment.

Suitable Applications

Soil preparation: Soil preparation is essential to proper vegetative establishment. In particular, soil preparation (i.e. tilling, raking, and amendment) is suitable for use in combination with any soil stabilization method, including RECPs or sod. Soil preparation should not be confused with roughening.

Roughening: Soil roughening is generally referred to as track walking (sometimes called imprinting) a slope, where treads from heavy equipment run parallel to the contours of the slope and act as mini terraces. Soil preparation is most effective when used in combination with erosion controls. Soil Roughening is suitable for use as a complementary process for controlling erosion on a site. Roughening is not intended to be used as a stand-alone BMP, and should be used with perimeter controls, additional erosion control measures, grade breaks, and vegetative establishment for maximum effectiveness. Roughening is intended to only affect surface soils and should not compromise slope stability or overall compaction. Suitable applications for soil roughening include:

Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- EC-3 Hydraulic Mulch
- EC-5 Soil Binders
- EC-7 Geotextiles and Mats



- Along any disturbed slopes, including temporary stockpiles, sediment basins, or compacted soil diversion berms and swales.
- Roughening should be used in combination with hydraulically applied stabilization methods, compost blanket, or straw mulch; but should not be used in combination with RECPs or sod because roughening is intended to leave terraces on the slope.

Limitations

- Preparation and roughening must take place prior to installing other erosion controls (such as hydraulically applied stabilizers) or sediment controls (such as fiber rolls) on the faces of slopes.
- In such cases where slope preparation is minimal, erosion control/revegetation BMPs that do not require extensive soil preparation - such as hydraulic mulching and seeding applications - should be employed.
- Consideration should be given to the type of erosion control BMP that follows surface preparation, as some BMPs are not designed to be installed over various types of tillage/roughening, i.e., RECPs (erosion control blankets) should not be used with soil roughening due to a “bridging” effect, which suspends the blanket above the seed bed.
- Surface roughness has an effect on the amount of mulch material that needs to be applied, which shows up as a general increase in mulch material due to an increase in surface area (Topographic Index -see EC-3 Hydraulic Mulching).

Implementation

- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

General

A roughened surface can significantly reduce erosion. Based on tests done at the San Diego State Erosion Research Laboratory, various roughening techniques on slopes can result in a 12 - 76% reduction in the erosion rate versus smooth slopes.

Materials

Minimal materials are required unless amendments and/or seed are added to the soil. The majority of soil roughening/preparation can be done with equipment that is on hand at a normal construction site, such as bull dozers and compaction equipment.

Installation Guidelines

Soil Preparation

- Where appropriate or feasible, soil should be prepared to receive the seed by disking or otherwise scarifying the surface to eliminate crust, improve air and water infiltration and create a more favorable environment for germination and growth.
- Based upon soil testing conducted, apply additional soil amendments (e.g. fertilizers, additional seed) to the soil to help with germination. Follow EC-4, Hydroseeding, when selecting and applying seed and fertilizers.

Cut Slope Roughening:

- Stair-step grade or groove the cut slopes that are steeper than 3:1.
- Use stair-step grading on any erodible material soft enough to be ripped with a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading.
- Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the "step" in toward the vertical wall.
- Do not make individual vertical cuts more than 2 feet (0.6 m) high in soft materials or more than 3 feet (0.9 m) high in rocky materials.
- Groove the slope using machinery to create a series of ridges and depressions that run across the slope, on the contour.

Fill Slope Roughening:

- Place on fill slopes with a gradient steeper than 3:1 in lifts not to exceed 8 inches (0.2 m), and make sure each lift is properly compacted.
- Ensure that the face of the slope consists of loose, uncompacted fill 4-6 inches (0.1-0.2 m) deep.
- Use grooving or tracking to roughen the face of the slopes, if necessary.
- Do not blade or scrape the final slope face.

Roughening for Slopes to be Mowed:

- Slopes which require mowing activities should not be steeper than 3:1.
- Roughen these areas to shallow grooves by track walking, scarifying, sheepsfoot rolling, or imprinting.
- Make grooves close together (less than 10 inches), and not less than 1 inch deep, and perpendicular to the direction of runoff (i.e., parallel to the slope contours).
- Excessive roughness is undesirable where mowing is planned.

Roughening With Tracked Machinery:

- Limit roughening with tracked machinery to soils with a sandy textural component to avoid undue compaction of the soil surface.
- Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during the final grading operation.
- Seed and mulch roughened areas as soon as possible to obtain optimum seed germination and growth.

Costs

Costs are based on the additional labor of tracking or preparation of the slope plus the cost of any required soil amendment materials.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check the seeded slopes for signs of erosion such as rills and gullies. Fill these areas slightly above the original grade, then reseed and mulch as soon as possible.
- Inspect BMPs weekly during normal operations, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

References

Soil Stabilization BMP Research for Erosion and Sediment Controls: Cost Survey Technical Memorandum, State of California Department of Transportation (Caltrans), July 2007.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



Description and Purpose

Non-vegetative stabilization methods are used for temporary or permanent stabilization of areas prone to erosion and should be used only where vegetative options are not feasible; examples include:

- Areas of vehicular or pedestrian traffic such as roads or paths;
- Arid environments where vegetation would not provide timely ground coverage, or would require excessive irrigation;
- Rocky substrate, infertile or droughty soils where vegetation would be difficult to establish; and
- Areas where vegetation will not grow adequately within the construction time frame.

There are several non-vegetative stabilization methods and selection should be based on site-specific conditions.

Decomposed Granite (DG) is a permanent erosion protection method that consists of a layer of stabilized decomposed granite placed over an erodible surface.

Degradable Mulches of various types (see EC-3, EC-6, EC-8) can be used for temporary non-vegetative stabilization; examples include straw mulch, compost, wood chips or hydraulic mulch.

Geotextiles and Mats can be used for temporary non-vegetative stabilization (see EC-7). These BMPs are typically manufactured

Categories

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SE	Sediment Control	☒
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Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



from degradable or synthetic materials and are designed and specified based on their functional longevity, i.e., how long they will persist and provide erosion protection. All geotextiles and mats should be replaced when they exceed their functional longevity or when permanent stabilization methods are instituted.

Gravel Mulch is a non-degradable erosion control product that is composed of washed and screened coarse to very coarse gravel, 16 mm to 64 mm (0.6" - 2.5"), similar to an AASHTO No. 3 coarse aggregate.

Rock Slope Protection consists of utilizing large rock or rip-rap (4" - 24") to stabilize slopes with a high erosion potential and those subject to scour along waterways.

Soil Binders can be used for temporary non-vegetative stabilization (see EC-5). The key to their use is functional longevity. In most cases, the soil binder will need to be routinely monitored and re-applied to maintain an erosion-resistant coverage.

Suitable Applications

Non-vegetated stabilization methods are suitable for use on disturbed soil areas and on material stockpiles that need to be temporarily or permanently protected from erosion by water and wind. Non-vegetated stabilization should only be utilized when vegetation cannot be established in the required timeframe, due to soil or climactic conditions, or where vegetation may be a potential fire hazard.

Decomposed Granite (DG) and Gravel Mulch are suitable for use in areas where vegetation establishment is difficult, on flat surfaces, trails and pathways, and when used in conjunction with a stabilizer or tackifier, on shallow slopes (i.e., 10:1 [H:V]). DG and gravel can also be used on shallow rocky slopes where vegetation cannot be established for permanent erosion control.

Degradable Mulches can be used to cover and protect soil surfaces from erosion both in temporary and permanent applications. In many cases, the use of mulches by themselves requires routine inspection and re-application. See EC-3 Hydraulic Mulch, EC-6 Straw Mulch, EC-8 Wood Mulch, or EC-14 Compost Blankets for more information.

Geotextiles and Mats can be used as a temporary stand-alone soil stabilization method. Depending on material selection, geotextiles and mats can be a short-term (3 mos – 1 year) or long-term (1-2 years) temporary stabilization method. For more information on geotextiles and mats see EC-7 Geotextiles and Mats.

Rock Slope Protection can be used when the slopes are subject to scour or have a high erosion potential, such as slopes adjacent to flowing waterways or slopes subject to overflow from detention facilities (spillways).

Soil Binders can be used for temporary stabilization of stockpiles and disturbed areas not subject to heavy traffic. See EC-5 Soil Binders for more information.

Limitations

General

- Refer to EC-3, EC-6, EC-8, and EC-14 for limitations on use of mulches. Refer to EC-7 for limitations on use of geotextiles and mats. Refer to EC-5 for limitations on use of Soil Binders.

Decomposed Granite

- Not available in some geographic regions.
- If not tackified, material may be susceptible to erosion even on slight slopes (e.g., 30:1 [H:V]).
- Installed costs may be more expensive than vegetative stabilization methods.

Gravel Mulch

- Availability is limited in some geographic regions.
- If not properly screened and washed, can contain fine material that can erode and/or create dust problems.
- If inadequately sized, material may be susceptible to erosion on sloped areas.
- Pore spaces fill with dirt and debris over time; may provide a growing medium for weeds.

Rock Slope Protection

- Installation is labor intensive.
- Installed costs can be significantly higher than vegetative stabilization methods.
- Rounded stones may not be used on slopes greater than 2:1 [H:V].

Implementation

General

Non-vegetated stabilization should be used in accordance with the following general guidance:

- Should be used in conjunction with other BMPs, including drainage, erosion controls and sediment controls.
- Refer to EC-3, EC-6, EC-8, and EC-14 for implementation details for mulches. Refer to EC-7 for implementation details for geotextiles and mats. Refer to EC-5 for implementation details for soil binders.
- Non-vegetated stabilization measures should be implemented as soon as the disturbance in the areas they are intended to protect has ceased.
- Additional guidance on the comparison and selection of temporary slope stabilization methods is provided in Appendix F of the Handbook.

Decomposed Granite Stabilization

- If used for a road or path should be installed on a prepared base.

- Should be mixed with a stabilizer if used for roads or pathways, or on slope applications.
- Though porous it is recommended to prevent standing water on or next to a decomposed granite road or pathway.

Gravel Mulch

- Should be sized based on slope, rainfall, and upgradient run-on conditions. Stone size should be increased as potential for erosion increases (steeper slopes, high intensity rainfall).
- If permanent, a weed control fabric should be placed prior to installation.
- Should be installed at a minimum 2" depth.
- Should completely cover all exposed surfaces.

Rock Slope Protection

- Rock slope protection installation should follow Caltrans Standard Specification 72-2: Rock Slope Protection. Refer to the specification for rock conformity requirements and installation methods.
- When using rock slope protection, rock size and installation method should be specified by an Engineer.
- A geotextile fabric should be placed prior to installation.

Costs

- Costs are highly variable depending not only on technique chosen, but also on materials chosen within specific techniques. In addition, availability of certain materials will vary by region/location, which will also affect the cost. Costs of mulches, geotextiles and mats, and soil binders are presented in their respective fact sheets. Costs for decomposed granite, gravel mulch stabilization and rock slope protection may be higher depending on location and availability of materials. Caltrans has provided an estimate for gravel mulch of \$10 - \$15/yd² in flat areas and \$11 - \$23/yd² on side slopes.

Inspection and Maintenance

General

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- For permanent installation, require inspection periodically and after major storm events to look for signs of erosion or damage to the stabilization.
- All damage should be repaired immediately.
- Refer to EC-3, EC-6, EC-8, and EC-14 for inspection and maintenance requirements for mulches. Refer to EC-7 for inspection and maintenance requirements for geotextiles and mats. Refer to EC-5 for inspection and maintenance requirements for soil binders.

Decomposed Granite and Gravel Mulch Stabilization

- Rake out and add decomposed granite or gravel as needed to areas subject to rill erosion. Inspect upgradient drainage controls and repair/modify as necessary.
- Should remain stable under loose surface material. Any significant problem areas should be repaired to restore uniformity to the installation.

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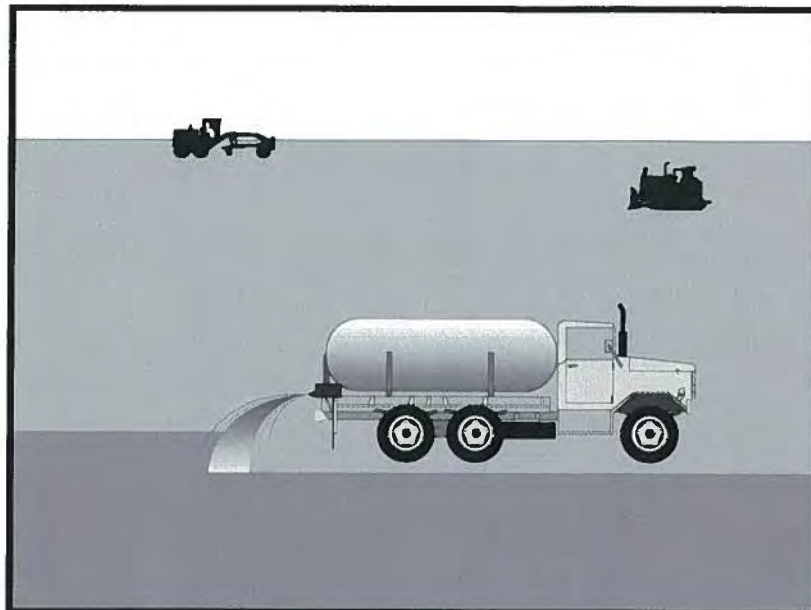
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Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-5 Soil Binders

Description and Purpose

Wind erosion or dust control consists of applying water or other chemical dust suppressants as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

California's Mediterranean climate, with a short "wet" season and a typically long, hot "dry" season, allows the soils to thoroughly dry out. During the dry season, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment. Site conditions and climate can make dust control more of an erosion problem than water based erosion. Additionally, many local agencies, including Air Quality Management Districts, require dust control and/or dust control permits in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. Wind erosion control is required to be implemented at all construction sites greater than 1 acre by the General Permit.

Suitable Applications

Most BMPs that provide protection against water-based erosion will also protect against wind-based erosion and dust control requirements required by other agencies will generally meet wind erosion control requirements for water quality protection. Wind erosion control BMPs are suitable during the following construction activities:



- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period (generally less than a few hours) and should be applied daily (or more often) to be effective.
- Over watering may cause erosion and track-out.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Chemical dust suppression agents may have potential environmental impacts. Selected chemical dust control agents should be environmentally benign.
- Effectiveness of controls depends on soil, temperature, humidity, wind velocity and traffic.
- Chemical dust suppression agents should not be used within 100 feet of wetlands or water bodies.
- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.
- If the soil surface has minimal natural moisture, the affected area may need to be pre-wetted so that chemical dust control agents can uniformly penetrate the soil surface.

Implementation

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table presents dust control practices that can be applied to varying site conditions that could potentially cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph or less, and controlling the number and activity of vehicles on a site at any given time.

Chemical dust suppressants include: mulch and fiber based dust palliatives (e.g. paper mulch with gypsum binder), salts and brines (e.g. calcium chloride, magnesium chloride), non-petroleum based organics (e.g. vegetable oil, lignosulfonate), petroleum based organics (e.g. asphalt emulsion, dust oils, petroleum resins), synthetic polymers (e.g. polyvinyl acetate, vinyls, acrylic), clay additives (e.g. bentonite, montmorillonite) and electrochemical products (e.g. enzymes, ionic products).

Site Condition	Dust Control Practices							
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Temporary Gravel Construction Entrances/Equipment Wash Down	Synthetic Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	X	X	X	X	X			X
Disturbed Areas Subject to Traffic			X	X	X	X		X
Material Stockpiles		X	X	X			X	X
Demolition			X			X	X	
Clearing/Excavation			X	X				X
Truck Traffic on Unpaved Roads			X	X	X	X	X	
Tracking					X	X		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (see EC-1, Scheduling).
- Quickly treat exposed soils using water, mulching, chemical dust suppressants, or stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Restrict construction traffic to stabilized roadways within the project site, as practicable.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality

Control Board (RWQCB) requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."

- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and wheel wash areas.
- Stabilize inactive areas of construction sites using temporary vegetation or chemical stabilization methods.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater and should meet all applicable regulatory requirements.

Costs

Installation costs for water and chemical dust suppression vary based on the method used and the length of effectiveness. Annual costs may be high since some of these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Check areas protected to ensure coverage.
- Most water-based dust control measures require frequent application, often daily or even multiple times per day. Obtain vendor or independent information on longevity of chemical dust suppressants.

References

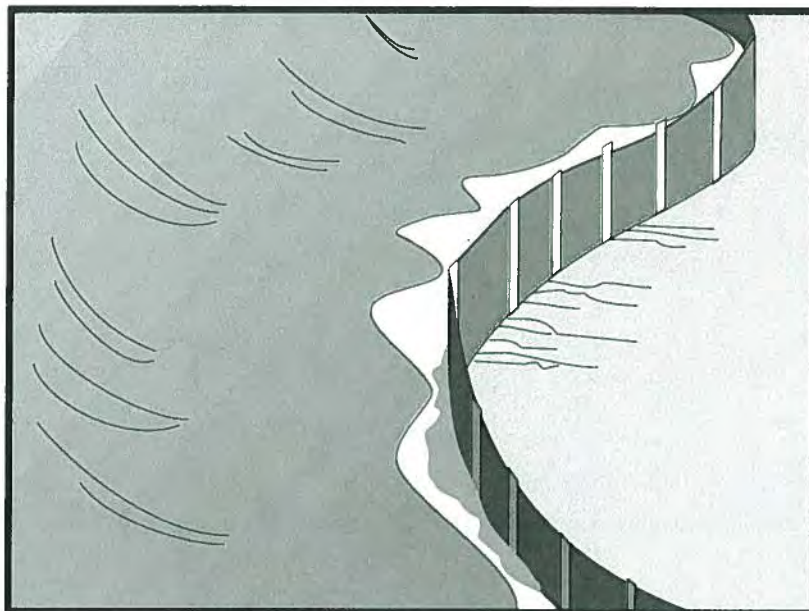
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Description and Purpose

A silt fence is made of a woven geotextile that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They could also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion and around inlets within disturbed areas (SE-10). Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Around inlets.
- Below other small cleared areas.

Categories

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SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
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Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- SE-5 Fiber Rolls
- SE-6 Gravel Bag Berm
- SE-8 Sandbag Barrier
- SE-10 Storm Drain Inlet Protection
- SE-12 Temporary Silt Dike
- SE-14 Biofilter Bags



Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.
- Do not use in locations where ponded water may cause a flooding hazard. Runoff typically ponds temporarily on the upstream side of silt fence.
- Do not use silt fence to divert water flows or place across any contour line. Fences not constructed on a level contour, or fences used to divert flow will concentrate flows resulting in additional erosion and possibly overtopping or failure of the silt fence.
- Improperly installed fences are subject to failure from undercutting, overtopping, or collapsing.
- Not effective unless trenched and keyed in.
- Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
- Do not use on slopes subject to creeping, slumping, or landslides.

Implementation

General

A silt fence is a temporary sediment barrier consisting of woven geotextile stretched across and attached to supporting posts, trenched-in, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.
- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft² of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.

- Silt fences should remain in place until the disturbed area is permanently stabilized, after which, the silt fence should be removed and properly disposed.
- Silt fence should be used in combination with erosion source controls up slope in order to provide the most effective sediment control.
- Be aware of local regulations regarding the type and installation requirements of silt fence, which may differ from those presented in this fact sheet.

Design and Layout

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Woven geotextile material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

Standard vs. Heavy Duty Silt Fence

Standard Silt Fence

- Generally applicable in cases where the slope of area draining to the silt fence is 4:1 (H:V) or less.
- Used for shorter durations, typically 5 months or less
- Area draining to fence produces moderate sediment loads.

Heavy Duty Silt Fence

- Use is generally limited to 8 months or less.
- Area draining to fence produces moderate sediment loads.
- Heavy duty silt fence usually has 1 or more of the following characteristics, not possessed by standard silt fence.
 - Fence fabric has higher tensile strength.
 - Fabric is reinforced with wire backing or additional support.
 - Posts are spaced closer than pre-manufactured, standard silt fence products.
 - Posts are metal (steel or aluminum)

Materials

Standard Silt Fence

- Silt fence material should be woven geotextile with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D4632 and should have an integral reinforcement layer. The

reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491.

- Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.
- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

Heavy-Duty Silt Fence

- Some silt fence has a wire backing to provide additional support, and there are products that may use prefabricated plastic holders for the silt fence and use metal posts or bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement for health and safety purposes.

Installation Guidelines – Traditional Method

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line of the proposed silt fence (trenches should not be excavated wider or deeper than necessary for proper silt fence installation).
- Bottom of the silt fence should be keyed-in a minimum of 12 in.
- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.
- When standard strength geotextile is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy-duty wire staples at least 1 in. long. The mesh should extend into the trench.
- When extra-strength geotextile and closer post spacing are used, the mesh support fence may be eliminated.
- Woven geotextile should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, geotextile should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.
- The trench should be backfilled with native material and compacted.
- Construct silt fences with a setback of at least 3 ft from the toe of a slope. Where, due to specific site conditions, a 3 ft setback is not available, the silt fence may be constructed at the

toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and more difficult to maintain.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed $\frac{1}{3}$ the height of the barrier; in no case should the reach exceed 500 ft.
- Cross barriers should be a minimum of $\frac{1}{3}$ and a maximum of $\frac{1}{2}$ the height of the linear barrier.
- See typical installation details at the end of this fact sheet.

Installation Guidelines - Static Slicing Method

- Static Slicing is defined as insertion of a narrow blade pulled behind a tractor, similar to a plow blade, at least 10 inches into the soil while at the same time pulling silt geotextile fabric into the ground through the opening created by the blade to the depth of the blade. Once the geotextile is installed, the soil is compacted using tractor tires.
- This method will not work with pre-fabricated, wire backed silt fence.
- Benefits:
 - Ease of installation (most often done with a 2 person crew). In addition, installation using static slicing has been found to be more efficient on slopes, in rocky soils, and in saturated soils.
 - Minimal soil disturbance.
 - Greater level of compaction along fence, leading to higher performance (i.e. greater sediment retention).
 - Uniform installation.
 - Less susceptible to undercutting/undermining.

Costs

- It should be noted that costs vary greatly across regions due to available supplies and labor costs.
- Average annual cost for installation using the traditional silt fence installation method (assumes 6 month useful life) is \$7 per linear foot based on vendor research. Range of cost is \$3.50 - \$9.10 per linear foot.
- In tests, the slicing method required 0.33 man hours per 100 linear feet, while the trenched based systems required as much as 1.01 man hours per linear foot.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair undercut silt fences.

- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence should be inspected and maintained regularly.
- Remove silt fence when upgradient areas are stabilized. Fill and compact post holes and anchor trench, remove sediment accumulation, grade fence alignment to blend with adjacent ground, and stabilize disturbed area.

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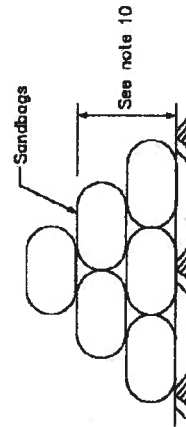
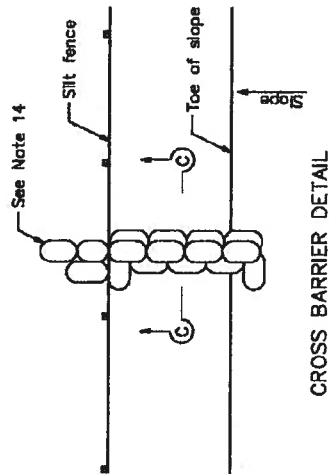
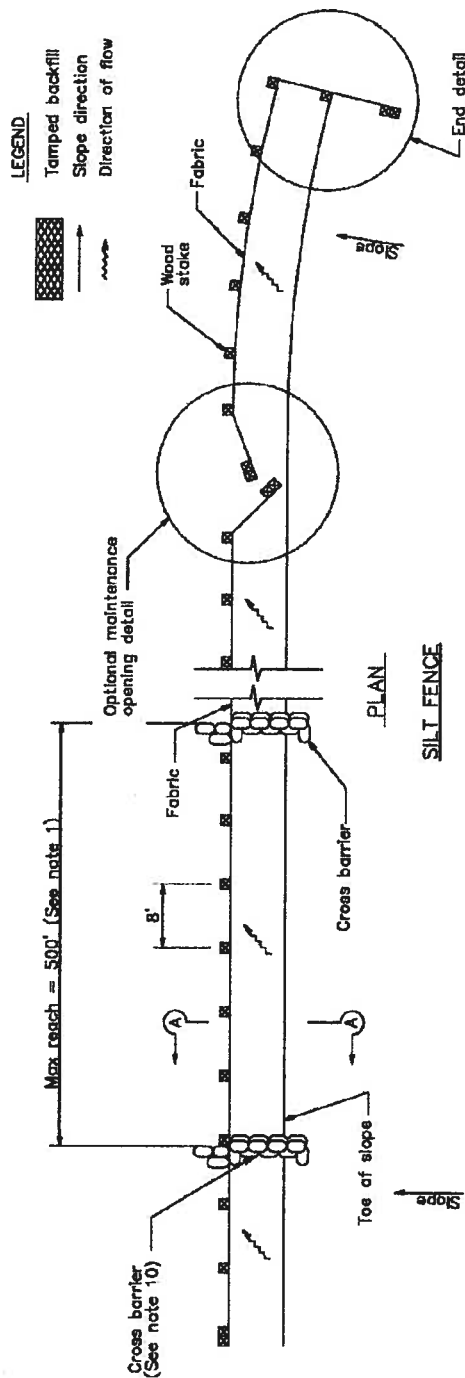
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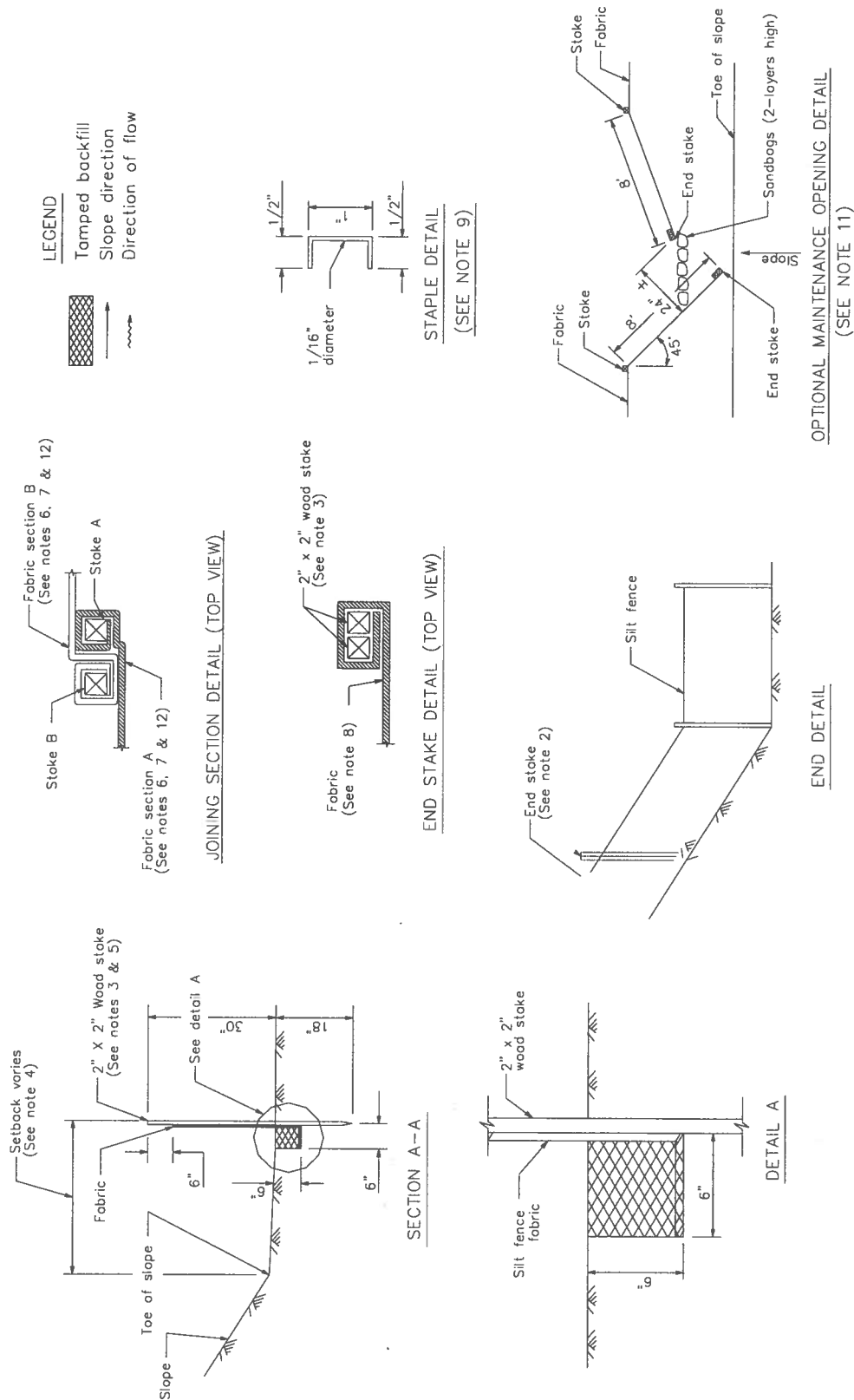
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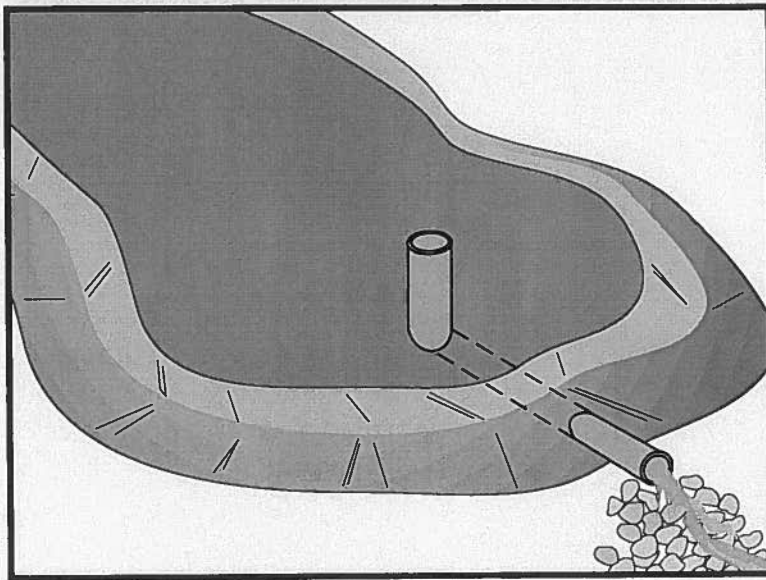
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NOTES

- Construct the length of each reach so that the change in base elevation along the reach does not exceed $1/3$ the height of the linear barrier. In no case shall the reach length exceed 500'.
- The last 8'-0" of fence shall be turned up slope.
- Stake dimensions are nominal.
- Dimension may vary to fit field condition.
- Stakes shall be spaced at 8'-0" maximum and shall be positioned on downstream side of fence.
- Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
- Stakes shall be driven tightly together to prevent potential flow-through of sediment at joint. The tops of the stakes shall be secured with wire.
- For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
- Minimum 4 staples per stake. Dimensions shown are typical.
- Cross barriers shall be a minimum of $1/3$ and a maximum of $1/2$ the height of the linear barrier.
- Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
- Joining sections shall not be placed at sump locations.
- Sandbag rows and layers shall be offset to eliminate gaps.
- Add 3-4 bags to cross barrier on downstream side of silt fence as needed to prevent bypass or undermining and as allowable based on site limits of disturbance.





Description and Purpose

A sediment basin is a temporary basin formed by excavation or by constructing an embankment so that sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out before the runoff is discharged.

Sediment basin design guidance presented in this fact sheet is intended to provide options, methods, and techniques to optimize temporary sediment basin performance and basin sediment removal. Basin design guidance provided in this fact sheet is not intended to guarantee basin effluent compliance with numeric discharge limits (numeric action levels or numeric effluent limits for turbidity). Compliance with discharge limits requires a thoughtful approach to comprehensive BMP planning, implementation, and maintenance. Therefore, optimally designed and maintained sediment basins should be used in conjunction with a comprehensive system of BMPs that includes:

- Diverting runoff from undisturbed areas away from the basin
- Erosion control practices to minimize disturbed areas on-site and to provide temporary stabilization and interim sediment controls (e.g., stockpile perimeter control, check dams, perimeter controls around individual lots) to reduce the basin's influent sediment concentration.

At some sites, sediment basin design enhancements may be required to adequately remove sediment. Traditional

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Targeted Constituents

Sediment	☒
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-3 Sediment Trap (for smaller areas)



(aka “physical”) enhancements such as alternative outlet configurations or flow deflection baffles increase detention time and other techniques such as outlet skimmers preferentially drain flows with lower sediment concentrations. These “physical” enhancement techniques are described in this fact sheet. To further enhance sediment removal particularly at sites with fine soils or turbidity sensitive receiving waters, some projects may need to consider implementing Active Treatment Systems (ATS) whereby coagulants and flocculants are used to enhance settling and removal of suspended sediments. Guidance on implementing ATS is provided in SE-11.

Suitable Applications

Sediment basins may be suitable for use on larger projects with sufficient space for constructing the basin. Sediment basins should be considered for use:

- Where sediment-laden water may enter the drainage system or watercourses
- On construction projects with disturbed areas during the rainy season
- At the outlet of disturbed watersheds between 5 acres and 75 acres and evaluated on a site by site basis
- Where post construction detention basins are required
- In association with dikes, temporary channels, and pipes used to convey runoff from disturbed areas

Limitations

Sediment basins must be installed only within the property limits and where failure of the structure will not result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. In addition, sediment basins are attractive to children and can be very dangerous. Local ordinances regarding health and safety must be adhered to. If fencing of the basin is required, the type of fence and its location should be shown in the SWPPP and in the construction specifications.

- As a general guideline, sediment basins are suitable for drainage areas of 5 acres or more, but not appropriate for drainage areas greater than 75 acres. However, the tributary area should be evaluated on a site by site basis.
- Sediment basins may become an “attractive nuisance” and care must be taken to adhere to all safety practices. If safety is a concern, basin may require protective fencing.
- Sediment basins designed according to this fact sheet are only effective in removing sediment down to about the silt size fraction. Sediment-laden runoff with smaller size fractions (fine silt and clay) may not be adequately treated unless chemical (or other appropriate method) treatment is used in addition to the sediment basin.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft or more must obtain approval from California Department of Water Resources Division of Safety of Dams (<http://www.water.ca.gov/damsafety/>).

- Water that stands in sediment basins longer than 96 hours may become a source of mosquitoes (and midges), particularly along perimeter edges, in shallow zones, in scour or below-grade pools, around inlet pipes, along low-flow channels, and among protected habitats created by emergent or floating vegetation (e.g. cattails, water hyacinth), algal mats, riprap, etc.
- Basins require large surface areas to permit settling of sediment. Size may be limited by the available area.

Implementation

General

A sediment basin is a controlled stormwater release structure formed by excavation or by construction of an embankment of compacted soil across a drainage way, or other suitable location. It is intended to trap sediment before it leaves the construction site. The basin is a temporary measure expected to be used during active construction in most cases and is to be maintained until the site area is permanently protected against erosion or a permanent detention basin is constructed.

Sediment basins are suitable for nearly all types of construction projects. Whenever possible, construct the sediment basins before clearing and grading work begins. Basins should be located at the stormwater outlet from the site but not in any natural or undisturbed stream. A typical application would include temporary dikes, pipes, and/or channels to convey runoff to the basin inlet.

Many development projects in California are required by local ordinances to provide a stormwater detention basin for post-construction flood control, desilting, or stormwater pollution control. A temporary sediment basin may be constructed by rough grading the post-construction control basins early in the project.

Sediment basins if properly designed and maintained can trap a significant amount of the sediment that flows into them. However, traditional basins do not remove all inflowing sediment. Therefore, they should be used in conjunction with erosion control practices such as temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

Planning

To improve the effectiveness of the basin, it should be located to intercept runoff from the largest possible amount of disturbed area. Locations best suited for a sediment basin are generally in lower elevation areas of the site (or basin tributary area) where site drainage would not require significant diversion or other means to direct water to the basin but outside jurisdictional waterways. However, as necessary, drainage into the basin can be improved by the use of earth dikes and drainage swales (see BMP EC-9). The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

Construct before clearing and grading work begins when feasible.

- Do not locate the basin in a jurisdictional stream.

- Basin sites should be located where failure of the structure will not cause loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft must obtain approval from the Division of Dam Safety. Local dam safety requirements may be more stringent.
- Limit the contributing area to the sediment basin to only the runoff from the disturbed soil areas. Use temporary concentrated flow conveyance controls to divert runoff from undisturbed areas away from the sediment basin.
- The basin should be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where post-construction (permanent) detention basins will be constructed, and (3) where the basins can be maintained on a year-round basis to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area, and to maintain the basin to provide the required capacity.

Design

When designing a sediment basin, designers should evaluate the site constraints that could affect the efficiency of the BMP. Some of these constraints include: the relationship between basin capacity, anticipated sediment load, and freeboard, available footprint for the basin, maintenance frequency and access, and hydraulic capacity and efficiency of the temporary outlet infrastructure. Sediment basins should be designed to maximize sediment removal and to consider sediment load retained by the basin as it affects basin performance.

Three Basin Design Options (Part A) are presented below along with a Typical Sediment/Detention Basin Design Methodology (Part B). Regardless of the design option that is selected, designers also need to evaluate the sediment basin capacity with respect to sediment accumulation (See “*Step 3. Evaluate the Capacity of the Sediment Basin*”), and should incorporate approaches identified in “*Step 4. Other Design Considerations*” to enhance basin performance.

A) Basin Design Options:

Option 1:

Design sediment basin(s) using the standard equation:

$$A_s = \frac{1.2Q}{V_s} \quad (\text{Eq. 1})$$

Where:

A_s = Minimum surface area for trapping soil particles of a certain size

V_s = Settling velocity of the design particle size chosen ($V_s = 0.00028$ ft/s for a design particle size of 0.01 mm at 68°F)

1.2 = Factor of safety recommended by USEPA to account for the reduction in basin efficiency caused due to turbulence and other non ideal conditions.

$$Q = CIA \quad (\text{Eq.2})$$

Where

Q = Discharge rate measured in cubic feet per second

C = Runoff coefficient (unitless)

I = Peak rainfall intensity for the 10-year, 6-hour rain event (in/hr)

A = Area draining into the sediment basin in acres

The design particle size should be the smallest soil grain size determined by wet sieve analysis, or the fine silt sized (0.01 mm [or 0.0004 in.]) particle, and the Vs used should be 100 percent of the calculated settling velocity.

This sizing basin method is dependent on the outlet structure design or the total basin length with an appropriate outlet. If the designer chooses to utilize the outlet structure to control the flow duration in the basin, the basin length (distance between the inlet and the outlet) should be a minimum of twice the basin width; the depth should not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity). If the designer chooses to utilize the basin length (with appropriate basin outlet) to control the flow duration in the basin, the basin length (distance between the inlet and the outlet) should be specifically designed to capture 100% of the design particle size; the depth should not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity).

The basin should be located on the site where it can be maintained on a year-round basis and should be maintained on a schedule to retain the 2 ft of capacity.

Option 2:

Design pursuant to local ordinance for sediment basin design and maintenance, provided that the design efficiency is as protective or more protective of water quality than Option 1.

Option 3:

The use of an equivalent surface area design or equation provided that the design efficiency is as protective or more protective of water quality than Option 1.

B) Typical Sediment/Detention Basin Design Methodology:

Design of a sediment basin requires the designer to have an understanding of the site constraints, knowledge of the local soil (e.g., particle size distribution of potentially contributing soils), drainage area of the basin, and local hydrology. Designers should not assume that a sediment basin for location A is applicable to location B. Therefore, designers can use this factsheet as guidance but will need to apply professional judgment and knowledge of the site to design an effective and efficient sediment basin. The following provides a general overview of typical design methodologies:

Step 1. Hydrologic Design

- Evaluate the site constraints and assess the drainage area for the sediment basin. Designers should consider on- and off-site flows as well as changes in the drainage area associated with site construction/disturbance. To minimize additional construction during the course of the project, the designer should consider identifying the maximum drainage area when calculating the basin dimensions.
- If a local hydrology manual is not available it is recommended to follow standard rational method procedures to estimate discharge. The references section of this factsheet provides a reference to standard hydrology textbooks that can provide standard methodologies. If local rainfall depths are not available, values can be obtained from standard precipitation frequency maps from NOAA (downloaded from <http://www.wrcc.dri.edu/pcpnfreq.html>).

Step 2. Hydraulic Design

- Calculate the surface area required for the sediment basin using Equation 1. In which discharge is estimated for a 10-yr 6-hr event using rational method procedure listed in local hydrology manual and V_s is estimated using Stokes Law presented in Equation 3.

$$V_s = 2.81d^2 \quad (\text{Eq. 3})$$

Where

V_s = Settling velocity in feet per second at 68°F

d = diameter of sediment particle in millimeters (smallest soil grain size determined by wet sieve analysis or fine silt (0.01 mm [or 0.0004 in.]

- In general the basin outlet design requires an iterative trial and error approach that considered the maximum water surface elevation, the elevation versus volume (stage-storage) relationship, the elevation versus discharge (stage-discharge) relationship, and the estimated inflow hydrograph. To adequately design the basins to settle sediment, the outlet configuration and associated outflow rates can be estimated by numerous methodologies. The following provides some guidance for design the basin outlet:
 - An outlet should have more than one orifice.
 - An outlet design typically utilizes multiple horizontal rows of orifices (approximately 3 or more) with at least 2 orifices per row (see Figures 1 and 2 at the end of this fact sheet).
 - Orifices can vary in shape.
 - Select the appropriate orifice diameter and number of perforations per row with the objective of minimizing the number of rows while maximizing the detention time.

- The diameter of each orifice is typically a maximum of 3-4 inches and a minimum of 0.25-0.5 inches.
- If a rectangular orifice is used, it is recommended to have minimum height of 0.5 inches and a maximum height of 6 inches.
- Rows are typically spaced at three times the diameter center to center vertically with a minimum distance of approximately 4 inches on center and a maximum distance of 1 foot on center.
- To estimate the outflow rate, each row is calculated separately based on the flow through a single orifice then multiplied by the number of orifices in the row. This step is repeated for each of the rows. Once all of the orifices are estimated, the total outflow rate versus elevation (stage-discharge curve) is developed to evaluate the detention time within the basin.
- Flow through a single orifice can be estimated using an Equation 4:

$$Q = BC' A(2gH)^{0.5} \quad (\text{Eq.4})$$

Where

Q = Discharge in ft³/s

C' = Orifice coefficient (unitless)

A = Area of the orifice (ft²)

g = acceleration due to gravity (ft³/s)

H = Head above the orifice (ft)

B = Anticipated Blockage or clogging factor (unitless), It is dependent on anticipated sediment and debris load, trash rack configuration etc, so the value is dependent on design engineers professional judgment and/or local requirements (B is never greater than 1 and a value of 0.5 is generally used)

- Care must be taken in the selection of orifice coefficient ("C'"); 0.60 is most often recommended and used. However, based on actual tests, Young and Graziano (1989), "Outlet Hydraulics of Extended Detention Facilities for Northern Virginia Planning District Commission", recommends the following:
 - C' = 0.66 for thin materials; where the thickness is equal to or less than the orifice diameter, or
 - C' = 0.80 when the material is thicker than the orifice diameter
- If different sizes of orifices are used along the riser then they have to be sized such that not more than 50 percent of the design storm event drains in one-third of the drawdown time (to provide adequate settling time for events smaller than the design storm event) and the entire volume drains within 96 hours or as regulated by the local vector control agency. If a basin fails to drain within 96 hours, the basin must be pumped dry.

- Because basins are not maintained for infiltration, water loss by infiltration should be disregarded when designing the hydraulic capacity of the outlet structure.
- **Floating Outlet Skimmer:** The floating skimmer (see Figure 3 at the end of this fact sheet is an alternative outlet configuration (patented) that drains water from upper portion of the water column. This configuration has been used for temporary and permanent basins and can improve basin performance by eliminating bottom orifices which have the potential of discharging solids. Some design considerations for this alternative outlet device includes the addition of a sand filter or perforated under drain at the low point in the basin and near the floating skimmer. These secondary drains allow the basin to fully drain. More detailed guidelines for sizing the skimmer can be downloaded from <http://www.fairclothskimmer.com/>.
- **Hold and Release Valve:** An ideal sediment/detention basin would hold all flows to the design storm level for sufficient time to settle solids, and then slowly release the storm water. Implementing a reliable valve system for releasing detention basins is critical to eliminate the potential for flooding in such a system. Some variations of hold and release valves include manual valves, bladder devices or electrically operated valves. When a precipitation event is forecast, the valve would be close for the duration of the storm and appropriate settling time. When the settling duration is met (approximately 24 or 48 hours), the valve would be opened and allow the stormwater to be discharged at a rate that does not resuspend settled solids and in a non-erosive manner. If this type of system is used the valve should be designed to empty the entire basin within 96 hours or as stipulated by local vector control regulations.

