



FOR DEPARTMENT USE ONLY				
Date Received	Amount Received	Amount Due	Date Complete	Notification No.
	\$	\$		
Assigned to:				

## NOTIFICATION OF LAKE OR STREAMBED ALTERATION

Complete EACH field, unless otherwise indicated, following the enclosed instructions and submit ALL required enclosures. Attach additional pages, if necessary.

### 1. APPLICANT PROPOSING PROJECT

Name			
Business/Agency			
Mailing Address			
City, State, Zip			
Telephone		Fax	
Email			

### 2. CONTACT PERSON (Complete only if different from applicant)

Name			
Street Address			
City, State, Zip			
Telephone		Fax	
Email			

### 3. PROPERTY OWNER (Complete only if different from applicant)

Name			
Street Address			
City, State, Zip			
Telephone		Fax	
Email			

### 4. PROJECT NAME AND AGREEMENT TERM

A. Project Name				
B. Agreement Term Requested		<input type="checkbox"/> Regular (5 years or less) <input type="checkbox"/> Long-term (greater than 5 years)		
C. Project Term		D. Seasonal Work Period		E. Number of Work Days
Beginning (year)	Ending (year)	Start Date (month/day)	End Date (month/day)	



## 5. AGREEMENT TYPE

Check the applicable box. If box B, C, D, E, or F is checked, complete the specified attachment.

A.	<input type="checkbox"/> Standard ( <i>Most construction projects, excluding the categories listed below</i> )	
B.	<input type="checkbox"/> Gravel/Sand/Rock Extraction ( <i>Attachment A</i> )	Mine I.D. Number: _____
C.	<input type="checkbox"/> Timber Harvesting ( <i>Attachment B</i> )	THP Number: _____
D.	<input type="checkbox"/> Water Diversion/Extraction/Impoundment ( <i>Attachment C</i> )	SWRCB Number: _____
E.	<input type="checkbox"/> Routine Maintenance ( <i>Attachment D</i> )	
F.	<input type="checkbox"/> Cannabis Cultivation ( <i>Attachment E</i> )	
G.	<input type="checkbox"/> Department Grant Programs	Agreement Number: _____
H.	<input type="checkbox"/> Master	
I.	<input type="checkbox"/> Master Timber Operations	

## 6. FEES

See the current fee schedule to determine the appropriate notification fee. Itemize each project's estimated cost and corresponding fee. **Note: The Department may not process this notification until the correct fee has been received.**

A. Project		B. Project Cost	C. Project Fee
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
		D. Base Fee ( <i>if applicable</i> )	
		E. TOTAL FEE*	

\* Check, money orders, or any debit/credit card with the Visa or Mastercard logo are accepted.



## 7. PRIOR NOTIFICATION AND ORDERS

A. Has a notification previously been submitted to, or a Lake or Streambed Alteration Agreement previously been issued by, the Department for the project described in this notification?		
<input type="checkbox"/> Yes ( <i>Provide the information below</i> ) <input type="checkbox"/> No		
Applicant	Notification Number	Date
B. Is this notification being submitted in response to a court or administrative order or notice, or a notice of violation (NOV) issued by the Department?		
<input type="checkbox"/> No <input type="checkbox"/> Yes ( <i>Enclose a copy of the order, notice, or NOV. If the applicant was directed to notify the Department verbally rather than in writing, identify the person who directed the applicant to submit this notification and the agency he or she represents, and describe the circumstances relating to the order.</i> )		
<input type="checkbox"/> Continued on additional page(s)		

## 8. PROJECT LOCATION

A. Address or description of project location. ( <i>Include a map that marks the location of the project with a reference to the nearest city or town, and provide driving directions from a major road or highway</i> )				
<input type="checkbox"/> Continued on additional page(s)				
B. River, stream, or lake affected by the project.				
C. What water body is the river, stream, or lake tributary to?				
D. Is the river or stream segment affected by the project listed in the state or federal Wild and Scenic Rivers Acts?		<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Unknown
E. County				
F. USGS 7.5 Minute Quad Map Name	G. Township	H. Range	I. Section	J. ¼ Section
<input type="checkbox"/> Continued on additional page(s)				
K. Meridian ( <i>check one</i> )	<input type="checkbox"/> Humboldt <input type="checkbox"/> Mt. Diablo <input type="checkbox"/> San Bernardino			
L. Assessor's Parcel Number(s)				
<input type="checkbox"/> Continued on additional page(s)				