Step 3. Evaluate the Capacity of the Sediment Basin

- Typically, sediment basins do not perform as designed when they are not properly maintained or the sediment yield to the basin is larger than expected. As part of a good sediment basin design, designers should consider maintenance cycles, estimated soil loss and/or sediment yield, and basin sediment storage volume. The two equations below can be used to quantify the amount of soil entering the basin.
- The Revised Universal Soil Loss Equation (RUSLE, Eq.5) can be used to estimate annual soil loss and the Modified Universal Soil Equation (MUSLE, Eq.6) can be used to estimate sediment yield from a single storm event.

$$A = R \times K \times LS \times C \times P \quad (\text{Eq.5})$$

$$Y = 95(Q \times q_p)^{0.56} \times K \times LS \times C \times P \quad (\text{Eq.6})$$

Where:

A = annual soil loss, tons/acre-year

R = rainfall erosion index, in 100 ft.tons/acre.in/hr

K = soil erodibility factor, tons/acre per unit of R

LS = slope length and steepness factor (unitless)

C = vegetative cover factor (unitless)

P = erosion control practice factor (unitless)

Y = single storm sediment yield in tons

Q = runoff volume in acre-feet

q_p = peak flow in cfs

- Detailed descriptions and methodologies for estimating the soil loss can be obtained from standard hydrology text books (See References section).
- Determination of the appropriate equation should consider construction duration and local environmental factors (soils, hydrology, etc.). For example, if a basin is planned for a project duration of 1 year and the designer specifies one maintenance cycle, RUSLE could be used to estimate the soil loss and thereby the designer could indicate that the sediment storage volume would be half of the soil loss value estimated. As an example for use of MUSLE, a project may have a short construction duration thereby requiring fewer maintenance cycles and a reduced sediment storage volume. MUSLE would be used to estimate the anticipated soil loss based on a specific storm event to evaluate the sediment storage volume and appropriate maintenance frequency.
- The soil loss estimates are an essential step in the design and it is essential that the designer provide construction contractors with enough information to understand maintenance frequency and/or depths within the basin that would trigger maintenance. Providing maintenance methods, frequency and specification should be included in design bid documents such as the SWPPP Site Map.
- Once the designer has quantified the amount of soil entering the basin, the depth required for sediment storage can be determined by dividing the estimated sediment loss by the surface area of the basin.

Step 4. Other Design Considerations

- Consider designing the volume of the settling zone for the total storm volume associated with the 2-year event or other appropriate design storms specified by the local agency. This volume can be used as a guide for sizing the basin without iterative routing calculations. The depth of the settling zone can be estimated by dividing the estimated 2-yr storm volume by the surface area of the basin.
- The basin volume consists of two zones:
 - A sediment storage zone at least 1 ft deep.
 - A settling zone at least 2 ft deep.
 - The basin depth must be no less than 3 ft (not including freeboard).
- Proper hydraulic design of the outlet is critical to achieving the desired performance of the basin. The outlet should be designed to drain the basin within 24 to 96 hours (also referred

to as “drawdown time”). The 24-hour limit is specified to provide adequate settling time; the 96-hour limit is specified to mitigate vector control concerns.

- Confirmation of the basin performance can be evaluated by routing the design storm (10-yr 6-hr, or as directed by local regulations) through the basin based on the basin volume (stage-storage curve) and the outlet design (stage-discharge curve based on the orifice configuration or equivalent outlet design).
- Sediment basins, regardless of size and storage volume, should include features to accommodate overflow or bypass flows that exceed the design storm event.
 - Include an emergency spillway to accommodate flows not carried by the principal spillway. The spillway should consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap (or equivalent protection) on fill slopes.
 - The spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, should be a minimum of 20 ft in length.
- Rock, vegetation or appropriate erosion control should be used to protect the basin inlet, outlet, and slopes against erosion.
- The total depth of the sediment basin should include the depth required for sediment storage, depth required for settling zone and freeboard of at least 1 foot or as regulated by local flood control agency for a flood event specified by the local agency.
- The basin alignment should be designed such that the length of the basin is more than twice the width of the basin; the length should be determined by measuring the distance between the inlet and the outlet. If the site topography does not allow for this configuration baffles should be installed so that the ratio is satisfied. If a basin has more than one inflow point, any inflow point that conveys more than 30 percent of the total peak inflow rate has to meet the required length to width ratio.
- An alternative basin sizing method proposed by Fifield (2004) can be consulted to estimate an alternative length to width ratio and basin configuration. These methods can be considered as part of Option 3 which allows for alternative designs that are protective or more protective of water quality.
- Baffles (see Figure 4 at the end of this fact sheet) can be considered at project sites where the existing topography or site constraints limit the length to width ratio. Baffles should be constructed of earthen berms or other structural material within the basin to divert flow in the basin, thus increasing the effective flow length from the basin inlet to the outlet riser. Baffles also reduce the change of short circuiting and allows for settling throughout the basin.
- Baffles are typically constructed from the invert of the basin to the crest of the emergency spillway (i.e., design event flows are meant to flow around the baffles and flows greater than the design event would flow over the baffles to the emergency spillway).

- Use of other materials for construction of basin baffles (such as silt fence) may not be appropriate based on the material specifications and will require frequent maintenance (maintain after every storm event). Maintenance may not be feasible when required due to flooded conditions resulting from frequent (i.e., back to back) storm events. Use of alternative baffle materials should not deviate from the intended purpose of the material, as described by the manufacturer.
- Sediment basins are best used in conjunction with erosion controls.
- Basins with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and basins capable of impounding more than 35,000 ft³, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.
- A forebay, constructed upstream of the basin may be provided to remove debris and larger particles.
- The outflow from the sediment basin should be provided with velocity dissipation devices (see BMP EC-10) to prevent erosion and scouring of the embankment and channel.
- The principal outlet should consist of a corrugated metal, high density polyethylene (HDPE), or reinforced concrete riser pipe with dewatering holes and an anti-vortex device and trash rack attached to the top of the riser, to prevent floating debris from flowing out of the basin or obstructing the system. This principal structure should be designed to accommodate the inflow design storm.
- A rock pile or rock-filled gabions can serve as alternatives to the debris screen, although the designer should be aware of the potential for extra maintenance involved should the pore spaces in the rock pile clog.
- The outlet structure should be placed on a firm, smooth foundation with the base securely anchored with concrete or other means to prevent floatation.
- Attach riser pipe (watertight connection) to a horizontal pipe (barrel). Provide anti-seep collars on the barrel.
- Cleanout level should be clearly marked on the riser pipe.

Installation

- Securely anchor and install an anti-seep collar on the outlet pipe/riser and provide an emergency spillway for passing major floods (see local flood control agency).
- Areas under embankments must be cleared and stripped of vegetation.
- Chain link fencing should be provided around each sediment basin to prevent unauthorized entry to the basin or if safety is a concern.

Costs

The cost of a sediment basin is highly variable and is dependent of the site configuration. To decrease basin construction costs, designers should consider using existing site features such as berms or depressed area to site the sediment basin. Designers should also consider potential savings associated with designing the basin to minimize the number of maintenance cycles and siting the basin in a location where a permanent BMP (e.g., extended detention basin) is required for the project site.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level and as required by local requirements. It is recommended that at a minimum, basins be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Examine basin banks for seepage and structural soundness.
- Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Check inlet and outlet area for erosion and stabilize if required.
- Check fencing for damage and repair as needed.
- Sediment that accumulates in the basin must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage volume. Sediment removed during maintenance should be managed properly. The sediment should be appropriately evaluated and used or disposed of accordingly. Options include: incorporating sediment into earthwork on the site (only if there is no risk that sediment is contaminated); or off-site export/disposal at an appropriate location (e.g., sediment characterization and disposal to an appropriate landfill).
- Remove standing water from basin within 96 hours after accumulation.
- If the basin does not drain adequately (e.g., due to storms that are more frequent or larger than the design storm or other unforeseen site conditions), dewatering should be conducted in accordance with appropriate dewatering BMPs (see NS-2) and in accordance with local permits as applicable.
- To minimize vector production:
 - Remove accumulation of live and dead floating vegetation in basins during every inspection.
 - Remove excessive emergent and perimeter vegetation as needed or as advised by local or state vector control agencies.

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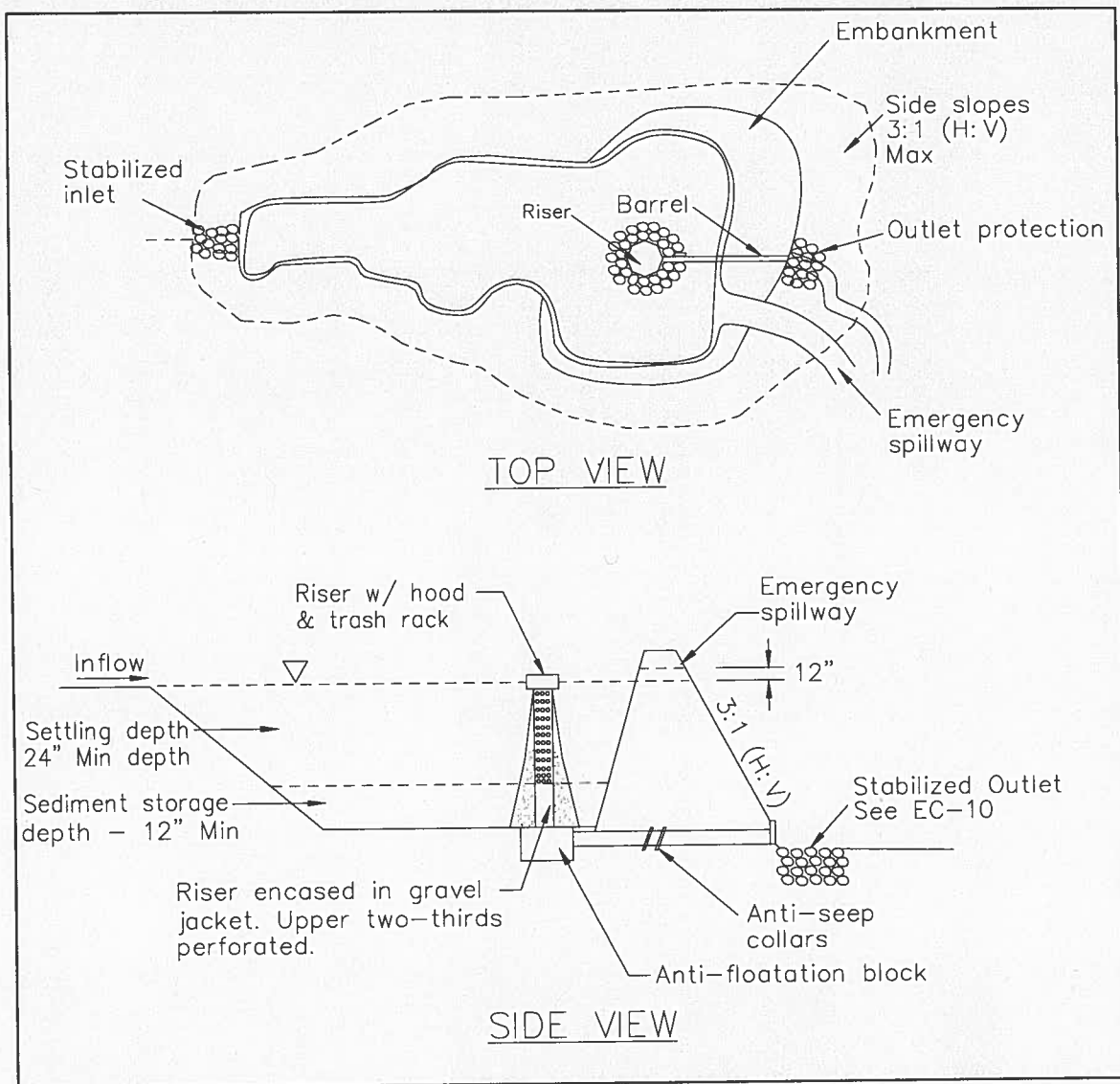


**FIGURE 1: TYPICAL TEMPORARY SEDIMENT BASIN
MULTIPLE ORIFICE DESIGN
NOT TO SCALE**

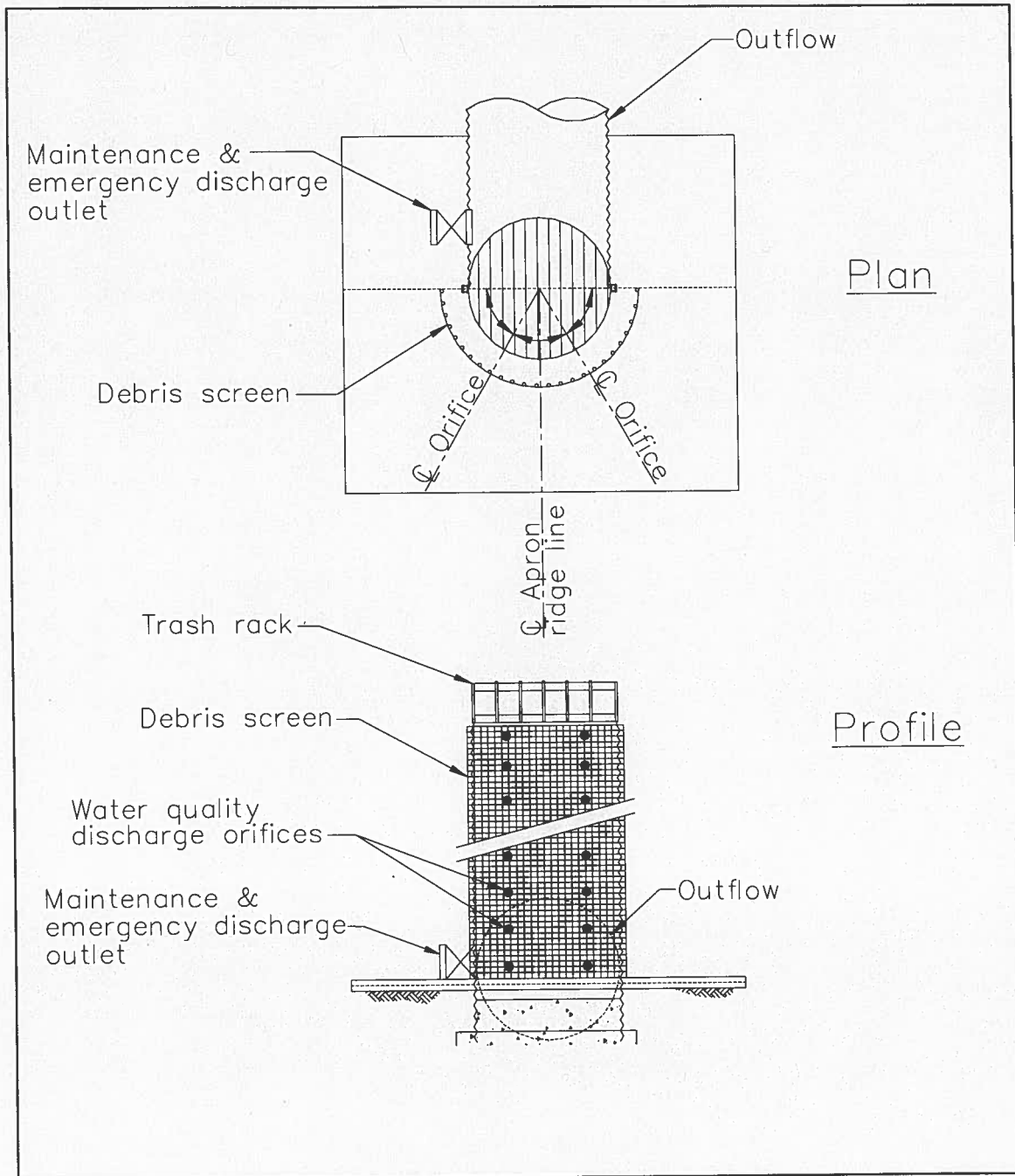


FIGURE 2: MULTIPLE ORIFICE OUTLET RISER
NOT TO SCALE

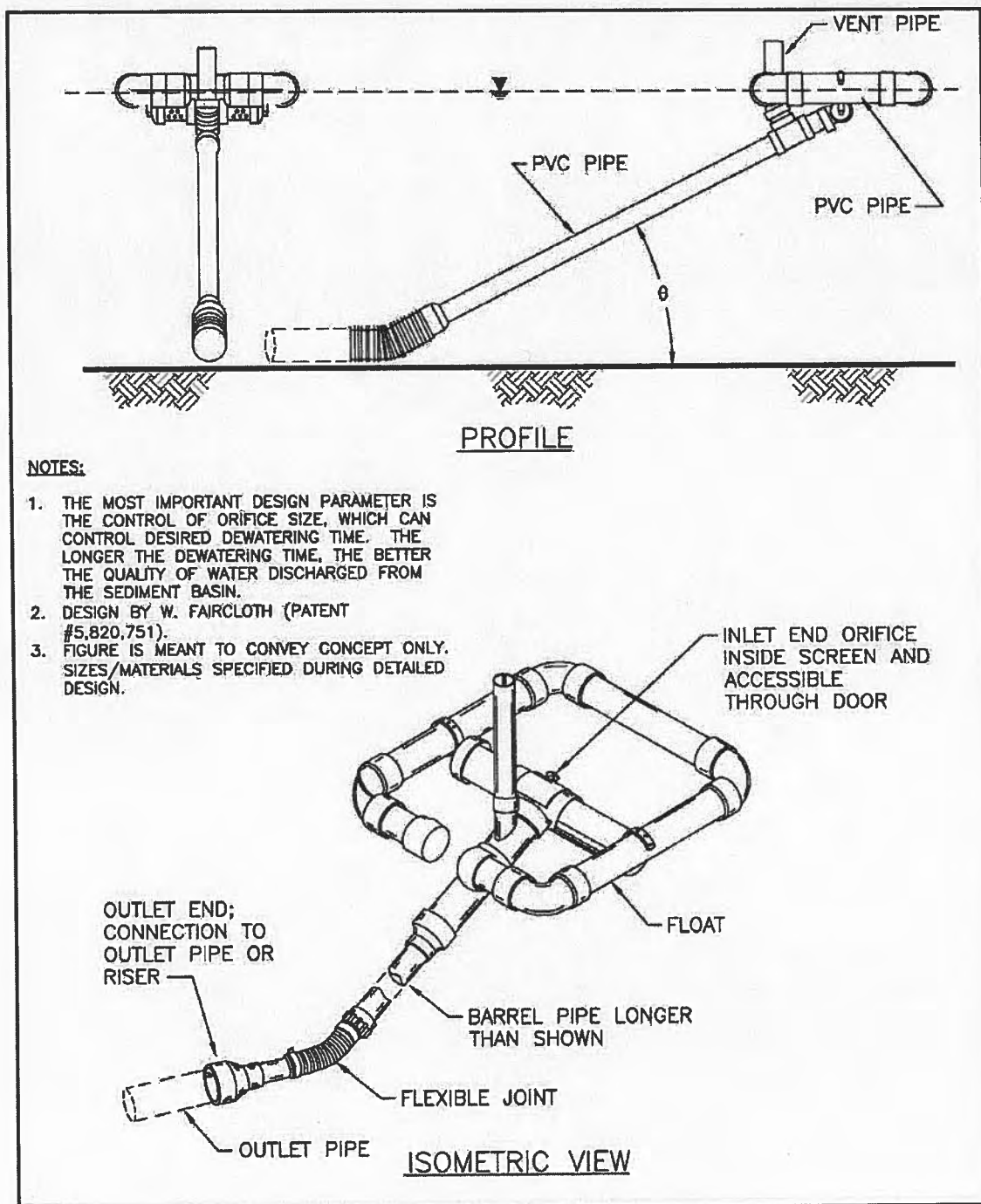


FIGURE 3: TYPICAL SKIMMER
NOT TO SCALE

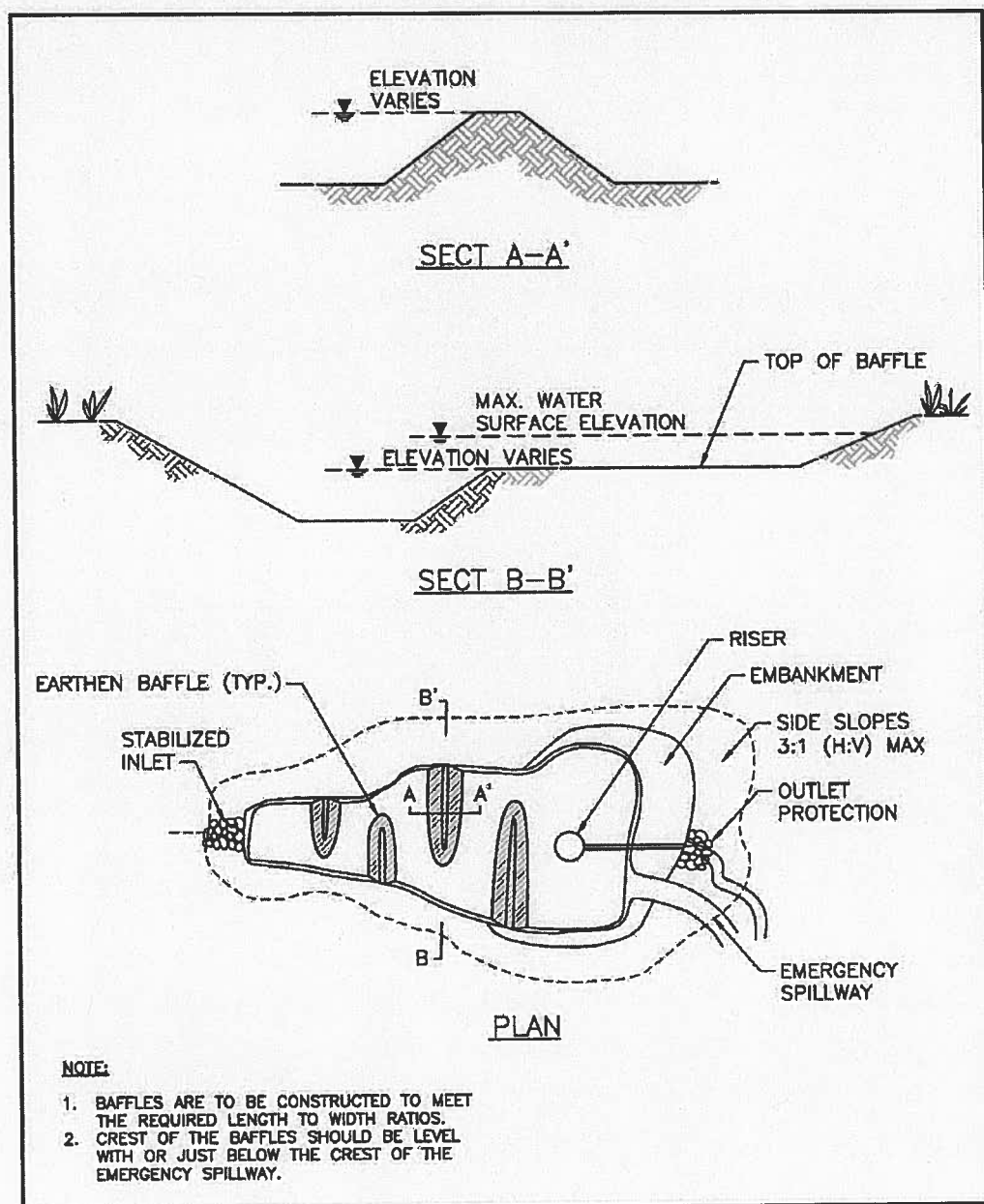
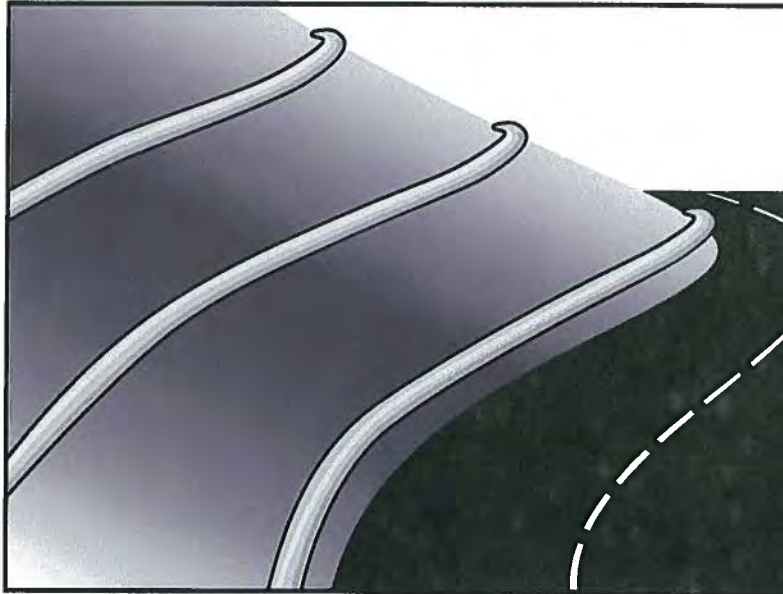