M. Coordinates (If available, provide at least latitude/longitude or UTM coordinates and check appropriate boxes)			
Latitude/Longitude	Latitude:		Longitude:
	<input type="checkbox"/> Degrees/Minutes/Seconds <input type="checkbox"/> Decimal Degrees <input type="checkbox"/> Decimal Minutes		
UTM	Easting:	Northing:	<input type="checkbox"/> Zone 10 <input type="checkbox"/> Zone 11
Datum used for Latitude/Longitude or UTM		<input type="checkbox"/> NAD 27 <input type="checkbox"/> NAD 83 or WGS 84	

## 9. PROJECT CATEGORY

WORK TYPE	NEW CONSTRUCTION	REPLACE EXISTING STRUCTURE	REPAIR-MAINTAIN-OPERATE EXISTING STRUCTURE
Bank stabilization – bioengineering/recontouring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bank stabilization – rip-rap/retaining wall/gabion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Boat dock/pier	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Boat ramp	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bridge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Channel clearing/vegetation management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Culvert	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Debris basin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dam	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Filling of wetland, river, stream, or lake	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Geotechnical survey	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Habitat enhancement – revegetation/mitigation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Levee	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low water crossing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Road/trail	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sediment removal: pond, stream, or marina	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
flood control	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Storm drain outfall structure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Temporary stream crossing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Utility crossing: horizontal directional drilling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
jack/bore	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
open trench	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water diversion without facility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Water diversion with facility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other (specify):	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>





## 10. PROJECT DESCRIPTION

A. Describe the project in detail. Include photographs of the project location and immediate surrounding area.

- Written description of all project activities with detailed step-by-step description of project implementation.
- Include any structures (e.g., rip-rap, culverts) that will be placed or modified in or near the stream, river, or lake, and any channel clearing.
- Specify volume, and dimensions of all materials and features (e.g., rip rap fields) that will be used or installed.
- If water will be diverted or drafted, specify the purpose or use.
- Enclose diagrams, drawings, plans, and maps that provide all of the following: site specific construction details; dimensions of each structure and/or extent of each activity in the bed, channel, bank or floodplain; overview of the entire project area (i.e., “bird’s-eye view”) showing the location of each structure and/or activity, significant area features, stockpile areas, areas of temporary disturbance, and where the equipment/machinery will access the project area.

☐ Continued on additional page(s)

B. Specify the equipment and machinery that will be used to complete the project.

☐ Continued on additional page(s)

C. Will water be present during the proposed work period (specified in box 4.D) in the stream, river, or lake (specified in box 8.B).

☐ Yes    ☐ No (*Skip to box 11*)

D. Will the proposed project require work in the wetted portion of the channel?

☐ Yes (*Enclose a plan to divert water around work site*)  
☐ No



## 11. PROJECT IMPACTS

A. Describe impacts to the bed, channel, and bank of the river, stream, or lake, and the associated riparian habitat. Specify the dimensions of the modifications in length (linear feet) and area (square feet or acres) and the type and volume of material (cubic yards) that will be moved, displaced, or otherwise disturbed, if applicable.

☐ Continued on additional page(s)

B. Will the project affect any vegetation?

☐ Yes (Complete the tables below) ☐ No (Include aerial photo with date supporting this determination)

Vegetation Type	Temporary Impact	Permanent Impact
	Linear feet: _____ Total area: _____	Linear feet: _____ Total area: _____
	Linear feet: _____ Total area: _____	Linear feet: _____ Total area: _____

Tree Species	Number of Trees to be Removed	Trunk Diameter (range)

☐ Continued on additional page(s)

C. Are any special status animal or plant species, or habitat that could support such species, known to be present on or near the project site?

☐ Yes (List each species and/or describe the habitat below) ☐ No ☐ Unknown

☐ Continued on additional page(s)

D. Identify the source(s) of information that supports a “yes” or “no” answer above in Box 11.C.

☐ Continued on additional page(s)

E. Has a biological study been completed for the project site?

☐ Yes (Enclose the biological study) ☐ No

*Note: A biological assessment or study may be required to evaluate potential project impacts on biological resources.*



F. Has a hydrological study been completed for the project or project site?

☐ Yes (*Enclose the hydrological study*)      ☐ No

*Note: A hydrological study or other information on site hydraulics (e.g., flows, channel characteristics, and/or flood recurrence intervals) may be required to evaluate potential project impacts on hydrology.*

G. Have fish or wildlife resources or waters of the state been mapped or delineated on the project site?

☐ Yes (*Enclose the mapped results*)      ☐ No

*Note: Check “yes” if fish and wildlife resources or waters of the state on the project site have been mapped or delineated. “Wildlife” means and includes all wild animals, birds, plants, fish, amphibians, reptiles and related ecological communities, including the habitat upon which the wildlife depends.” (Fish & G. Code, § 89.5.) If “yes” is checked, submit the mapping or delineation. If the mapping or delineation is in digital format (e.g., GIS shape files or KMZ), you must submit the information in this format for the Department to deem your notification complete. If “no” is checked, or the resolution of the mapping or delineation is insufficient, the Department may request mapping or delineation (in digital or non-digital format), or higher resolution mapping or delineation for the Department to deem the notification complete.*

## 12. MEASURES TO PROTECT FISH, WILDLIFE, AND PLANT RESOURCES

A. Describe the techniques that will be used to prevent sediment from entering watercourses during and after construction.

☐ Continued on additional page(s)

B. Describe project avoidance and/or minimization measures to protect fish, wildlife, and plant resources.

☐ Continued on additional page(s)

C. Describe any project mitigation and/or compensation measures to protect fish, wildlife, and plant resources.

☐ Continued on additional page(s)



### 13. PERMITS

List any local, State, and federal permits required for the project and check the corresponding box(es). Enclose a copy of each permit that has been issued.

- A. \_\_\_\_\_ ☐ Applied ☐ Issued
- B. \_\_\_\_\_ ☐ Applied ☐ Issued
- C. \_\_\_\_\_ ☐ Applied ☐ Issued
- D. Unknown whether ☐ local, ☐ State, or ☐ federal permit is needed for the project. (*Check each box that applies*)

☐ Continued on additional page(s)

### 14. ENVIRONMENTAL REVIEW

A. Has a draft or final document been prepared for the project pursuant to the California Environmental Quality Act (CEQA) and/or National Environmental Protection Act (NEPA)?

- ☐ Yes (*Check the box for each CEQA or NEPA document that has been prepared and enclose a copy of each.*)
- ☐ No (*Check the box for each CEQA or NEPA document listed below that will be or is being prepared.*)

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Notice of Exemption  | <input type="checkbox"/> Mitigated Negative Declaration             | <input type="checkbox"/> NEPA document ( <i>type</i> ): _____ |
| <input type="checkbox"/> Initial Study        | <input type="checkbox"/> Environmental Impact Report                |   |
| <input type="checkbox"/> Negative Declaration | <input type="checkbox"/> Notice of Determination ( <i>Enclose</i> ) |   |
| <input type="checkbox"/> THP/ NTMP            | <input type="checkbox"/> Mitigation, Monitoring, Reporting Plan     |   |

B. State Clearinghouse Number (*if applicable*)

C. Has a CEQA lead agency been determined? ☐ Yes (*Complete boxes D, E, and F*) ☐ No (*Skip to box 14.G*)

D. CEQA Lead Agency

E. Contact Person

F. Telephone Number

G. If the project described in this notification is not the "whole project" or action pursuant to CEQA, briefly describe the entire project (Cal. Code Regs., tit. 14, § 15378).

☐ Continued on additional page(s)

H. Has a CEQA filing fee been paid pursuant to Fish and Game Code section 711.4?

- ☐ Yes (*Enclose proof of payment*) ☐ No (*Briefly explain below the reason a CEQA filing fee has not been paid*)

*Note: If a CEQA filing fee is required, the Lake or Streambed Alteration Agreement may not be finalized until paid.*





### 15. SITE INSPECTION

Check one box only.

- ☐ In the event the Department determines that a site inspection is necessary, I hereby authorize a Department representative to enter the property where the project described in this notification will take place at any reasonable time, and hereby certify that I am authorized to grant the Department such entry.
- ☒ I request the Department to first contact (*insert name*) Aiyana or Robert Neely  
at (*insert telephone number*) 707-672-9419 to schedule a date and time to enter the property where the project described in this notification will take place. I understand that this may delay the Department's determination as to whether a Lake or Streambed Alteration Agreement is required and/or the Department's issuance of a draft agreement pursuant to this notification.