**FIGURE 4: TYPICAL TEMPORARY SEDIMENT BASIN
WITH BAFFLES
NOT TO SCALE**



Description and Purpose

A fiber roll consists of straw, coir, or other biodegradable materials bound into a tight tubular roll wrapped by netting, which can be photodegradable or natural. Additionally, gravel core fiber rolls are available, which contain an imbedded ballast material such as gravel or sand for additional weight when staking the rolls are not feasible (such as use as inlet protection). When fiber rolls are placed at the toe and on the face of slopes along the contours, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff (through sedimentation). By interrupting the length of a slope, fiber rolls can also reduce sheet and rill erosion until vegetation is established.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- At the end of a downward slope where it transitions to a steeper slope.
- Along the perimeter of a project.
- As check dams in unlined ditches with minimal grade.
- Down-slope of exposed soil areas.
- At operational storm drains as a form of inlet protection.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- SE-1 Silt Fence
- SE-6 Gravel Bag Berm
- SE-8 Sandbag Barrier
- SE-12 Temporary Silt Dike
- SE-14 Biofilter Bags



- Around temporary stockpiles.

Limitations

- Fiber rolls are not effective unless trenched in and staked.
- Not intended for use in high flow situations.
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.
- Rolls typically function for 12-24 months depending upon local conditions.

Implementation

Fiber Roll Materials

- Fiber rolls should be prefabricated.
- Fiber rolls may come manufactured containing polyacrylamide (PAM), a flocculating agent within the roll. Fiber rolls impregnated with PAM provide additional sediment removal capabilities and should be used in areas with fine, clayey or silty soils to provide additional sediment removal capabilities. Monitoring may be required for these installations.
- Fiber rolls are made from weed free rice straw, flax, or a similar agricultural material bound into a tight tubular roll by netting.
- Typical fiber rolls vary in diameter from 9 in. to 20 in. Larger diameter rolls are available as well.

Installation

- Locate fiber rolls on level contours spaced as follows:
 - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
 - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
 - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Prepare the slope before beginning installation.
- Dig small trenches across the slope on the contour. The trench depth should be $\frac{1}{4}$ to $\frac{1}{3}$ of the thickness of the roll, and the width should equal the roll diameter, in order to provide area to backfill the trench.

- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- It is recommended that pilot holes be driven through the fiber roll. Use a straight bar to drive holes through the roll and into the soil for the wooden stakes.
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into the trench.
 - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
 - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.
- See typical fiber roll installation details at the end of this fact sheet.

Removal

- Fiber rolls can be left in place or removed depending on the type of fiber roll and application (temporary vs. permanent installation). Typically, fiber rolls encased with plastic netting are used for a temporary application because the netting does not biodegrade. Fiber rolls used in a permanent application are typically encased with a biodegradable material and are left in place. Removal of a fiber roll used in a permanent application can result in greater disturbance.
- Temporary installations should only be removed when up gradient areas are stabilized per General Permit requirements, and/or pollutant sources no longer present a hazard. But, they should also be removed before vegetation becomes too mature so that the removal process does not disturb more soil and vegetation than is necessary.

Costs

Material costs for regular fiber rolls range from \$20 - \$30 per 25 ft roll.

Material costs for PAM impregnated fiber rolls range between 7.00-\$9.00 per linear foot, based upon vendor research.

Inspection and Maintenance

- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP should be periodically removed

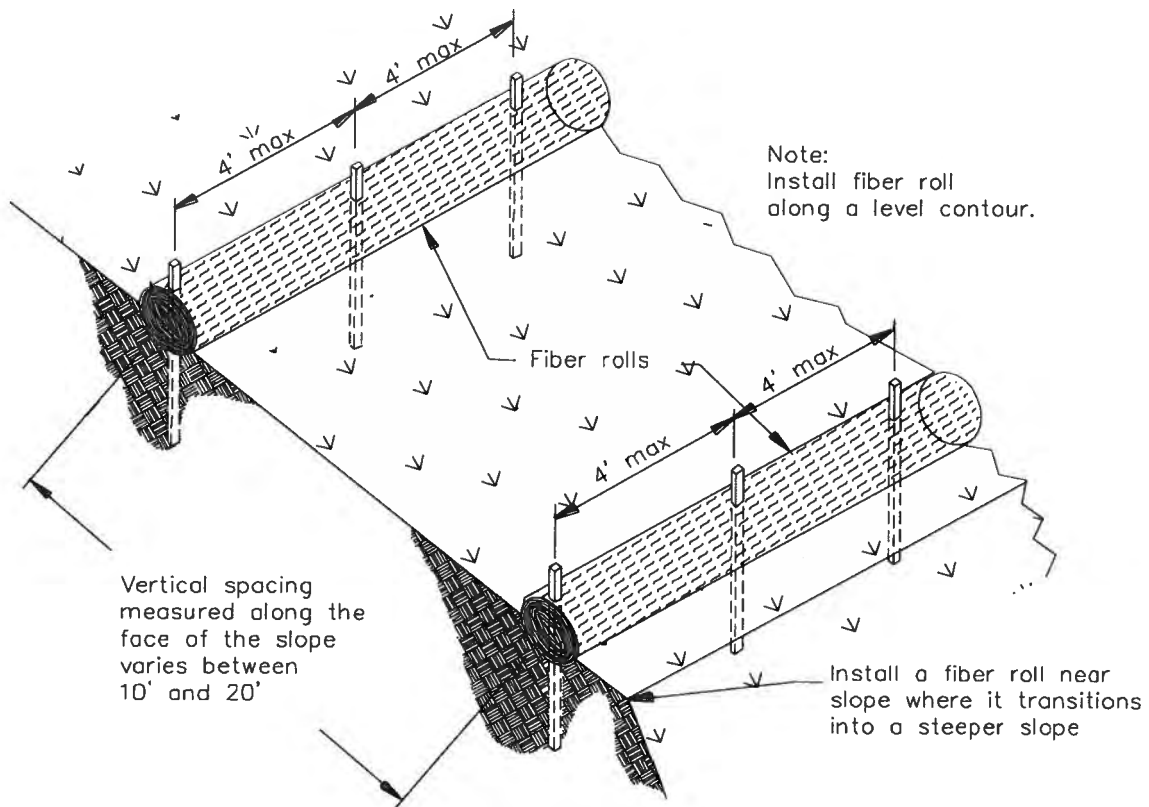
in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-third the designated sediment storage depth.

- If fiber rolls are used for erosion control, such as in a check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.
- Repair any rills or gullies promptly.

References

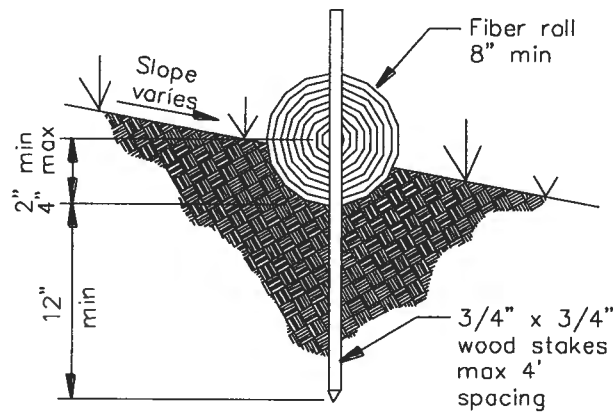
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



TYPICAL FIBER ROLL INSTALLATION

N.T.S.

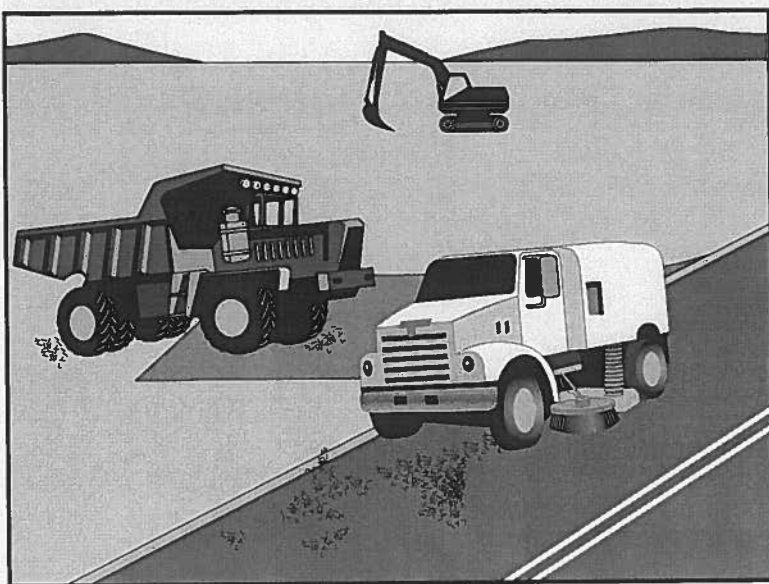


ENTRENCHMENT DETAIL

N.T.S.

Street Sweeping and Vacuuming

SE-7



Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.
- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.

Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	☒
Metals	
Bacteria	
Oil and Grease	☒
Organics	

Potential Alternatives

None



Street Sweeping and Vacuuming SE-7

- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from \$58/hour (3 yd³ hopper) to \$88/hour (9 yd³ hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

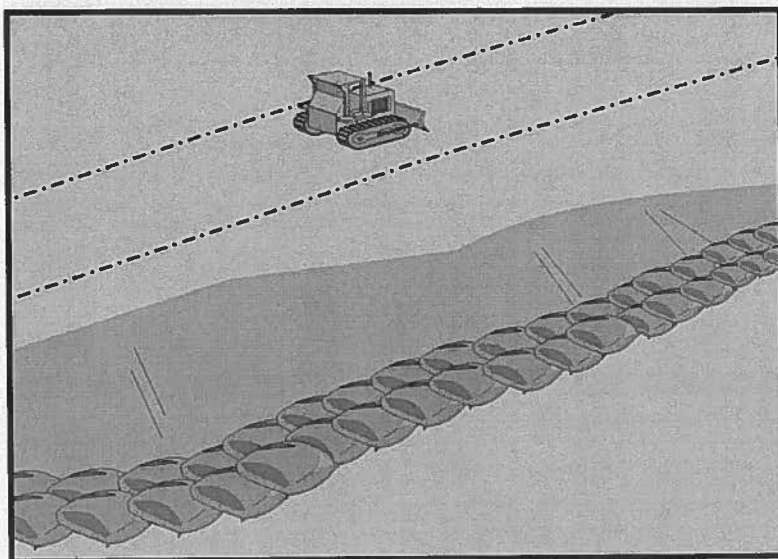
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Sandbag Barrier

SE-8



Description and Purpose

A sandbag barrier is a series of sand-filled bags placed on a level contour to intercept or to divert sheet flows. Sandbag barriers placed on a level contour pond sheet flow runoff, allowing sediment to settle out.

Suitable Applications

Sandbag barriers may be suitable:

- As a linear sediment control measure:
 - Below the toe of slopes and erodible slopes.
 - As sediment traps at culvert/pipe outlets.
 - Below other small cleared areas.
 - Along the perimeter of a site.
 - Down slope of exposed soil areas.
 - Around temporary stockpiles and spoil areas.
 - Parallel to a roadway to keep sediment off paved areas.
 - Along streams and channels.
- As linear erosion control measure:
 - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

- SE-1 Silt Fence
- SE-5 Fiber Rolls
- SE-6 Gravel Bag Berm
- SE-14 Biofilter Bags



- At the top of slopes to divert runoff away from disturbed slopes.
- As check dams across mildly sloped construction roads.

Limitations

- It is necessary to limit the drainage area upstream of the barrier to 5 acres.
- Sandbags are not intended to be used as filtration devices.
- Easily damaged by construction equipment.
- Degraded sandbags may rupture when removed, spilling sand.
- Sand is easily transported by runoff if bag is damaged or ruptured.
- Installation can be labor intensive.
- Durability of sandbags is somewhat limited and bags may need to be replaced when installation is required for longer than 6 months. When used to detain concentrated flows, maintenance requirements increase.
- Burlap should not be used for sandbags.

Implementation

General

A sandbag barrier consists of a row of sand-filled bags placed on a level contour. When appropriately placed, a sandbag barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding allows sediment to settle. Sand-filled bags have limited porosity, which is further limited as the fine sand tends to quickly plug with sediment, limiting or completely blocking the rate of flow through the barrier. If a porous barrier is desired, consider SE-1, Silt Fence, SE-5, Fiber Rolls, SE-6, Gravel Bag Berms or SE-14, Biofilter Bags. Sandbag barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets which erode rills, and ultimately gullies, into disturbed, sloped soils. Sandbag barriers are similar to gravel bag berms, but less porous. Generally, sandbag barriers should be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.

Design and Layout

- Locate sandbag barriers on a level contour.
- When used for slope interruption, the following slope/sheet flow length combinations apply:
 - Slope inclination of 4:1 (H:V) or flatter: Sandbags should be placed at a maximum interval of 20 ft, with the first row near the slope toe.
 - Slope inclination between 4:1 and 2:1 (H:V): Sandbags should be placed at a maximum interval of 15 ft. (a closer spacing is more effective), with the first row near the slope toe.

Slope inclination 2:1 (H:V) or greater: Sandbags should be placed at a maximum interval of 10 ft. (a closer spacing is more effective), with the first row near the slope toe.

- Turn the ends of the sandbag barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, sand bag barriers should be set back from the slope toe to facilitate cleaning. Where specific site conditions do not allow for a set-back, the sand bag barrier may be constructed on the toe of the slope. To prevent flows behind the barrier, bags can be placed perpendicular to a berm to serve as cross barriers.
- Drainage area should not exceed 5 acres.
- Stack sandbags at least three bags high.
- Butt ends of bags tightly.
- Overlap butt joints of row beneath with each successive row.
- Use a pyramid approach when stacking bags.
- In non-traffic areas
 - Height = 18 in. maximum
 - Top width = 24 in. minimum for three or more layer construction
 - Side slope = 2:1 (H:V) or flatter
- In construction traffic areas
 - Height = 12 in. maximum
 - Top width = 24 in. minimum for three or more layer construction.
 - Side slopes = 2:1 (H:V) or flatter.
- See typical sandbag barrier installation details at the end of this fact sheet.

Materials

- **Sandbag Material:** Sandbag should be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight of 4 ounces/yd², Mullen burst strength exceeding 300 lb/in² in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355. Use of burlap is not an acceptable substitute, as sand can more easily mobilize out of burlap.
- **Sandbag Size:** Each sand-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.

- **Fill Material:** All sandbag fill material should be non-cohesive, Class 3 (Caltrans Standard Specification, Section 25) permeable material free from clay and deleterious material, such as recycled concrete or asphalt.

Costs

Empty sandbags cost \$0.25 - \$0.75. Average cost of fill material is \$8 per yd³. Additional labor is required to fill the bags. Pre-filled sandbags are more expensive at \$1.50 - \$2.00 per bag. These costs are based upon vendor research.

Inspection and Maintenance

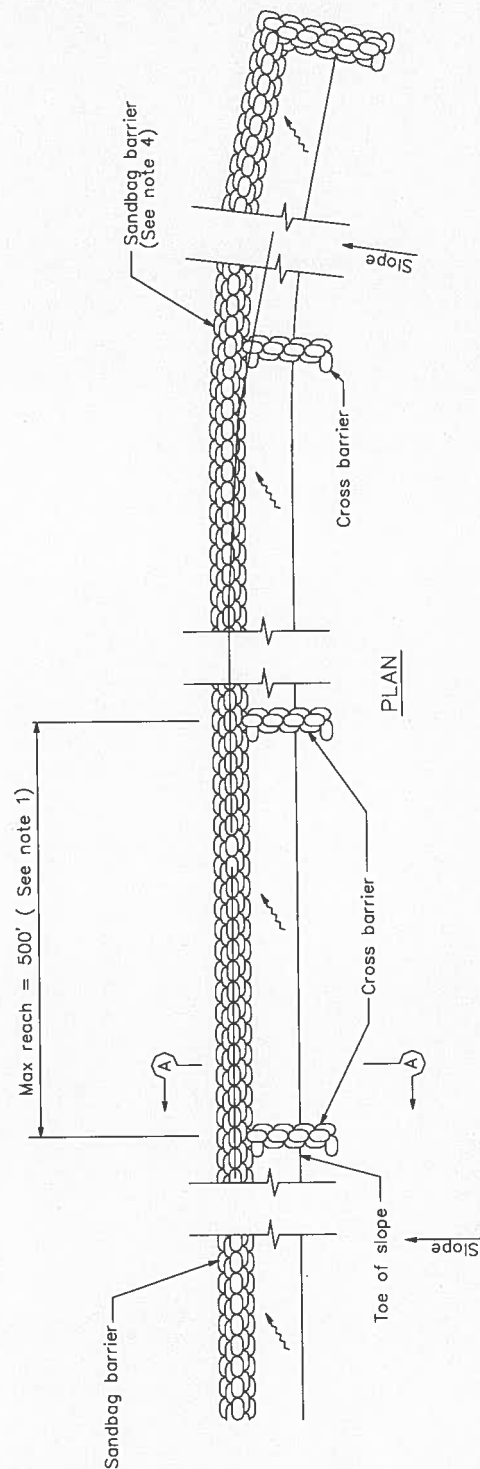
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sandbags exposed to sunlight will need to be replaced every two to three months due to degradation of the bags.
- Reshape or replace sandbags as needed.
- Repair washouts or other damage as needed.
- Sediment that accumulates behind the BMP should be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height.
- Remove sandbags when no longer needed and recycle sand fill whenever possible and properly dispose of bag material. Remove sediment accumulation, and clean, re-grade, and stabilize the area.