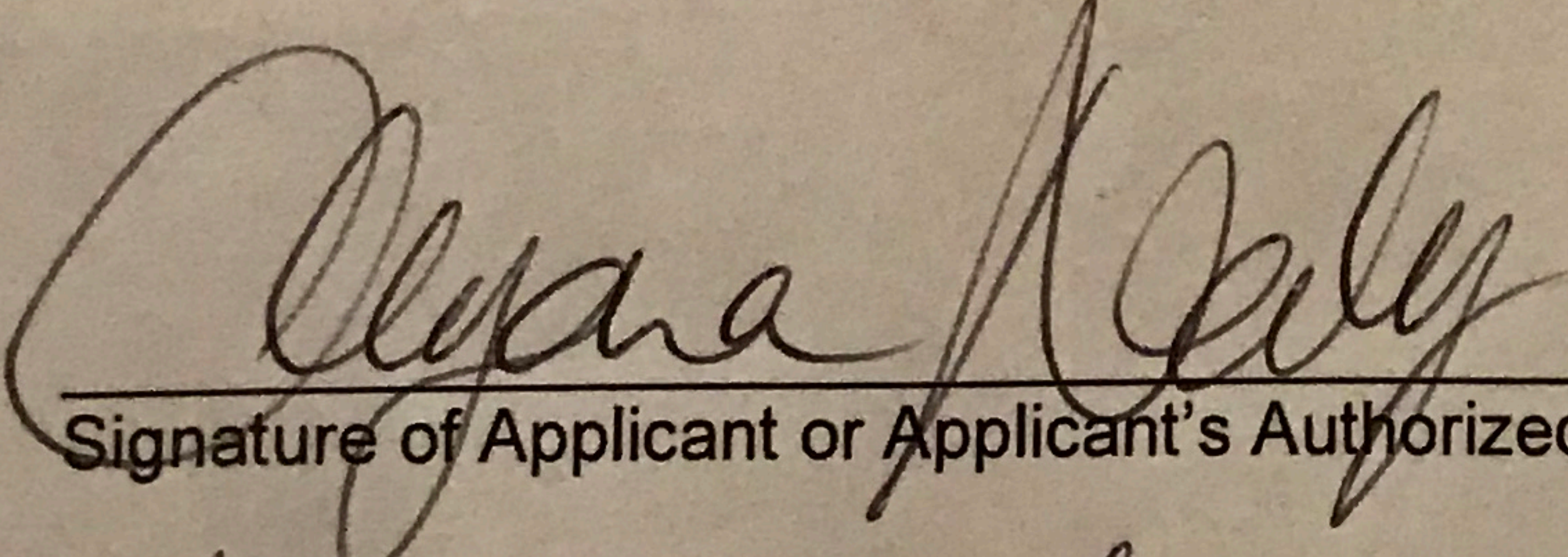
### 16. DIGITAL FORMAT

Is any of the information included as part of the notification available in digital format (i.e., CD, DVD, etc.)?

- ☐ Yes (Please enclose the information via digital media with the completed notification form)
- ☒ No

### 17. SIGNATURE

I hereby certify that to the best of my knowledge the information in this notification is true and correct and that I am authorized to sign this notification as, or on behalf of, the applicant. I understand that if any information in this notification is found to be untrue or incorrect, the Department may suspend processing this notification or suspend or revoke any draft or final Lake or Streambed Alteration Agreement issued pursuant to this notification. I understand also that if any information in this notification is found to be untrue or incorrect and the project described in this notification has already begun, I and/or the applicant may be subject to civil or criminal prosecution. I understand that this notification applies only to the project(s) described herein and that I and/or the applicant may be subject to civil or criminal prosecution for undertaking any project not described herein unless the Department has been separately notified of that project in accordance with Fish and Game Code section 1602 or 1611.