References

Standard Specifications for Construction of Local Streets and Roads, California Department of Transportation (Caltrans), July 2002.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

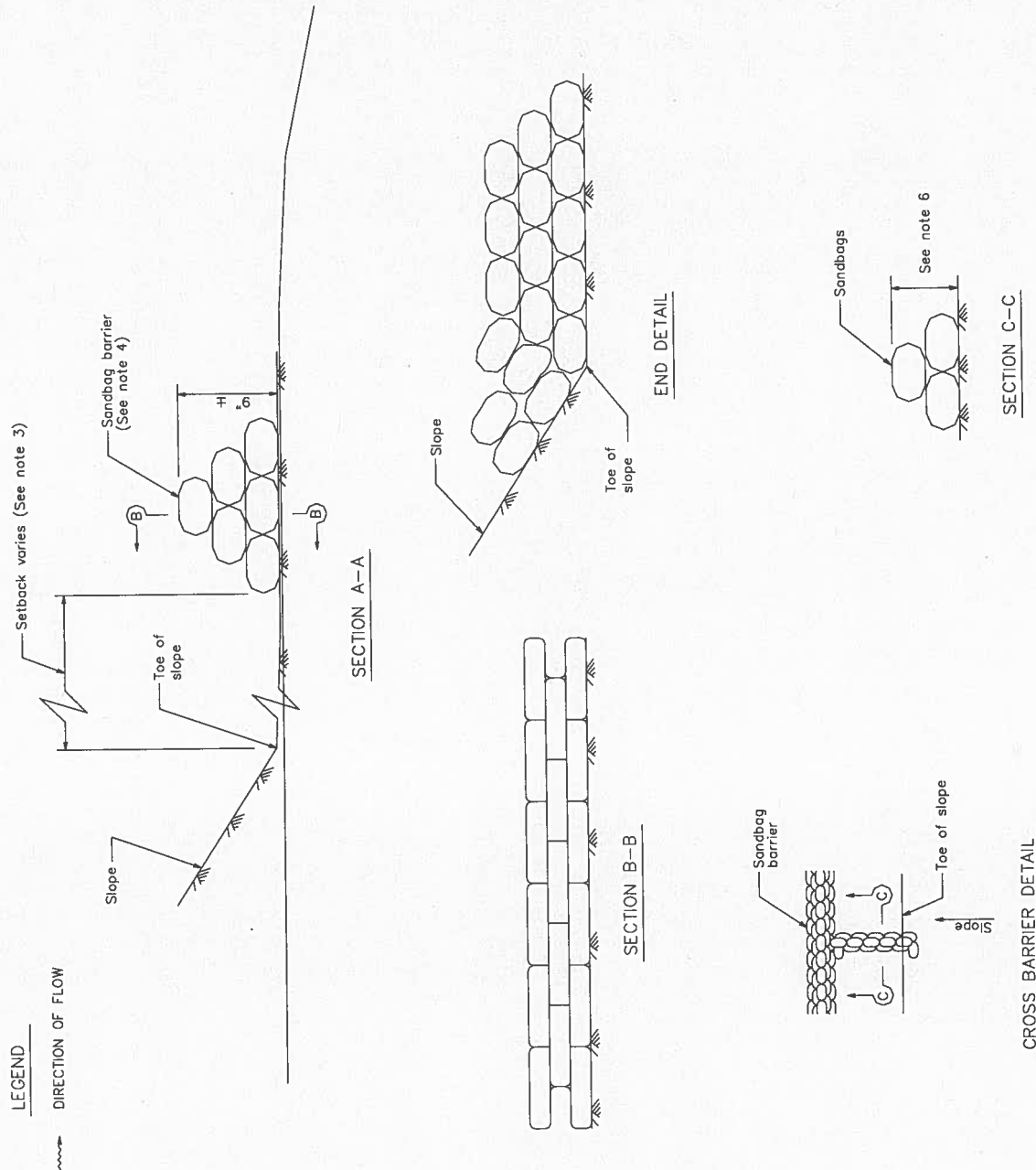
Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



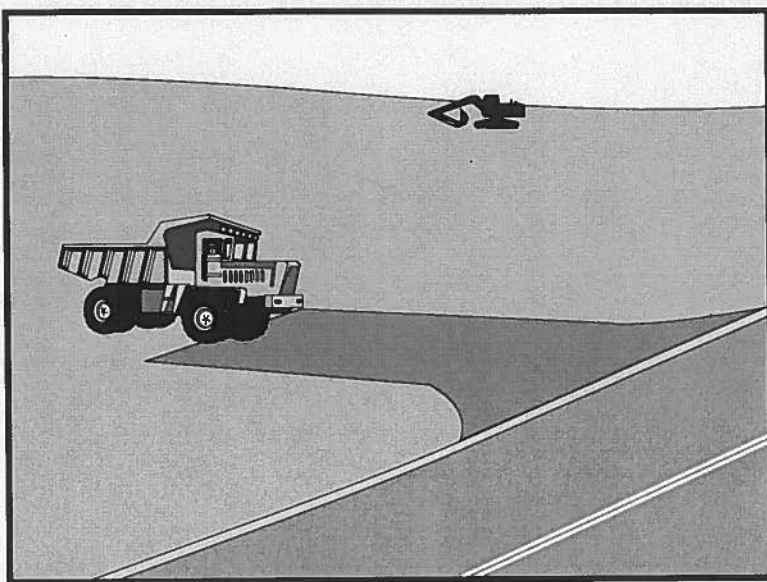
SANDBAG BARRIER

NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed $1/2$ the height of the linear barrier. In no case shall the reach length exceed 500'.
2. Place sandbags tightly.
3. Dimension may vary to fit field condition.
4. Sandbag barrier shall be a minimum of 3 bags high.
5. The end of the barrier shall be turned up slope.
6. Cross barriers shall be a min of $1/2$ and a max of $2/3$ the height of the linear barrier.
7. Sandbag rows and layers shall be staggered to eliminate gaps.



Stabilized Construction Entrance/Exit TC-1



Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water



Stabilized Construction Entrance/Exit TC-1

runoff.

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft minimum, and 30 ft minimum width.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.

Stabilized Construction Entrance/Exit TC-1

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from \$1,200 to \$4,800 each, averaging \$2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from \$1,200 - \$6,000 each, averaging \$3,600 per entrance.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stabilized Construction Entrance/Exit TC-1

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

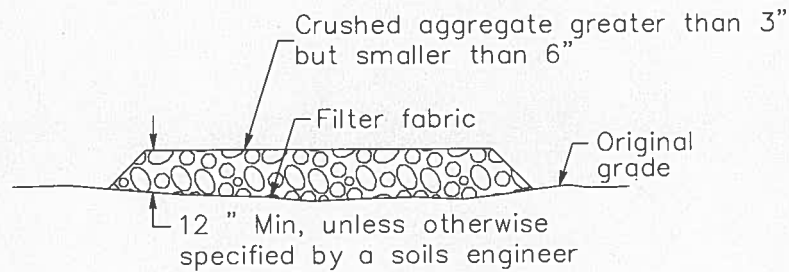
Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

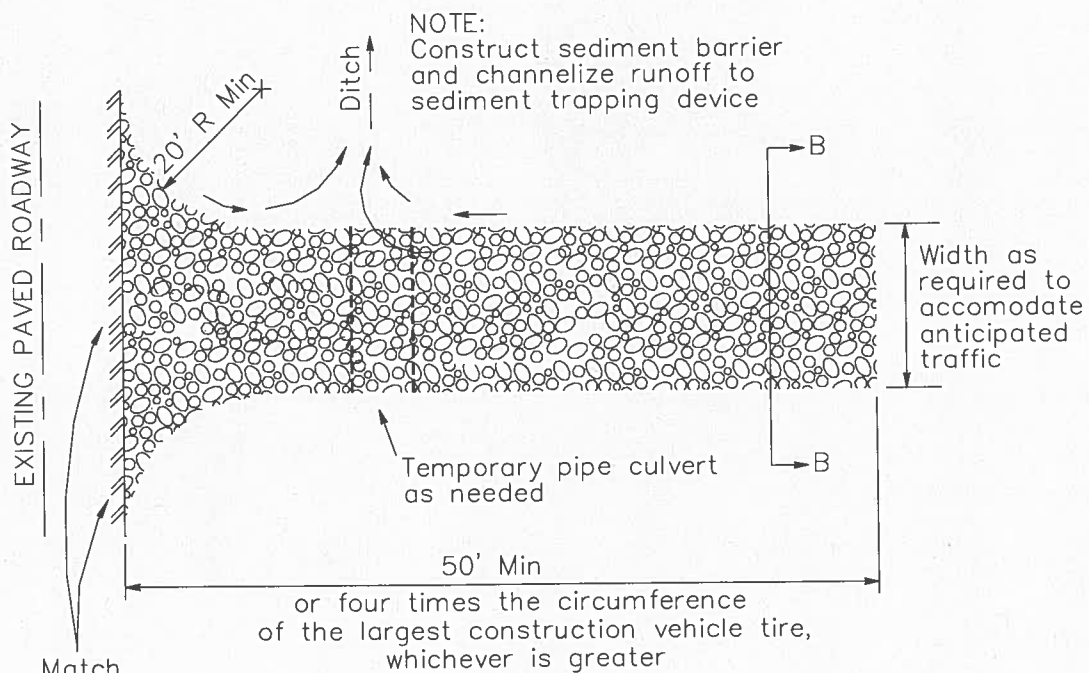
Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Stabilized Construction Entrance/Exit TC-1

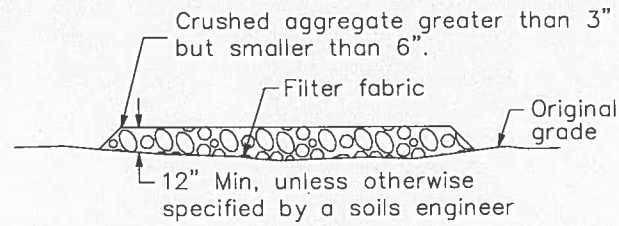


SECTION B-B
NTS

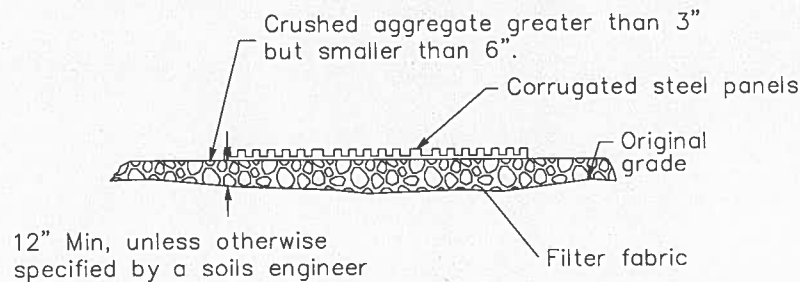


PLAN
NTS

Stabilized Construction Entrance/Exit TC-1

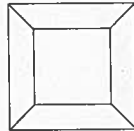


SECTION B-B
NTS

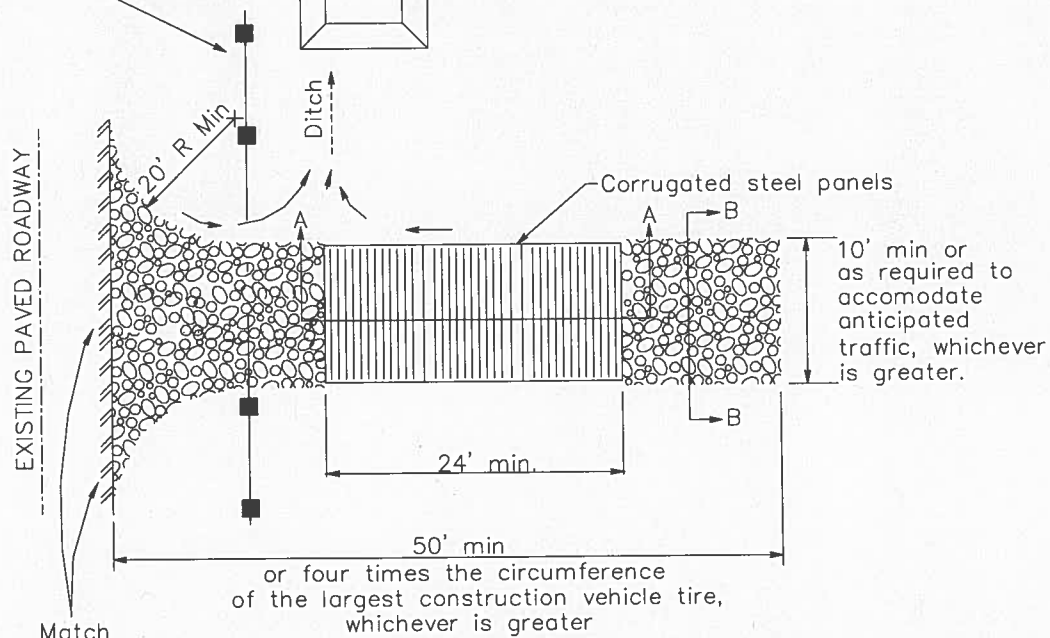


SECTION A-A
NOT TO SCALE

NOTE:
Construct sediment barrier and channelize runoff to sediment trapping device



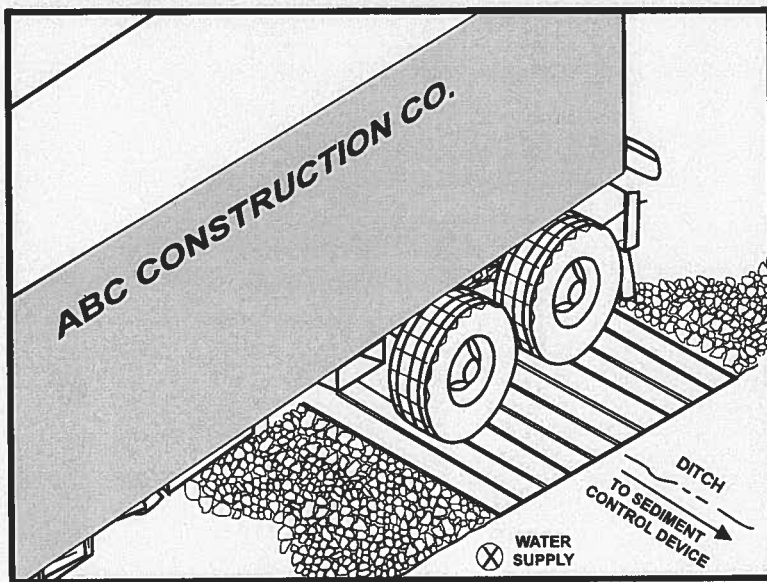
Sediment trapping device



PLAN
NTS

Entrance/Outlet Tire Wash

TC-3



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☒
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

TC-1 Stabilized Construction Entrance/Exit

Description and Purpose

A tire wash is an area located at stabilized construction access points to remove sediment from tires and under carriages and to prevent sediment from being transported onto public roadways.

Suitable Applications

Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.

Limitations

- The tire wash requires a supply of wash water.
- A turnout or doublewide exit is required to avoid having entering vehicles drive through the wash area.
- Do not use where wet tire trucks leaving the site leave the road dangerously slick.

Implementation

- Incorporate with a stabilized construction entrance/exit. See TC-1, Stabilized Construction Entrance/Exit.
- Construct on level ground when possible, on a pad of coarse aggregate greater than 3 in. but smaller than 6 in. A geotextile fabric should be placed below the aggregate.
- Wash rack should be designed and constructed/manufactured for anticipated traffic loads.



- Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff.
- Use hoses with automatic shutoff nozzles to prevent hoses from being left on.
- Require that all employees, subcontractors, and others that leave the site with mud caked tires and undercarriages to use the wash facility.
- Implement SC-7, Street Sweeping and Vacuuming, as needed.

Costs

Costs are low for installation of wash rack.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.
- Inspect routinely for damage and repair as needed.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

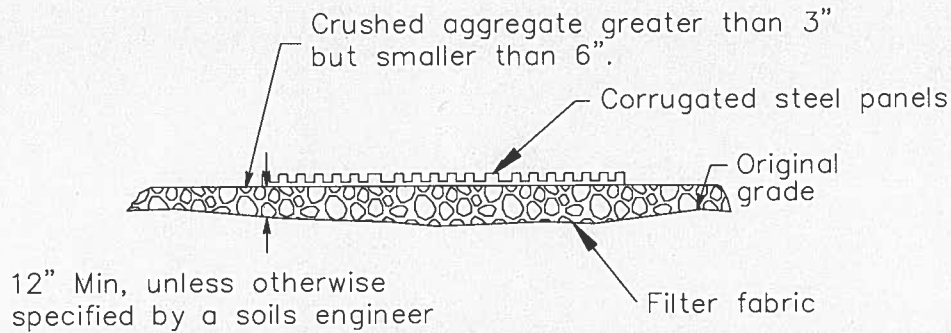
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

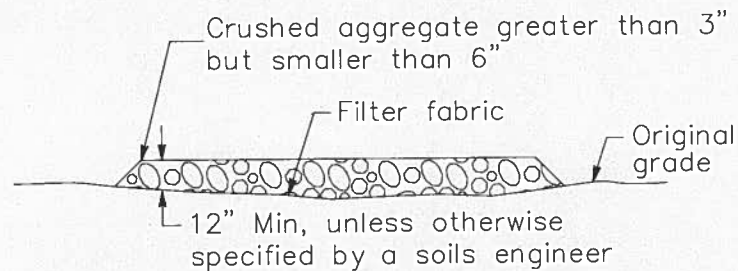
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Entrance/Outlet Tire Wash

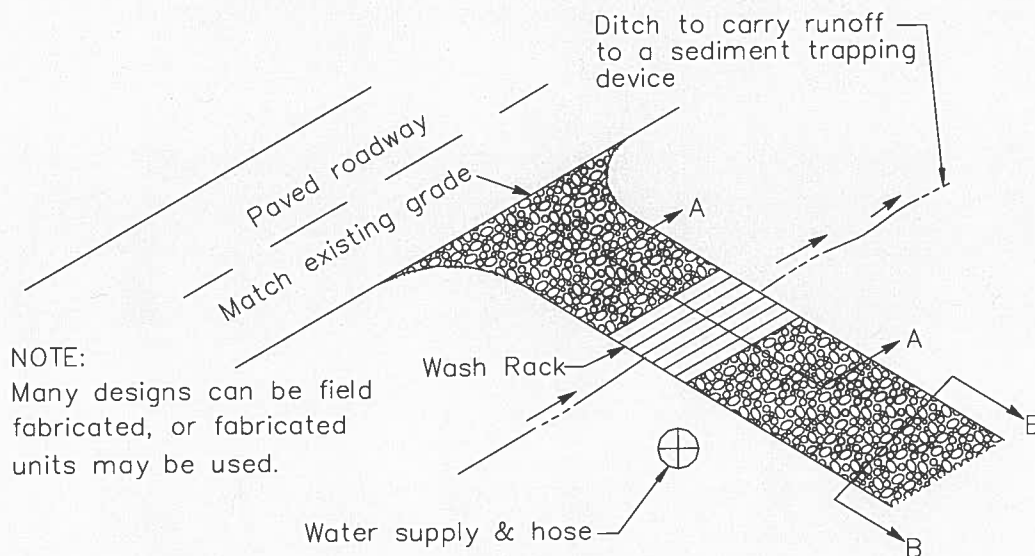
TC-3



SECTION A-A
NOT TO SCALE



SECTION B-B
NTS



TYPICAL TIRE WASH
NOT TO SCALE



Description and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and the transport of pollutants offsite. These practices can reduce or eliminate non-stormwater discharges.

Suitable Applications

Water conservation practices are suitable for all construction sites where water is used, including piped water, metered water, trucked water, and water from a reservoir.

Limitations

- None identified.

Implementation

- Keep water equipment in good working condition.
- Stabilize water truck filling area.
- Repair water leaks promptly.
- Washing of vehicles and equipment on the construction site is discouraged.
- Avoid using water to clean construction areas. If water must be used for cleaning or surface preparation, surface should be swept and vacuumed first to remove dirt. This will minimize amount of water required.
- Direct construction water runoff to areas where it can soak

Categories

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



into the ground or be collected and reused.

- Authorized non-stormwater discharges to the storm drain system, channels, or receiving waters are acceptable with the implementation of appropriate BMPs.
- Lock water tank valves to prevent unauthorized use.

Costs

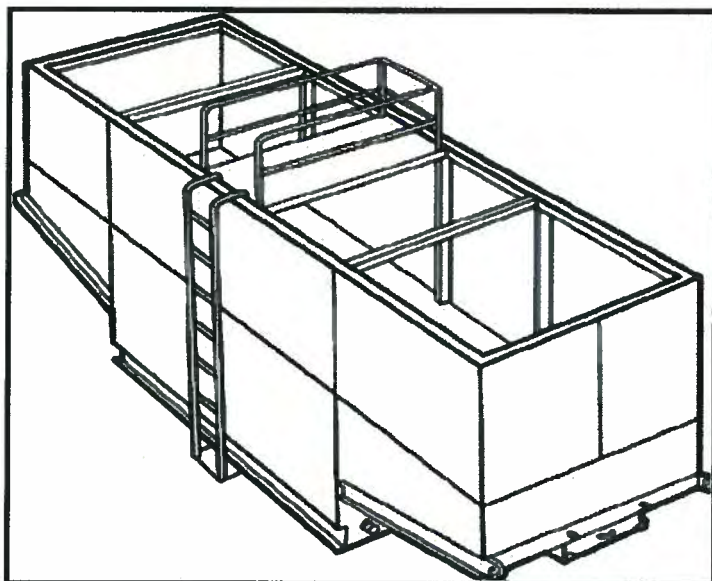
The cost is small to none compared to the benefits of conserving water.

Inspection and Maintenance

- Inspect and verify that activity based BMPs are in place prior to the commencement of authorized non-stormwater discharges.
- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges are occurring.
- Repair water equipment as needed to prevent unintended discharges.
 - Water trucks
 - Water reservoirs (water buffalos)
 - Irrigation systems
 - Hydrant connections

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



Categories

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Description and Purpose

Dewatering operations are practices that manage the discharge of pollutants when non-stormwater and accumulated precipitation (stormwater) must be removed from a work location to proceed with construction work or to provide vector control.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Discharges from dewatering operations can contain high levels of fine sediment and other pollutants that, if not properly treated, could lead to exceedences of the General Permit requirements or Basin Plan standards.

Suitable Applications

These practices are implemented for discharges of non-stormwater from construction sites. Non-stormwaters include, but are not limited to, groundwater, water from cofferdams, water diversions, and waters used during construction activities that must be removed from a work area to facilitate construction.

Practices identified in this section are also appropriate for implementation when managing the removal of accumulated precipitation (stormwater) from depressed areas at a construction site.

Stormwater mixed with non-stormwater should be managed as non-stormwater.

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☒
Organics	

Potential Alternatives

- SE-5: Fiber Roll
- SE-6: Gravel Bag Berm

Limitations

- Dewatering operations will require, and should comply with applicable local and project-specific permits and regulations. In some areas, all dewatering activities, regardless of the discharge volume, require a dewatering permit.
- Site conditions will dictate design and use of dewatering operations.
- The controls discussed in this fact sheet primarily address sediment. Other secondary pollutant removal benefits are discussed where applicable.
- The controls detailed in this fact sheet only allow for minimal settling time for sediment particles. Use only when site conditions restrict the use of the other control methods.
- Avoid dewatering discharges where possible by using the water for dust control.

Implementation

- A Construction Site Monitoring Plan (CSMP) should be included in the project Stormwater Pollution Prevention Plan (SWPPP).
- Regional Water Quality Control Board (RWQCB) Regions may require notification and approval prior to any discharge of water from construction sites.
- The destination of discharge from dewatering activities will typically determine the type of permit required by the discharger. For example, when discharging to a water of the U.S., a dewatering permit may be required from the site's governing RWQCB. When discharging to a sanitary sewer or Municipal Separate Storm Sewer System (MS4), a permit may need to be obtained through the owner of the sanitary sewer or MS4 in addition to obtaining an RWQCB dewatering permit. Additional permits or permissions from other agencies may be required for dewatering cofferdams or diversions.
- Dewatering discharges should not cause erosion at the discharge point. Appropriate BMPs should be implemented to maintain compliance with all applicable permits.
- Maintain dewatering records in accordance with all local and project-specific permits and regulations.

Sediment Treatment

A variety of methods can be used to treat water during dewatering operations. Several devices are presented below and provide options to achieve sediment removal. The sediment particle size and permit or receiving water limitations on sediment or turbidity are key considerations for selecting sediment treatment option(s); in some cases, the use of multiple devices may be appropriate. Use of other enhanced treatment methods (i.e., introduction of chemicals or electric current to enhance flocculation and removal of sediment) must comply with: 1) for storm drain or surface water discharges, the requirements for Active Treatment Systems (see SE-11); or 2) for sanitary sewer discharges, the requirements of applicable sanitary sewer discharge permits.