  
Signature of Applicant or Applicant's Authorized Representative

Date

11/14/18

Aiyana Neely  
Print Name



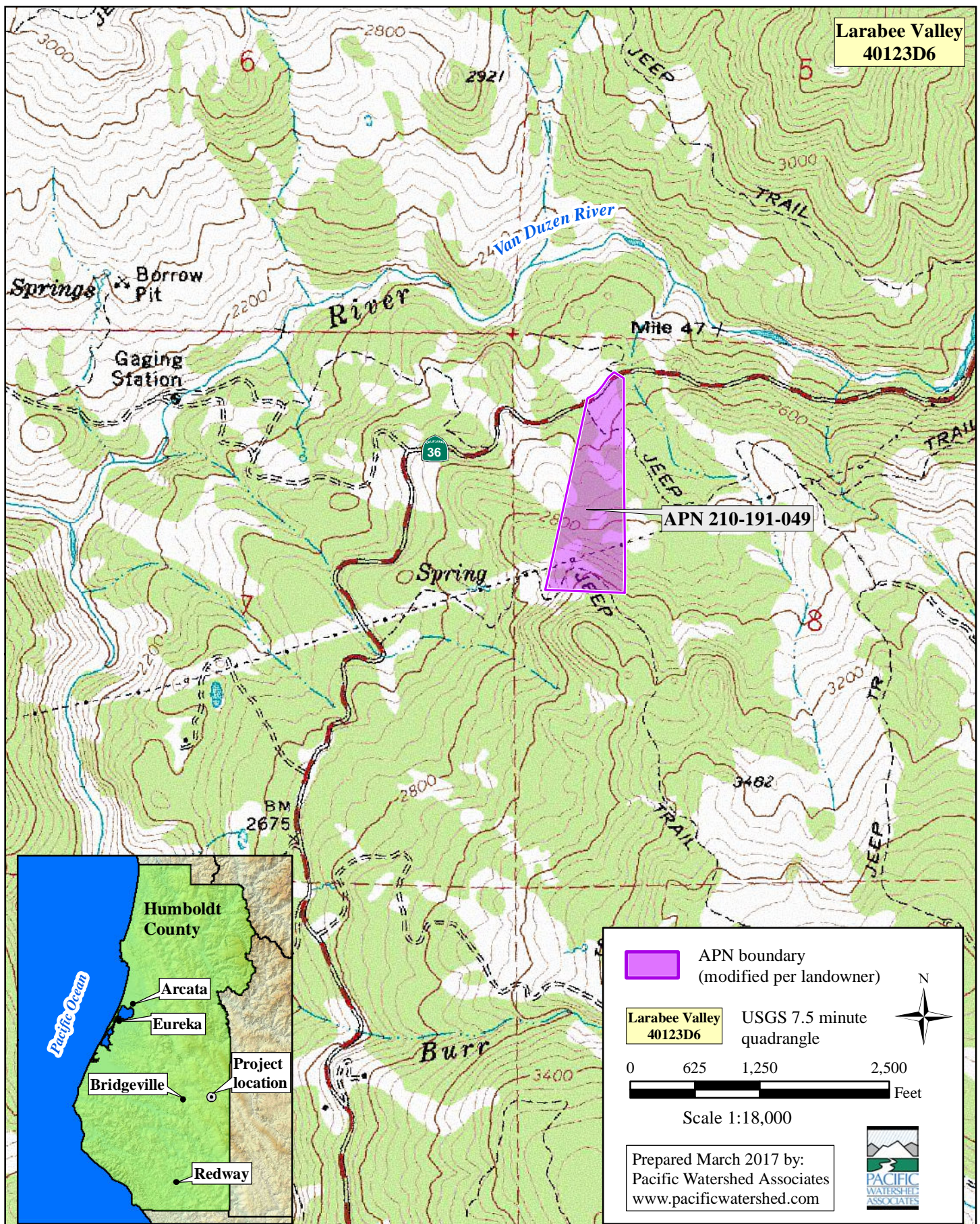


Figure 1. Location map for LSAA map for Highway 36 Homestead, APN 210-191-049, 41600 California State Highway 36, Bridgeville, Humboldt County, California.



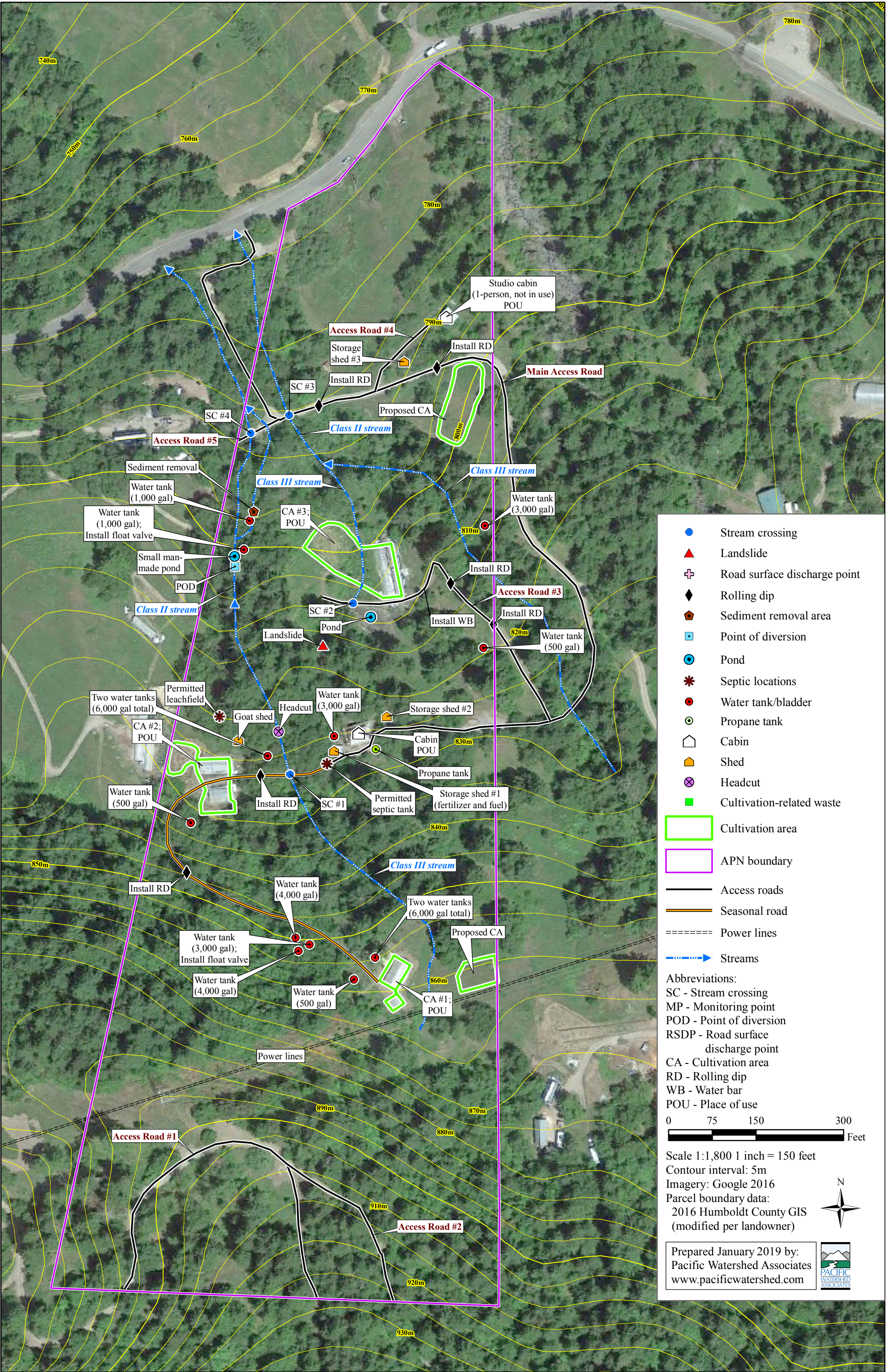


Figure 2. LSAA map for Highway 36 Homestead, APN 210-191-049, 41600 California State Highway 36, Bridgeville, Humboldt County, California.



## **6. FEES**

The project costs for the existing surface water diversion (POD) includes the installation of an off-channel flow (water) meter to monitor and record water use, the installation of float valves on water tanks where necessary, and any costs to improve the water lines and infrastructure. Costs for the four stream crossings include, but are not limited to, the time and materials (culverts, rock armor, heavy equipment time, etc.) to upgrade or decommission the crossing. And finally the costs for the sediment removal above SC#4 will be limited to time and materials at remove the sediment plug with the use of hand tools (shovel, pick axe, wheel barrel, etc.).

## **8. PROJECT LOCATION**

The project is located on Humboldt County APN 210-191-049. The property can be accessed by heading south on Highway 101 from Eureka to Highway 36 for approximately 39 miles take a dirt road to the right. The destination is located on the right.

A site map of the project area displaying the roads, locations of the stream crossings and proposed road drainage structures, point of diversion, places of use, and water storage is attached to this application. The attached map is associated with a Water Resource Protection Plan (WRPP) that was developed for this property as part of the Regional Water Quality Control Board Waiver of Waste Discharge Program in order to stormproof stream crossings, and reduce road related sediment delivery to the Van Duzen River Watershed.

## **10. PROJECT DESCRIPTION**

This LSAA is being submitted for one existing surface water diversion (POD), three stream crossing upgrades (SC#1, #3, and #4), one spring fed pond (SC#2) proposed for decommissioning, and sediment removal in the stream channel above SC#4. .