Sediment Basin (see also SE-2)

Description:

- A sediment basin is a temporary basin with a controlled release structure that is formed by excavation or construction of an embankment to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment basins are generally larger than Sediment Traps (SE-3) and have a designed outlet structure.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, silt, some metals that settle out with the sediment.

Implementation:

- Excavation and construction of related facilities is required.
- Temporary sediment basins should be fenced if safety is a concern.
- Outlet protection is required to prevent erosion at the outfall location.

Maintenance:

- Maintenance is required for safety fencing, vegetation, embankment, inlet and outlet, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Sediment Trap (See also SE-3)

Description:

- A sediment trap is a temporary basin formed by excavation and/or construction of an earthen embankment across a waterway or low drainage area to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment traps are generally smaller than Sediment Basins (SE-2) and do not have a designed outlet (but do have a spillway or overflow).

Appropriate Applications:

Effective for the removal of large and medium sized particles (sand and gravel) and some metals that settle out with the sediment.

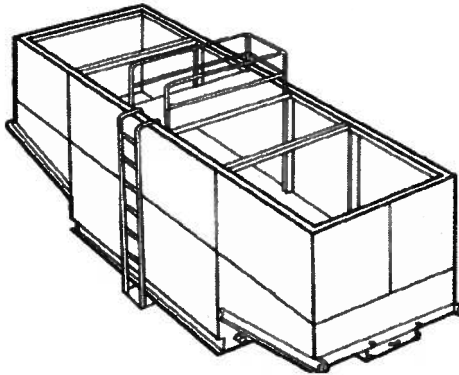
Implementation:

- Excavation and construction of related facilities is required.
- Trap inlets should be located to maximize the travel distance to the trap outlet.
- Use rock or vegetation to protect the trap outlets against erosion.

Maintenance:

- Maintenance is required for vegetation, embankment, inlet and outfall structures, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Weir Tanks



Description:

- A weir tank separates water and waste by using weirs. The configuration of the weirs (over and under weirs) maximizes the residence time in the tank and determines the waste to be removed from the water, such as oil, grease, and sediments.

Appropriate Applications:

- The tank removes trash, some settleable solids (gravel, sand, and silt), some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

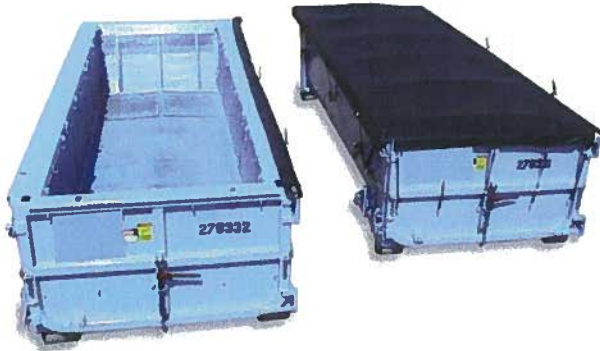
Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.
- Treatment capacity (i.e., volume and number of tanks) should provide at a minimum the required volume for discrete particle settling for treatment design flows.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal should be conducted by a licensed waste disposal company.

Dewatering Tanks



Description:

- A dewatering tank removes debris and sediment. Flow enters the tank through the top, passes through a fabric filter, and is discharged through the bottom of the tank. The filter separates the solids from the liquids.

Appropriate Applications:

- The tank removes trash, gravel, sand, and silt, some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

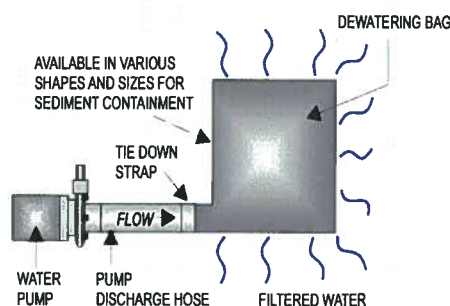
Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal should be conducted by licensed waste disposal company.

Gravity Bag Filter



Description:

- A gravity bag filter, also referred to as a dewatering bag, is a square or rectangular bag made of non-woven geotextile fabric that collects gravel, sand, silt, and fines.

Appropriate Applications:

- Effective for the removal of sediments (gravel, sand, silt, and fines). Some metals are removed with the sediment.

Implementation:

- Water is pumped into one side of the bag and seeps through the top, bottom, and sides of the bag.
- Place filter bag on pavement or a gravel bed or paved surface. Avoid placing a dewatering bag on unprotected bare soil. If placing the bag on bare soil is unavoidable, a secondary barrier should be used, such as a rock filter bed placed beneath and beyond the edges of the bag to, prevent erosion and capture sediments that escape the bag.
- Perimeter control around the downstream end of the bag should be implemented. Secondary sediment controls are important especially in the initial stages of discharge, which tend to allow fines to pass through the bag.

Maintenance:

- Inspection of the flow conditions, bag condition, bag capacity, and the secondary barrier (as applicable) is required.
- Replace the bag when it no longer filters sediment or passes water at a reasonable rate.
- Caution should be taken when removing and disposing of the bag, to prevent the release of captured sediment
- Properly dispose of the bag offsite. If sediment is removed from the bag prior to disposal (bags can potentially be reused depending upon their condition), dispose of sediment in accordance with the general maintenance procedures described at the end of this BMP Fact Sheet.

Sand Media Particulate Filter



Description:

- Water is treated by passing it through canisters filled with sand media. Generally, sand filters provide a final level of treatment. They are often used as a secondary or higher level of treatment after a significant amount of sediment and other pollutants have been removed using other methods.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, and silt and some metals, as well as the reduction of biochemical oxygen demand (BOD) and turbidity.
- Sand filters can be used for stand-alone treatment or in conjunction with bag and cartridge filtration if further treatment is required.
- Sand filters can also be used to provide additional treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filters require regular service to monitor and maintain the level of the sand media. If subjected to high loading rates, filters can plug quickly.
- Venders generally provide data on maximum head loss through the filter. The filter should be monitored daily while in use, and cleaned when head loss reaches target levels.
- If cleaned by backwashing, the backwash water may need to be hauled away for disposal, or returned to the upper end of the treatment train for another pass through the series of dewatering BMPs.

Pressurized Bag Filter



Pressurized Bag Filter

Description:

- A pressurized bag filter is a unit composed of single filter bags made from polyester felt material. The water filters through the unit and is discharged through a header. Vendors provide bag filters in a variety of configurations. Some units include a combination of bag filters and cartridge filters for enhanced contaminant removal.

Appropriate Applications:

- Effective for the removal of sediment (sand and silt) and some metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Oil absorbent bags are available for hydrocarbon removal.
- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filter bags require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Cartridge Filter



Description:

- Cartridge filters provide a high degree of pollutant removal by utilizing a number of individual cartridges as part of a larger filtering unit. They are often used as a secondary or higher (polishing) level of treatment after a significant amount of sediment and other pollutants are removed. Units come with various cartridge configurations (for use in series with bag filters) or with a larger single cartridge filtration unit (with multiple filters within).

Appropriate Applications:

- Effective for the removal of sediment (sand, silt, and some clays) and metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Hydrocarbons can effectively be removed with special resin cartridges.
- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance.

Maintenance:

- The cartridges require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Costs

- Sediment control costs vary considerably depending on the dewatering and sediment treatment system that is selected. Pressurized filters tend to be more expensive than gravity settling, but are often more effective. Simple tanks are generally rented on a long-term basis (one or more months) and can range from \$360 per month for a 1,000 gallon tank to \$2,660 per month for a 10,000 gallon tank. Mobilization and demobilization costs vary considerably.

Inspection and Maintenance

- Inspect and verify that dewatering BMPs are in place and functioning prior to the commencement of activities requiring dewatering.
- Inspect dewatering BMPs daily while dewatering activities are being conducted.

- Inspect all equipment before use. Monitor dewatering operations to ensure they do not cause offsite discharge or erosion.
- Sample dewatering discharges as required by the General Permit.
- Unit-specific maintenance requirements are included with the description of each unit.
- Sediment removed during the maintenance of a dewatering device may be either spread onsite and stabilized, or disposed of at a disposal site as approved by the owner.
- Sediment that is commingled with other pollutants should be disposed of in accordance with all applicable laws and regulations and as approved by the owner.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003; Updated March 2004.

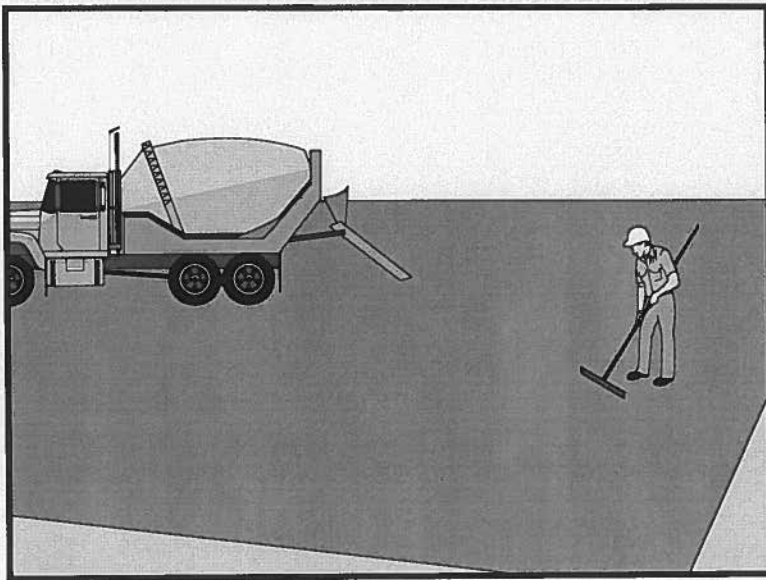
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Labor Surcharge & Equipment Rental Rates, April 1, 2002 through March 31, 2003, California Department of Transportation (Caltrans).

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Paving and Grinding Operations

NS-3



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☒
Organics	

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent runoff and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH and turbidity (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Many types of construction materials associated with paving and grinding operations, including mortar, concrete, and cement and their associated wastes have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute stormwater runoff or discharge to the storm drain system or watercourses.

Limitations

- Paving opportunities may be limited during wet weather.
- Discharges of freshly paved surfaces may raise pH to environmentally harmful levels and trigger permit violations.



Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is forecasted.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent stormwater runoff (see WM-1, Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses. These materials should be stored consistent with WM-3, Stockpile Management.
- Disposal of PCC (Portland cement concrete) and AC (asphalt concrete) waste should be in conformance with WM-8, Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
 - AC grindings, pieces, or chunks used in embankments or shoulder backing should not be allowed to enter any storm drains or watercourses. Install inlet protection and perimeter controls until area is stabilized (i.e. cutting, grinding or other removal activities are complete and loose material has been properly removed and disposed of) or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9, Earth Dikes and Drainage Swales; SE-1, Silt Fence; SE-5, Fiber Rolls, or SE-13 Compost Socks and Berms
 - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt should be recycled or disposed of properly.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by a vacuum attachment to the grinding machine, or by sweeping, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8, Concrete Waste Management, and WM-10, Liquid Waste Management.
- Pavement removal activities should not be conducted in the rain.
- Collect removed pavement material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.

- If removed pavement material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:
 - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or creeks. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5, Solid Waste Management.
 - Old asphalt should be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect waste materials by dry methods, such as sweeping or shoveling, and return to aggregate base stockpile or dispose of properly. Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, Concrete Waste Management, or pump the water to the sanitary sewer if authorized by the local wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate should not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized (i.e. all sealing operations are complete and cured and loose materials have been properly removed and disposed).
- Inlet protection (SE-10, Storm Drain Inlet Protection) should be used during application of seal coat, tack coat, slurry seal, and fog seal.
- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials and dispose of in accordance with the applicable regulations. See NS-10, Vehicle and Equipment Maintenance, WM-4, Spill Prevention and Control, and WM-10, Liquid Waste Management.
- Substances used to coat asphalt transport trucks and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.
- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.
- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8, Vehicle and Equipment Cleaning.

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the stormwater drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond six inches from the top to leave room for splashing.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

- All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of paving and grinding operations.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Sample stormwater runoff required by the General Permit.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

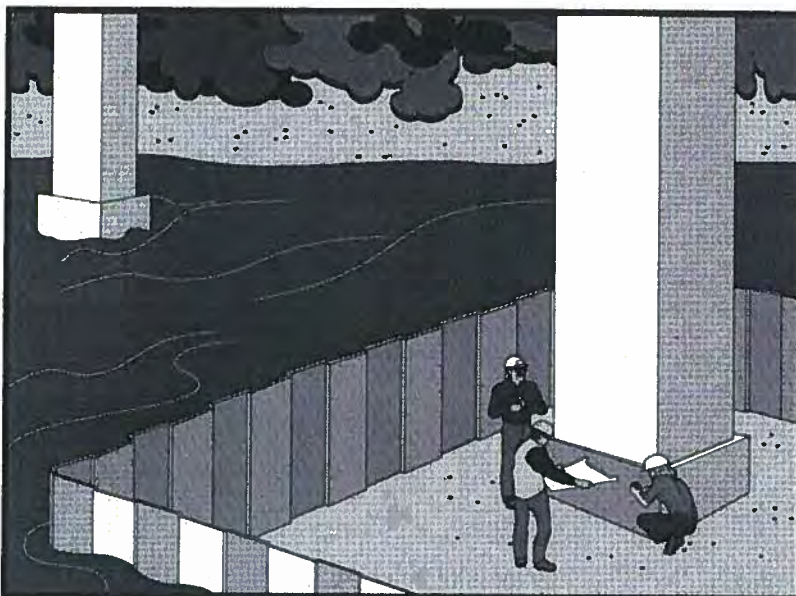
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.



Description and Purpose

Clear water diversion consists of a system of structures and measures that intercept clear surface water runoff upstream of a project, transport it around the work area, and discharge it downstream with minimal water quality degradation from either the project construction operations or the construction of the diversion. Clear water diversions are used in a waterway to enclose a construction area and reduce sediment pollution from construction work occurring in or adjacent to water. Structures commonly used as part of this system include diversion ditches, berms, dikes, slope drains, rock, gravel bags, wood, aqua barriers, cofferdams, filter fabric or turbidity curtains, drainage and interceptor swales, pipes, or flumes.

Suitable Applications

A clear water diversion is typically implemented where appropriate permits (1601 Agreement) have been secured and work must be performed in a flowing stream or water body.

- Clear water diversions are appropriate for isolating construction activities occurring within or near a water body such as streambank stabilization, or culvert, bridge, pier or abutment installation. They may also be used in combination with other methods, such as clear water bypasses and/or pumps.
- Pumped diversions are suitable for intermittent and low flow streams.
- Excavation of a temporary bypass channel, or passing the

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None



flow through a heavy pipe (called a “flume”) with a trench excavated under it, is appropriate for the diversion of streams less than 20 ft wide, with flow rates less than 100 cfs.

- Clear water diversions incorporating clean washed gravel may be appropriate for use in salmonid spawning streams.

Limitations

- Diversion and encroachment activities will usually disturb the waterway during installation and removal of diversion structures.
- Installation may require Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required.
- Diversion and encroachment activities may constrict the waterway, which can obstruct flood flows and cause flooding or washouts. Diversion structures should not be installed without identifying potential impacts to the stream channel.
- Diversion or isolation activities are not appropriate in channels where there is insufficient stream flow to support aquatic species in the area dewatered as a result of the diversion.
- Diversion or isolation activities are inappropriate in deep water unless designed or reviewed by an engineer registered in California.
- Diversion or isolation activities should not completely dam stream flow.
- Dewatering and removal may require additional sediment control or water treatment. See NS-2, Dewatering Operations.
- Not appropriate if installation, maintenance, and removal of the structures will disturb sensitive aquatic species of concern.

Implementation

General

- Implement guidelines presented in NS-17, Streambank Stabilization to minimize impacts to streambanks.
- Where working areas encroach on flowing streams, barriers adequate to prevent the flow of muddy water into streams should be constructed and maintained between working areas and streams. During construction of the barriers, muddying of streams should be held to a minimum.
- Diversion structures must be adequately designed to accommodate fluctuations in water depth or flow volume due to tides, storms, flash floods, etc.
- Heavy equipment driven in wet portions of a water body to accomplish work should be completely clean of petroleum residue, and water levels should be below the fuel tanks, gearboxes, and axles of the equipment unless lubricants and fuels are sealed such that inundation by water will not result in discharges of fuels, oils, greases, or hydraulic fluids.

- Excavation equipment buckets may reach out into the water for the purpose of removing or placing fill materials. Only the bucket of the crane/ excavator/backhoe may operate in a water body. The main body of the crane/excavator/backhoe should not enter the water body except as necessary to cross the stream to access the work site.
- Stationary equipment such as motors and pumps located within or adjacent to a water body, should be positioned over drip pans.
- When any artificial obstruction is being constructed, maintained, or placed in operation, sufficient water should, at all times, be allowed to pass downstream to maintain aquatic life.
- Equipment should not be parked below the high water mark unless allowed by a permit.
- Disturbance or removal of vegetation should not exceed the minimum necessary to complete operations. Precautions should be taken to avoid damage to vegetation by people or equipment. Disturbed vegetation should be replaced with the appropriate erosion control measures.
- Riparian vegetation approved for trimming as part of the project should be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation should be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble should be removed upon completion of project activities.
- Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- Where possible, avoid or minimize diversion and encroachment impacts by scheduling construction during periods of low flow or when the stream is dry. Scheduling should also consider seasonal releases of water from dams, fish migration and spawning seasons, and water demands due to crop irrigation.
- Construct diversion structures with materials free of potential pollutants such as soil, silt, sand, clay, grease, or oil.

Temporary Diversions and Encroachments

- Construct diversion channels in accordance with EC-9, Earth Dikes and Drainage Swales.
- In high flow velocity areas, stabilize slopes of embankments and diversion ditches using an appropriate liner, in accordance with EC-7, Geotextiles and Mats, or use rock slope protection.
- Where appropriate, use natural streambed materials such as large cobbles and boulders for temporary embankment and slope protection, or other temporary soil stabilization methods.
- Provide for velocity dissipation at transitions in the diversion, such as the point where the stream is diverted to the channel and the point where the diverted stream is returned to its natural channel. See also EC-10, Velocity Dissipation Devices.

Temporary Dry Construction Areas

- When dewatering behind temporary structures to create a temporary dry construction area, such as cofferdams, pass pumped water through a sediment-settling device, such as a portable tank or settling basin, before returning water to the water body. See also NS-2, Dewatering Operations.
- Any substance used to assemble or maintain diversion structures, such as form oil, should be non-toxic and non-hazardous.
- Any material used to minimize seepage underneath diversion structures, such as grout, should be non-toxic, non-hazardous, and as close to a neutral pH as possible.

Comparison of Diversion and Isolation Techniques:

- Gravel bags are relatively inexpensive, but installation and removal can be labor intensive. It is also difficult to dewater the isolated area. Sandbags should not be used for this technique in rivers or streams, as sand should never be put into or adjacent to a stream, even if encapsulated in geotextile.
- Gravel Bag Berms (SE-6) used in conjunction with an impermeable membrane are cost effective, and can be dewatered relatively easily. If spawning gravel is used, the impermeable membrane can be removed from the stream, and the gravel can be spread out and left as salmonid spawning habitat if approved in the permit. Only clean, washed gravel should be used for both the gravel bag and gravel berm techniques.
- Cofferdams are relatively expensive, but frequently allow full dewatering. Also, many options now available are relatively easy to install.
- Sheet pile enclosures are a much more expensive solution, but do allow full dewatering. This technique is not well suited to small streams, but can be effective on large rivers or lakes, and where staging and heavy equipment access areas are available.
- K-rails are an isolation method that does not allow full dewatering, but can be used in small to large watercourses, and in fast-water situations.
- A relatively inexpensive isolation method is filter fabric isolation. This method involves placement of gravel bags or continuous berms to 'key-in' the fabric, and subsequently staking the fabric in place. This method should be used in relatively calm water, and can be used in smaller streams. Note that this is not a dewatering method, but rather a sediment isolation method.
- Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They can also be used for in-stream construction, when dewatering an area is not required.
- When used in watercourses or streams, cofferdams must be used in accordance with permit requirements.
- Manufactured diversion structures should be installed following manufacturer's specifications.

- Filter fabric and turbidity curtain isolation installation methods can be found in the specific technique descriptions that follow.

Filter Fabric Isolation Technique

Definition and Purpose

A filter fabric isolation structure is a temporary structure built into a waterway to enclose a construction area and reduce sediment pollution from construction work in or adjacent to water. This structure is composed of filter fabric, gravel bags, and steel t-posts.

Appropriate Applications

- Filter fabric may be used for construction activities such as streambank stabilization, or culvert, bridge, pier or abutment installation. It may also be used in combination with other methods, such as clean water bypasses and/or pumps.
- Filter fabric isolation is relatively inexpensive. This method involves placement of gravel bags or continuous berms to 'key-in' the fabric, and subsequently staking the fabric in place.
- If spawning gravel is used, all other components of the isolation can be removed from the stream, and the gravel may be spread out and left as salmonid spawning habitat if approved in the permit. Whether spawning gravel or other types of gravel are used, only clean washed gravel should be used as infill for the gravel bags or continuous berm.
- This method should be used in relatively calm water, and can be used in smaller streams. This is not a dewatering method, but rather a sediment isolation method.
- Water levels inside and outside the fabric curtain must be about the same, as differential heads will cause the curtain to collapse.

Limitations

- Do not use if the installation, maintenance and removal of the structures will disturb sensitive aquatic species of concern.
- Filter fabrics are not appropriate for projects where dewatering is necessary.
- Filter fabrics are not appropriate to completely dam stream flow.

Design and Installation

- For the filter fabric isolation method, a non-woven or heavy-duty fabric is recommended over standard silt fence. Using rolled geotextiles allows non-standard widths to be used.
- Anchor filter fabric with gravel bags filled with clean, washed gravel. Do not use sand. If a bag should split open, the gravel can be left in the stream, where it can provide aquatic habitat benefits. If a sandbag splits open in a watercourse, the sand could cause a decrease in water quality, and could bury sensitive aquatic habitat.
- Another anchor alternative is a continuous berm, made with the Continuous Berm Machine. This is a gravel-filled bag that can be made in very long segments. The length of the berms is usually limited to 18 ft for ease of handling (otherwise, it gets too heavy to move).

- Place the fabric on the bottom of the stream, and place either a bag of clean, washed gravel or a continuous berm over the bottom of the silt fence fabric, such that a bag-width of fabric lies on the stream bottom. The bag should be placed on what will be the outside of the isolation area.
- Pull the fabric up, and place a metal t-post immediately behind the fabric, on the inside of the isolation area; attach the silt fence to the post with three diagonal nylon ties.
- Continue placing fabric as described above until the entire work area has been isolated, staking the fabric at least every 6 ft.

Inspection and Maintenance

- Immediately repair any gaps, holes or scour.
- Remove and properly dispose of sediment buildup.
- Remove BMP upon completion of construction activity. Recycle or reuse if applicable.
- Revegetate areas disturbed by BMP removal if needed.

Turbidity Curtain Isolation Technique

Definition and Purpose

A turbidity curtain is a fabric barrier used to isolate the near shore work area. The barriers are intended to confine the suspended sediment. The curtain is a floating barrier, and thus does not prevent water from entering the isolated area; rather, it prevents suspended sediment from getting out.

Appropriate Applications

Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They are used when construction activities adjoin quiescent waters, such as lakes, ponds, and slow flowing rivers. The curtains are designed to deflect and contain sediment within a limited area and provide sufficient retention time so that the sediment particles will fall out of suspension.

Limitations

- Turbidity curtains should not be used in flowing water; they are best suited for use in ponds, lakes, and very slow-moving rivers.
- Turbidity curtains should not be placed across the width of a channel.
- Removing sediment that has been deflected and settled out by the curtain may create a discharge problem through the resuspension of particles and by accidental dumping by the removal equipment.

Design and Installation

- Turbidity curtains should be oriented parallel to the direction of flow.
- The curtain should extend the entire depth of the watercourse in calm-water situations.
- In wave conditions, the curtain should extend to within 1 ft of the bottom of the watercourse, such that the curtain does not stir up sediment by hitting the bottom repeatedly. If it is

desirable for the curtain to reach the bottom in an active-water situation, a pervious filter fabric may be used for the bottom 1 ft.

- The top of the curtain should consist of flexible flotation buoys, and the bottom should be held down by a load line incorporated into the curtain fabric. The fabric should be a brightly colored impervious mesh.
- The curtain should be held in place by anchors placed at least every 100 ft.
- First, place the anchors, then tow the fabric out in a furled condition, and connect to the anchors. The anchors should be connected to the flotation devices, and not to the bottom of the curtain. Once in place, cut the furling lines, and allow the bottom of the curtain to sink.
- Consideration must be given to the probable outcome of the removal procedure. It must be determined if it will create more of a sediment problem through re-suspension of the particles or by accidental dumping of material during removal. It is recommended that the soil particles trapped by the turbidity curtain only be removed if there has been a significant change in the original contours of the affected area in the watercourse.
- Particles should always be allowed to settle for a minimum of 6 to 12 hours prior to their removal or prior to removal of the turbidity curtain.

Maintenance and Inspection:

- The curtain should be inspected for holes or other problems, and any repairs needed should be made promptly.
- Allow sediment to settle for 6 to 12 hours prior to removal of sediment or curtain. This means that after removing sediment, wait an additional 6 to 12 hours before removing the curtain.
- To remove, install furling lines along the curtain, detach from anchors, and tow out of the water.

K-rail River Isolation

Definition and Purpose

This temporary sediment control or stream isolation method uses K-rails to form the sediment deposition area, or to isolate the in-stream or near-bank construction area.

Barriers are placed end-to-end in a pre-designed configuration and gravel-filled bags are used at the toe of the barrier and at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

Appropriate Applications

The K-rail isolation can be used in streams with higher water velocities than many other isolation techniques.

- This technique is also useful at the toe of embankments, and cut or fill slopes.

Limitations

- The K-rail method should not be used to dewater a project site, as the barrier is not watertight.

Design and Installation

- To create a floor for the K-rail, move large rocks and obstructions. Place washed gravel and gravel-filled bags to create a level surface for K-rails to sit. Washed gravel should always be used.
- Place the bottom two K-rails adjacent to each other, and parallel to the direction of flow; fill the center portion with gravel bags. Then place the third K-rail on top of the bottom two. There should be sufficient gravel bags between the bottom K-rails such that the top rail is supported by the gravel. Place plastic sheeting around the K-rails, and secure at the bottom with gravel bags.
- Further support can be added by pinning and cabling the K-rails together. Also, large riprap and boulders can be used to support either side of the K-rail, especially where there is strong current.

Inspection and Maintenance:

- The barrier should be inspected and any leaks, holes, or other problems should be addressed immediately.
- Sediment should be allowed to settle for at least 6 to 12 hours prior to removal of sediment, and for 6 to 12 hours prior to removal of the barrier.

Stream Diversions

The selection of which stream diversion technique to use will depend upon the type of work involved, physical characteristics of the site, and the volume of water flowing through the project.

Advantages of a Pumped Diversion

- Downstream sediment transport can be nearly eliminated.
- Dewatering of the work area is possible.
- Pipes can be moved around to allow construction operations.
- The dams can serve as temporary access to the site.
- Increased flows can be managed by adding more pumping capacity.

Disadvantages of a Pumped Diversion

- Flow volume is limited by pump capacity.
- A pumped diversion requires 24 hour monitoring of pumps.
- Sudden rain could overtop dams.
- Erosion at the outlet.

- Minor in-stream disturbance is required to install and remove dams.

Advantages of Excavated Channels and Flumes

- Excavated channels isolate work from water flow and allow dewatering.
- Excavated channels can handle larger flows than pumps.

Disadvantages of Excavated Channels and Flumes

- Bypass channel or flume must be sized to handle flows, including possible floods.
- Channels must be protected from erosion.
- Flow diversion and re-direction with small dams involves in-stream disturbance and mobilization of sediment.

Design and Installation

- Installation guidelines will vary based on existing site conditions and type of diversion used.
- Pump capacity must be sufficient for design flow.
- A standby pump is required in case a primary pump fails.
- Dam materials used to create dams upstream and downstream of diversion should be erosion resistant; materials such as steel plate, sheet pile, sandbags, continuous berms, inflatable water bladders, etc., would be acceptable.

When constructing a diversion channel, begin excavation of the channel at the proposed downstream end, and work upstream. Once the watercourse to be diverted is reached and the excavated channel is stable, breach the upstream end and allow water to flow down the new channel. Once flow has been established in the diversion channel, install the diversion weir in the main channel; this will force all water to be diverted from the main channel.

Inspection and Maintenance

- Pumped diversions require 24 hour monitoring of pumps.
- Inspect embankments and diversion channels for damage to the linings, accumulating debris, sediment buildup, and adequacy of the slope protection. Remove debris and repair linings and slope protection as required. Remove holes, gaps, or scour.
- Upon completion of work, the diversion or isolation structure should be removed and flow should be redirected through the new culvert or back into the original stream channel. Recycle or reuse if applicable.
- Revegetate areas disturbed by BMP removal if needed.

Costs

Costs of clear water diversion vary considerably and can be very high.

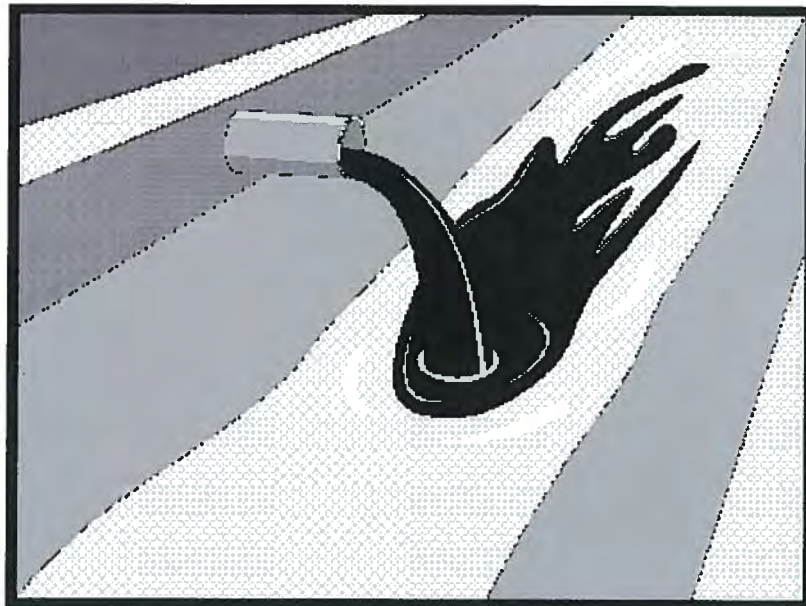
Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Refer to BMP-specific inspection and maintenance requirements.

References

California Bank and Shore Rock Slope Protection Design – Practitioners Guide and Field Evaluations of Riprap Methods, Caltrans Study No. F90TL03, October, 2000.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Description and Purpose

Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents.

Suitable Applications

This best management practice (BMP) applies to all construction projects. Illicit connection/discharge and reporting is applicable anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site.

Limitations

Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor. If pre-existing hazardous materials or wastes are known to exist onsite, they should be identified in the SWPPP and handled as set forth in the SWPPP.

Implementation

Planning

- Review the SWPPP. Pre-existing areas of contamination should be identified and documented in the SWPPP.
- Inspect site before beginning the job for evidence of illicit connections, illegal dumping or discharges. Document any pre-existing conditions and notify the owner.
- Inspect site regularly during project execution for evidence

Targeted Constituents

Sediment	
Nutrients	☒
Trash	☒
Metals	☒
Bacteria	☒
Oil and Grease	☒
Organics	☒

Potential Alternatives

None



of illicit connections, illegal dumping or discharges.

- Observe site perimeter for evidence for potential of illicitly discharged or illegally dumped material, which may enter the job site.

Identification of Illicit Connections and Illegal Dumping or Discharges

- **General** – unlabeled and unidentifiable material should be treated as hazardous.
- **Solids** - Look for debris, or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.
- **Liquids** - signs of illegal liquid dumping or discharge can include:
 - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils
 - Pungent odors coming from the drainage systems
 - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
 - Abnormal water flow during the dry weather season
- **Urban Areas** - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:
 - Abnormal water flow during the dry weather season
 - Unusual flows in sub drain systems used for dewatering
 - Pungent odors coming from the drainage systems
 - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes
 - Excessive sediment deposits, particularly adjacent to or near active offsite construction projects
- **Rural Areas** - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:
 - Abnormal water flow during the non-irrigation season
 - Non-standard junction structures
 - Broken concrete or other disturbances at or near junction structures

Reporting

Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery. For illicit connections or discharges to the storm drain system, notify the local stormwater management agency. For illegal dumping, notify the local law enforcement agency.

Cleanup and Removal

The responsibility for cleanup and removal of illicit or illegal dumping or discharges will vary by location. Contact the local stormwater management agency for further information.

Costs

Costs to look for and report illicit connections and illegal discharges and dumping are low. The best way to avoid costs associated with illicit connections and illegal discharges and dumping is to keep the project perimeters secure to prevent access to the site, to observe the site for vehicles that should not be there, and to document any waste or hazardous materials that exist onsite before taking possession of the site.

Inspection and Maintenance

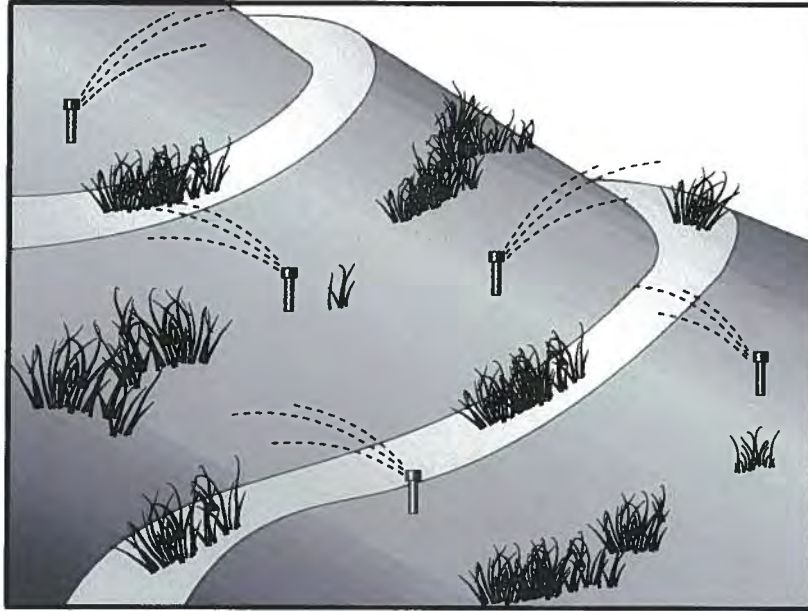
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect the site regularly to check for any illegal dumping or discharge.
- Prohibit employees and subcontractors from disposing of non-job related debris or materials at the construction site.
- Notify the owner of any illicit connections and illegal dumping or discharge incidents at the time of discovery.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.



Description and Purpose

Potable Water/Irrigation consists of practices and procedures to manage the discharge of potential pollutants generated during discharges from irrigation water lines, landscape irrigation, lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.

Suitable Applications

Implement this BMP whenever potable water or irrigation water discharges occur at or enter a construction site.

Limitations

None identified.

Implementation

- Direct water from offsite sources around or through a construction site, where feasible, in a way that minimizes contact with the construction site.
- Discharges from water line flushing should be reused for landscaping purposes where feasible.
- Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.
- Protect downstream stormwater drainage systems and watercourses from water pumped or bailed from trenches excavated to repair water lines.
- Inspect irrigated areas within the construction limits for

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	☒
Trash	
Metals	☒
Bacteria	
Oil and Grease	
Organics	☒

Potential Alternatives

None



excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used and to minimize runoff. Consider factors such as soil structure, grade, time of year, and type of plant material in determining the proper amounts of water for a specific area.

Costs

Cost to manage potable water and irrigation are low and generally considered to be a normal part of related activities.

Inspection and Maintenance

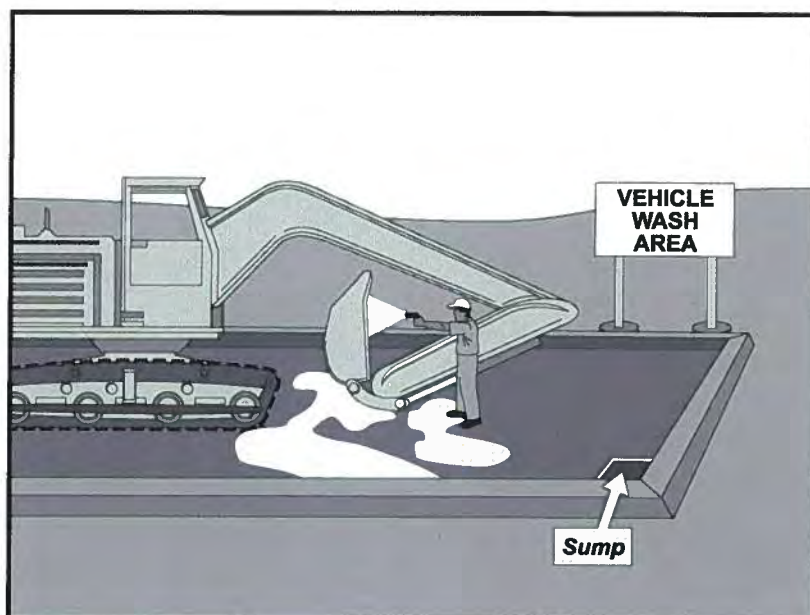
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events..
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Repair broken water lines as soon as possible.
- Inspect irrigated areas regularly for signs of erosion and/or discharge.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.



Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	☒
Trash	
Metals	
Bacteria	
Oil and Grease	☒
Organics	☒

Potential Alternatives

None



- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
 - Located away from storm drain inlets, drainage facilities, or watercourses
 - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runoff
 - Configured with a sump to allow collection and disposal of wash water
 - No discharge of wash waters to storm drains or watercourses
 - Used only when necessary
- When cleaning vehicles and equipment with water:
 - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
 - Use positive shutoff valve to minimize water usage
 - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

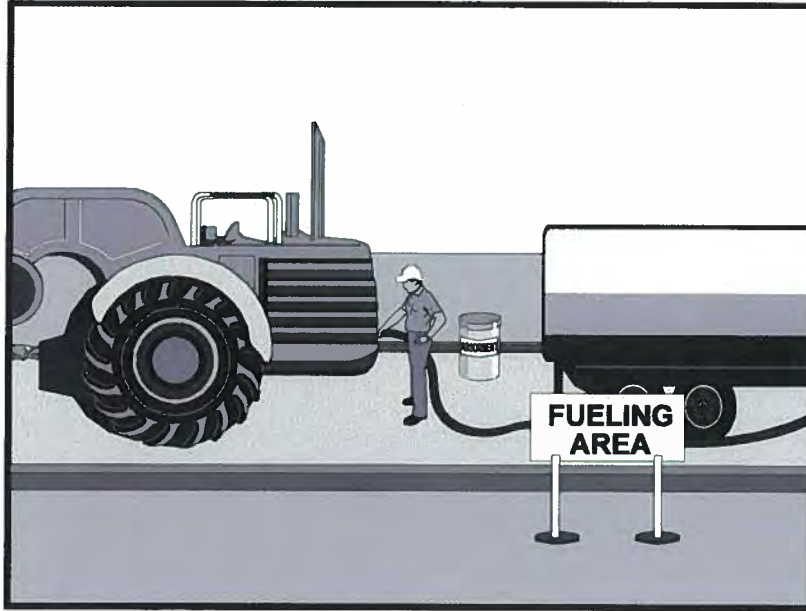
Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.



Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage “topping-off” of fuel tanks.
- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
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WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☒
Organics	

Potential Alternatives

None



be disposed of properly after use.

- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runoff and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.

- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

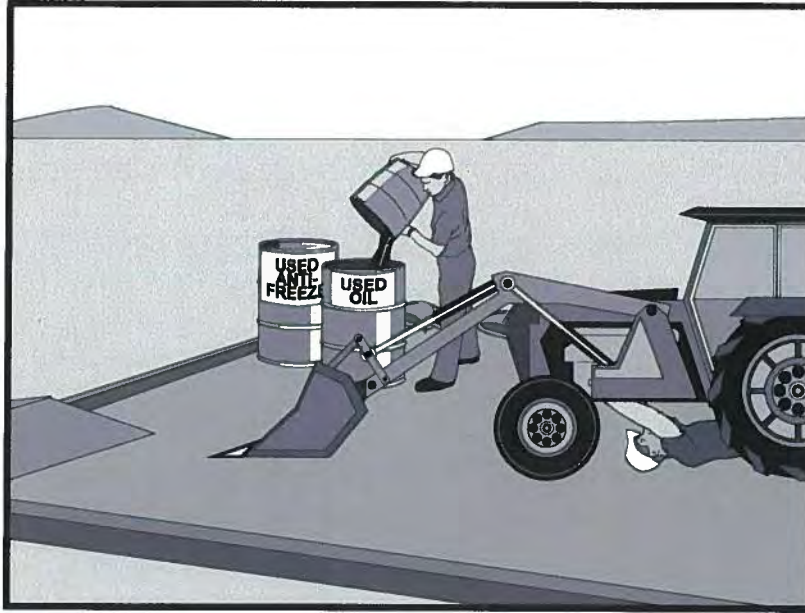
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle & Equipment Maintenance NS-10



Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a “dry and clean site”. The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TC-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8, Vehicle and Equipment Cleaning, and NS-9, Vehicle and

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	
Nutrients	☒
Trash	☒
Metals	
Bacteria	
Oil and Grease	☒
Organics	☒

Potential Alternatives

None



Vehicle & Equipment Maintenance NS-10

Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runoff and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.

Vehicle & Equipment Maintenance NS-10

- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an “environmentally friendly” label.
- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.
- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The “chlor” term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like, trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

Vehicle & Equipment Maintenance NS-10

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect BMPs in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Keep ample supplies of spill cleanup materials onsite.
- Maintain waste fluid containers in leak proof condition.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

References

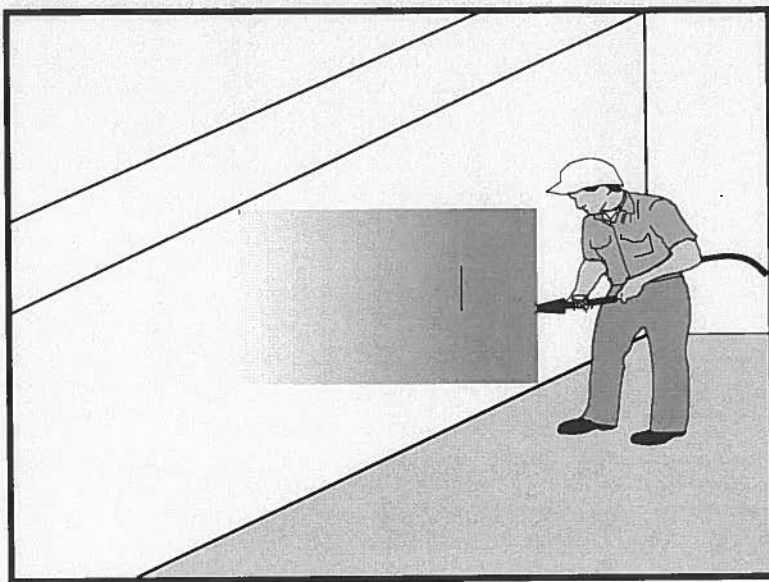
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Concrete Curing

NS-12



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	☒
Bacteria	
Oil and Grease	☒
Organics	

Potential Alternatives

None

Description and Purpose

Concrete curing is used in the construction of structures such as bridges, retaining walls, pump houses, large slabs, and structured foundations. Concrete curing includes the use of both chemical and water methods.

Concrete and its associated curing materials have basic chemical properties that can raise the pH of water to levels outside of the permitted range. Discharges of stormwater and non-stormwater exposed to concrete during curing may have a high pH and may contain chemicals, metals, and fines. The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Proper procedures and care should be taken when managing concrete curing materials to prevent them from coming into contact with stormwater flows, which could result in a high pH discharge.

Suitable Applications

Suitable applications include all projects where Portland Cement Concrete (PCC) and concrete curing chemicals are placed where they can be exposed to rainfall, runoff from other areas, or where runoff from the PCC will leave the site.



Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

Chemical Curing

- Avoid over spray of curing compounds.
- Minimize the drift by applying the curing compound close to the concrete surface. Apply an amount of compound that covers the surface, but does not allow any runoff of the compound.
- Use proper storage and handling techniques for concrete curing compounds. Refer to WM-1, Material Delivery and Storage.
- Protect drain inlets prior to the application of curing compounds.
- Refer to WM-4, Spill Prevention and Control.

Water Curing for Bridge Decks, Retaining Walls, and other Structures

- Direct cure water away from inlets and watercourses to collection areas for evaporation or other means of removal in accordance with all applicable permits. See WM-8 Concrete Waste Management.
- Collect cure water at the top of slopes and transport to a concrete waste management area in a non-erosive manner. See EC-9 Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Utilize wet blankets or a similar method that maintains moisture while minimizing the use and possible discharge of water.

Education

- Educate employees, subcontractors, and suppliers on proper concrete curing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete curing procedures.

Costs

All of the above measures are generally low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts uncured and partially cured concrete as required by the General Permit.
- Ensure that employees and subcontractors implement appropriate measures for storage, handling, and use of curing compounds.
- Inspect cure containers and spraying equipment for leaks.

References

Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non Point Source Pollution Control Program, 1992.

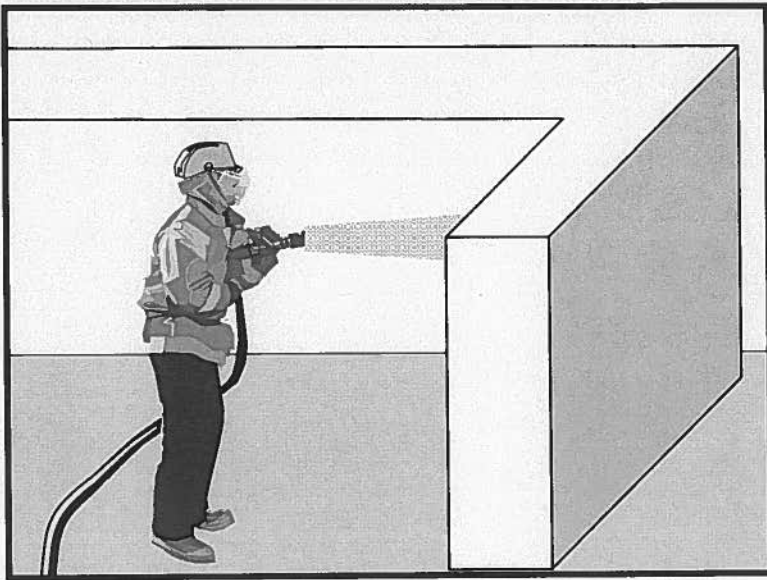
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Erosion and Sediment Control Manual, Oregon Department of Environmental Quality, February 2005.

Concrete Finishing

NS-13



Description and Purpose

Concrete finishing methods are used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Methods include sand blasting, shot blasting, grinding, or high pressure water blasting. Stormwater and non-stormwater exposed to concrete finishing by-products may have a high pH and may contain chemicals, metals, and fines. Proper procedures and implementation of appropriate BMPs can minimize the impact that concrete-finishing methods may have on stormwater and non-stormwater discharges.

The General Permit incorporates Numeric Effluent Limits (NEL) and Numeric Action Levels (NAL) for pH (see Section 2 of this handbook to determine your project's risk level and if you are subject to these requirements).

Concrete and its associated curing materials have basic chemical properties that can raise pH levels outside of the permitted range. Additional care should be taken when managing these materials to prevent them from coming into contact with stormwater flows, which could lead to exceedances of the General Permit requirements.

Suitable Applications

These procedures apply to all construction locations where concrete finishing operations are performed.

Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	☒

Legend:

- ☒ Primary Category
- ☒ Secondary Category

Targeted Constituents

Sediment	☒
Nutrients	
Trash	
Metals	☒
Bacteria	
Oil and Grease	
Organics	☒

Potential Alternatives

None



Limitations

- Runoff contact with concrete waste can raise pH levels in the water to environmentally harmful levels and trigger permit violations.

Implementation

- Collect and properly dispose of water from high-pressure water blasting operations.
- Collect contaminated water from blasting operations at the top of slopes. Transport or dispose of contaminated water while using BMPs such as those for erosion control. Refer to EC-9, Earth Dikes and Drainage Swales, EC-10, Velocity Dissipation Devices, and EC-11, Slope Drains.
- Direct water from blasting operations away from inlets and watercourses to collection areas for infiltration or other means of removal (dewatering). Refer to NS-2 Dewatering Operations.
- Protect inlets during sandblasting operations. Refer to SE-10, Storm Drain Inlet Protection.
- Refer to WM-8, Concrete Waste Management for disposal of concrete debris.
- Minimize the drift of dust and blast material as much as possible by keeping the blasting nozzle close to the surface.
- When blast residue contains a potentially hazardous waste, refer to WM-6, Hazardous Waste Management.

Education

- Educate employees, subcontractors, and suppliers on proper concrete finishing techniques to prevent contact with discharge as described herein.
- Arrange for the QSP or the appropriately trained contractor's superintendent or representative to oversee and enforce concrete finishing procedures.

Costs

These measures are generally of low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities.
- BMPs must be inspected in accordance with General Permit requirements for the associated project type and risk level. It is recommended that at a minimum, BMPs be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Sample non-stormwater discharges and stormwater runoff that contacts concrete dust and debris as required by the General Permit.

- Sweep or vacuum up debris from sandblasting at the end of each shift.
- At the end of each work shift, remove and contain liquid and solid waste from containment structures, if any, and from the general work area.
- Inspect containment structures for damage prior to use and prior to onset of forecasted rain.

References

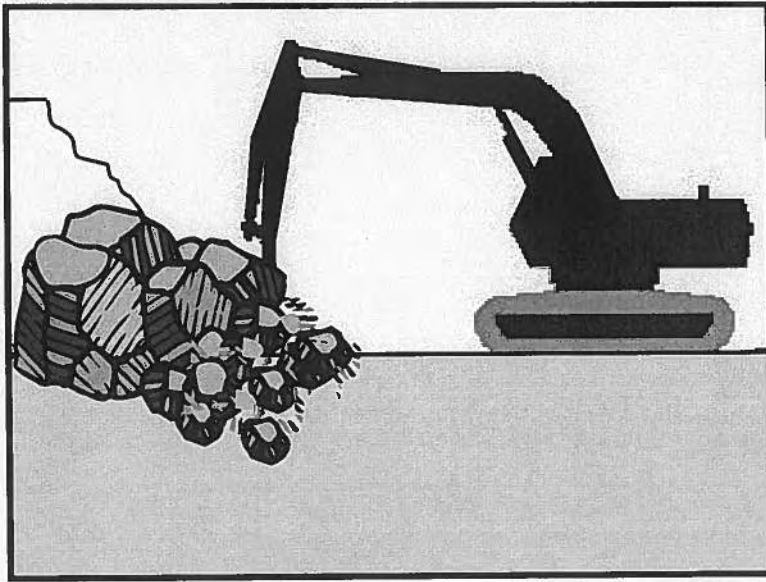
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), March 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Demolition Adjacent to Water

NS-15



Categories

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☒
WM	Waste Management and Materials Pollution Control	

Legend:

- ☒ Primary Objective
- ☒ Secondary Objective

Targeted Constituents

Sediment	☒
Nutrients	☒
Trash	☒
Metals	☒
Bacteria	☒
Oil and Grease	☒
Organics	☒

Potential Alternatives

None

Description and Purpose

Procedures to protect water bodies from debris and wastes associated with structure demolition or removal over or adjacent to watercourses.

Suitable Applications

Full bridge demolition and removal, partial bridge removal (barrier rail, edge of deck) associated with bridge widening projects, concrete channel removal, or any other structure removal that could potentially affect water quality.

Limitations

None identified.

Implementation

- Refer to NS-5, Clear Water Diversion, to direct water away from work areas.
- Use attachments on construction equipment such as backhoes to catch debris from small demolition operations.
- Use covers or platforms to collect debris.
- Platforms and covers are to be approved by the owner.
- Stockpile accumulated debris and waste generated during demolition away from watercourses and in accordance with WM-3, Stockpile Management.
- Ensure safe passage of wildlife, as necessary.



- Discharges to waterways shall be reported to the Regional Water Quality Control Board immediately upon discovery. A written discharge notification must follow within 7 days. Follow the spill reporting procedures in the SWPPP.
- For structures containing hazardous materials, i.e., lead paint or asbestos, refer to BMP WM-6, Hazardous Waste Management. For demolition work involving soil excavation around lead-painted structures, refer to WM-7, Contaminated Soil Management.

Costs

Cost may vary according to the combination of practices implemented.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Any debris-catching devices shall be emptied regularly. Collected debris shall be removed and stored away from the watercourse and protected from runoff.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Appendix C – Engineering Plans and Specifications (EPS)

*Final project plans will be included as an update to the SWPPP prior to construction.

Appendix D - Visual Monitoring/BMP Inspection Form

Visual Monitoring/BMP Inspection Form

Date/Time:

Observer:

FEATURE INSPECTED	DISCREPANCY DETECTED? CIRCLE ONE	
DAMAGE TO CONTAINMENT MEASURES OR EROSION CONTROL FENCING	YES	NO
IMPROPERLY INSTALLED OR INEFFECTIVE BOUNDARY FENCE	YES	NO
VEHICLE ACCESS INTO A "NO DISTURBANCE AREA"	YES	NO
DISTURBED AREAS WITH INADEQUATE EROSION PREVENTION AND SEDIMENT CONTROL PROTECTION	YES	NO
EVIDENCE OF SEDIMENT LEAVING OR NOT ENTERING INTO ADJACENT SEDIMENT BASINS; APPROXIMATE % OF SEDIMENT BASIN CAPACITY IF WATER IS PRESENT	YES	NO
SEDIMENT PILES LEFT UNPROTECTED OR LOCATED IN A DRAINAGE WAY	YES	NO
SPILLED OR IMPROPERLY STORED HAZARDOUS MATERIALS	YES	NO
ANY EVIDENCE OF SEDIMENT TRACKING DUE TO CONSTRUCTION	YES	NO
ANY SIGNS OF SOIL EROSION OR DEPOSITION DOWNGRAIENT FROM RUNOFF DISCHARGES	YES	NO
SEDIMENT ACCUMULATION WITHIN ONSITE WATER DRAINAGE CONTROL STRUCTURES.	YES	NO
ANY EVIDENCE OF ILLICIT, NOT AUTHORIZED, OR AUTHORIZED NON-STORM WATER DISCHARGES.	YES	NO
ANY OBSERVED IMPACTS TO A RECEIVING WATER	YES	NO

IF "YES" IS AN ANSWER TO ANY OF THE QUESTIONS ABOVE, THE FOLLOWING PAGE WILL BE FILLED OUT WITH A DOCUMENTED EXPLANATION AND A DESCRIPTION OF REMEDIAL ACTION TAKEN.

Date/Time:

Observer:

Describe Discrepancy Detected:

Location of Discrepancy (include photo of incident):

Weather Conditions:

Remedial Action(s) Taken:

Appendix E - Rain Event Action Plan Template

Rain Event Action Plan (REAP)

William Kent BMP Retrofit Project

Site Information: Placer County, CA T15N, R16E Section 24

QSP (name and emergency contact): Jordan Burge, 530-543-2670

Storm water sampler:

Date of REAP:

WDID No:

Date Rain Predicted to Occur:

Predicted % chance of rain:

Predicted Rain Event Triggered Actions

Below is a list of suggested actions and items to review for this project. All material storage areas, stockpiles, waste management areas, vehicle and equipment storage and maintenance, areas of active soil disturbance, and areas of active work shall be checked to ensure the proper implementation of BMPs. Project-wide BMPs should be checked and cross referenced to the appropriate map, EPS sheet and/or BMP Fact sheet.

Activity

Suggested action(s) to perform / items to review

Scheduling

- ☐ Inform project personnel of predicted rain
- ☐ Check scheduled activities and reschedule as needed
- ☐ Schedule staff for rain inspections (including weekends & holidays)
- ☐ Other:
- ☐
- ☐

Material Stock and Storage

- ☐ Hazardous materials or materials that could be damaged by precipitation are under cover or in a storage container
- ☐ Ensure enough plastic material and other temporary BMPS are available and ready for the day-use site, if open graded areas exist
- ☐ Verify Erosion and Sediment Control (ESC) material stock is adequate and available
- ☐ Perimeter control around stockpiles
- ☐ Materials and equipment properly stored and covered
- ☐ Other:
- ☐
- ☐

Operations	☐ Waste and debris removed from site ☐ Open excavations properly protected ☐ Perimeter controls around disturbed areas and site boundaries ☐ Port-a-potty closed and maintained ☐ Pumps fueled and BMP materials ready or in place for day-use site ☐ Any open utility piping stabilized or covered ☐ Any concrete or asphalt waste removed from site ☐ Other: ☐ ☐
Spills & Drips	☐ Spill kits ready and available ☐ All incident spills and drips contained and cleaned ☐ Drip pans emptied ☐ Other: ☐ ☐
Other/ Discussion/ Diagrams	
Attach a printout of the weather forecast from the NOAA website to the REAP	
I certify under penalty of law that this Rain Event Action Plan (REAP) will be performed in accordance with the General Permit by me or under my direction in accordance with a system designed to assure qualified personnel properly gathered and evaluated information submitted.	
Qualified SWPPP Practitioner (QSP)	Date

Appendix F – Permit Documents

*This appendix will be updated with permit documents when permits are approved.

Appendix G – Training Logs

Personnel Training Log

Storm water Management Training Log and Documentation

Project Name: _____

WDID #: _____

Storm water Management Topic: (circle as appropriate)

Erosion Control

Sediment Control

Wind Erosion Control

Storm water Sampling

Non-Storm water Management

Waste Management and Materials Pollution Control

Storm water Sampling

Specific Training Objective: _____

Location: _____ Date: _____

Instructor: _____ Telephone: _____

Course Length (hrs): _____

Attendee Roster

Name of Personnel	Name of Personnel	Name of Personnel

Appendix H – Prohibition Exemption Information

From Attachment F, Waste Discharge Prohibition Information for Activities in Stream Environment Zones and Floodplains of the Lake Tahoe Hydrologic Unit, of the Tahoe Construction Permit R6T-2011-0019

Chapter 5, section 5.7 of the Basin Plan provides that exemptions may be granted in floodplains under certain categories. The William Kent BMP Retrofit Project fits most appropriately under the following category:

1. Public outdoor recreational facilities if: (a) the project is a necessary part of a public agency's long range plans for public outdoor recreation; (b) the project, by its very nature, must be sited in a floodplain; (c) there is no feasible alternative that would reduce the extent of encroachment in a floodplain; and (d) the impacts on the floodplain are minimized.

Chapter 5, section 5.8 of the Basin Plan provides that exemptions may be granted in SEZs under certain categories. The William Kent BMP Retrofit Project fits most appropriately under the following category:

1. Public Outdoor Recreation facilities, when all of the following findings can be made: (a) the project, by its very nature, must be sited in an SEZ; (b) there is no feasible alternative that would reduce the extent of SEZ encroachment; (c) impacts are fully mitigated; and (d) SEZs are restored in an amount 1.5 times the area of SEZ disturbed or developed for the project.

The following answers Section 5.7 and 5.8 of the Basin Plan.

1. (a) the project, by its very nature, must be sited in a floodplain and SEZ:

See the William Kent BMP Retrofit and Administrative Site Redevelopment Environmental Assessment for a full analysis of the location and impacts of the campground and storm drain system. Also see Section II.A. Project Description for a detailed explanation of construction planned for 2014. The William Kent Campground is located within a confined site, surrounded by non-Forest Service property on all sides. There are currently two constructed channels that enter the campground, and they combine into one channel that exits the campground. The SEZ boundary primarily follows these channels. This project will move a significant portion of the campground away from this SEZ boundary, but in order to connect the road and storm drain system, a minimized portion must remain.

The storm drain pipes that drain directly into Lake Tahoe are in a confined location. They drain the campground across from Highway 89, and subsequently drain the neighborhoods above the campground. In order to drain these areas, the drainage location must remain.

1. (b) there is no feasible alternative that would reduce the extent of floodplain and SEZ encroachment:

One of the main goals of this project is to locate infrastructure away from SEZ. The portions of the project still within the SEZ boundary were minimized. For example, this project will reduce roadway crossings over the main channel from 9 crossings to 4 crossings. Additionally, the amount of disturbance in SEZ will be reduced from 23,028 square feet to 7,212 square feet.

The storm drain pipes adjacent to Lake Tahoe drain a portion of Highway 89, the William Kent Campground, and portions of the neighborhood above the campground. There are currently several infiltration basins that capture most surface water before entering the storm drain pipes, but a drainage location must remain to accommodate large storms in which surface water overtops basins.

1. (c) impacts on the floodplain are minimized; **and** impacts in the SEZ are fully mitigated:

As discussed above, permanent impacts to the floodplain and SEZ will be minimized. During construction, the impacts will also be minimized. Construction will take place between May 1 and October 15, maximizing the chance that the SEZ will be dry. Construction impacts will be minimized within the SEZ by limiting disturbance to within a maximum of 10 feet of the channel, or on existing or proposed roads (see Figures 2 – 7). The removal of a section of the storm drain pipes will only occur when the Lake Tahoe water level is at an elevation of 6,226 feet or lower. This will ensure minimal disturbance to the lakeshore during construction of the new channel. Additionally, micro-basins will be constructed within the campground to ensure storm water from impervious surfaces is captured to infiltrate. During construction, these micro-basins will be one of the first features built in order to capture sediment from recently graded ground during summer storms.

Impacts in the SEZ will be fully mitigated through temporary BMPs during construction, and permanent BMPs post-construction. Within the SEZ, BMPs will include uniform

decompaction, recontouring the existing ditch to mimic a natural swale condition, and hydromulch placement with native seed. Mitigation measures for this project include BMPs found in the William Kent BMP Retrofit Environmental Assessment, as well as with BMPs specifically identified for this type of construction. Each applicable BMP is described below. For the monitoring requirements that ensure these permanent BMPs are functioning correctly, see the actions reported in Section V.B. Visual Monitoring.

Applicable BMPs from the William Kent BMP Retrofit EA:

Nation Core BMPs	Best Management Practice Objective Description
Plan-1. Forest and Grassland Planning	Use the land management planning and decision making processes to incorporate direction for water quality management consistent with laws, regulation, and policy into land management plans.
Plan-2. Project Planning and Analysis	Use the project planning, environmental analysis, and decision making processes to incorporate water quality management BMPs into project design and implementation.
Plan-3. Aquatic Management Zone Planning	To maintain and improve or restore the condition of land around and adjacent to waterbodies in the context of the environment in which they are located, recognizing their unique values and importance to water quality while implementing land and resource management activities.
AqEco-1. Aquatic Ecosystem Improvement and Restoration Planning	Reestablish and retain ecological resilience of aquatic ecosystems and associated resources to achieve sustainability and provide a broad range of ecosystem services.
AqEco-2. Operations in Aquatic Ecosystems	Avoid, minimize, or mitigate adverse impacts to water quality when working in aquatic ecosystems.
AqEco-4. Stream Channels and Shorelines	Design and implement stream channel and lake shoreline projects in a manner that increase the potential for success in meeting project objectives and avoids, minimizes or mitigates adverse effects to soil, water quality and riparian resources.
Fac-1. Facilities and Nonrecreation Special Uses Planning	Use the applicable special use authorization and administrative facilities planning processes to develop measures to avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources during construction and operation of facilities and nonrecreation special uses activities.
Fac-2. Facility Construction and Stormwater Control	Avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources by controlling erosion and managing stormwater discharge originating from ground disturbance during construction of developed sites.

Fac-4. Sanitation Systems	Avoid, minimize or mitigate adverse effects to soil and water quality from bacteria, nutrients and other pollutants resulting from collection, transmission, treatment and disposal of sewage and wastewater at facilities.
Fac-5. Solid Waste Management	Avoid, minimize or mitigate adverse effects to water quality from trash, nutrients, bacteria and chemicals associated with solid waste management at facilities.
Fac-6. Hazardous Materials	Avoid or minimize short- and long-term adverse effects to soil and water resources by preventing releases of hazardous materials.
Fac-7. Vehicle and Equipment Wash Water	Avoid or minimize contamination of surface water and groundwater by vehicle or equipment wash water that may contain oil, grease, phosphates, soaps, road salts, other chemicals, suspended solids, and invasive species.
Rec-1. Recreation Planning	Use the applicable recreation planning process to develop measures to avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources during recreation activities.
Rec-2. Developed Recreation Sites	Avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources at developed recreation sites by maintaining desired levels of ground cover, limiting soil compaction and minimizing pollutants entering waterbodies.
Road-2. Road Location and Design	Locate and design roads to avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources.
Road-3. Road Construction	Avoid or minimize adverse effects to soil, water quality and riparian resources from erosion, sediment and other pollutant delivery during road construction or reconstruction.
Road-4. Road Operations and Maintenance	Avoid, minimize, or mitigate adverse effects to soil, water quality and riparian resources by controlling road use and operations and providing adequate and appropriate maintenance to minimize sediment production and other pollutants during the useful life of the roads.
Road-6. Road Storage and Decommissioning	Avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources by storing closed roads not needed for at least 1 year and decommissioning unneeded roads in a hydrologically stable manner to eliminate hydrologic connectivity, restore natural flow patterns and minimize soil erosion.
Road-7. Stream Crossings	Avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources when constructing, reconstructing or maintaining temporary and permanent waterbody crossings.
Road-9. Parking Staging Areas	Avoid, minimize or mitigate adverse effects to soil, water quality and riparian resources when constructing and maintaining parking and staging areas.

Road-10. Equipment Refueling and Servicing	Avoid or minimize adverse effects to soil, water quality and riparian resources from fuels, lubricants, cleaners and other harmful materials discharging into nearby surface waters or infiltrating through soils to contaminate groundwater resources during equipment refueling and servicing activities.
WatUses-1. Water Uses Planning	Use the applicable authorization and administrative planning processes to develop measures to avoid minimize or mitigate adverse effects to soil, water quality and riparian resources during construction, operation, maintenance and restoration of water use infrastructure.

Temporary and permanent BMPs are discussed extensively in Section III of this SWPPP, and all identified CASQA specifications are listed in Appendix B.

1. (d) SEZs are restored in an amount 1.5 times the area of SEZ disturbed or developed for the project:

See below numbers for SEZ restoration calculations developed for construction in 2014:

New permanent SEZ disturbance: 1,400 S.F.

SEZ Restored: 15,816 S.F.

As shown above, the amount of permanent infrastructure in SEZ restored greatly exceeds the amount of new permanent infrastructure in SEZ. The 1,400 S.F. of new SEZ disturbance was calculated within the new crossing depicted in Figures 2 and 5. The 15,816 S.F. of SEZ restoration was calculated from the campground loop road and spurs to be removed (see Figures 2 – 6). The amount of temporary disturbance in SEZ for this project is 9110 S.F. This was calculated based on the temporary disturbance required to restore SEZ, including removing roads and spurs, and recontouring the existing drainage ditch to mimic a natural drainage swale.

See Section II. Project Description for a detailed narrative of the project and its associated construction.