### **Surface water diversion/place of diversion (POD):**

- 1) POD (40.483803°,-123.645329°) is located on an unnamed Class II stream tributary to the Upper Van Duzen River. The diversion was initiated in 2010. The existing diversion consists of a vertically emplaced 18-inch diameter concrete cistern which is positioned in the stream channel near the left bank. Flow is diverted via a ¾-inch diameter black poly pipe with a screened inlet for domestic use (4-people) and the irrigation of 0.22 acres of cannabis. Flow is gravity fed to 14 storage tanks for a total of approximately 32,500 gallons of water storage. Approximately 0.57acre feet (185,385 gal.) is diverted from the watercourse per year (Photos 1-3).

Off-channel flow (water) meters will be installed at all points of use to monitor and record water use. Float valves will be installed on all water tanks where necessary to prevent overflow and eliminate surface water diversion when tanks are full (i.e. the 1,000 gal. holding tank and 3,000 gal. tank near CA#1). Channel flow rates will be calculated on a monthly basis (with a bucket and stopwatch) to determine the lowest and highest level of flow. Due to the unstable nature of the terrane all water lines will remain above ground. The landowner will regularly monitor the lines to ensure the system is working and no leaks are occurring. Additionally, the landowner is proposing to increase water storage capacity so that no diversion for irrigation occurs during the low flow season from April 1 to October 31. An Initial Statement of Diversion and Use has been submitted to the State Water Resources Control Board (SWRCB) Division of Water Rights (DWR) for the surface water diversion. Additionally, a Small Irrigation Use Registration was submitted the SWRCB- DWR for the surface water diversion and water storage.



**Stream crossings:**

- 1) Stream crossing #1 (40.482828°, -123.644981°) A small unculverted fill crossing on Class III watercourse with no formal drainage structure. Additionally, the road to the west of this crossing has limited, seasonal use. Active erosion was observed at two locations: 1) the outboard road where a small headcut has formed; and 2) below the outboard road where a large headcut has formed. The crossing exhibits a moderate erosion potential and threat to water quality (Photos 4-6).

The crossing will be upgraded with an armored fill sized for 100 year stream flows. See “Ten Steps for Constructing a Typical Armored Fill Stream Crossing” for a detailed description of the armored fill installation. The large headcut will be laid back to a stable (2:1) angle where feasible and 10 yd<sup>3</sup> rock armor will be installed in a “U-shaped” configuration to prevent the headcut from migrating upstream and potentially undermining the stream crossing (PWA Typical Drawing 18). Additionally, two rolling dips will be installed along the left road approach to reduce hydrologic connectivity and prevent surface erosion (See PWA Typical Drawing 11).

- 2) Stream crossing #2/ Pond spillway (40.483571°, -123.644490°) is an unlined, spring fed pond which collects storm flows and direct rainfall. The pond was installed in 2012, and based on a rapid assessment the embankment appears stable, however there is currently no spillway to drain the pond during high rainfall events or prevent failure of the embankment/season access road. This pond is not used as a source of water for either domestic or agricultural purposes (Photos 7-8).

The pond spillway will be enhanced/excavated to drain the pond and allow for bypass flow. Install a waterbar on the right road approach to reduce runoff and sediment delivery from the road network (See PWA Typical Drawing 10). Remove the greenhouse closest to the stream, the entire outdoor cultivation area and all cultivation waste/materials from this location.

- 3) Stream crossing #3 (40.484518°, -123.645002°) A Class II watercourse with a 30-inch diameter steel culvert. The culvert is installed high in the fillslope with a 3 foot plunge at the outlet that does not allow passage of aquatic organisms. In the event that the culvert plugs or fails, diversion potential exists to the left. The culvert is undersized for stream 100-year flows and associated debris. Additionally, the crossing exhibits a moderate erosion potential and threat to water quality (Photos 9-10).

The culvert will be replaced with a 60 inch dia. x 30 foot long culvert that is installed in line with the natural stream channel and sized for 100 year stream flows and associated debris, installed at channel grade, and at the base of fill (See PWA Typical Drawings 1a and 2). The increased culvert diameter may require the road surface to be built up to accommodate the new culvert. Additionally, two rolling dips will be installed along the right road approach to reduce hydrologic connectivity and prevent surface erosion.

- 4) Stream crossing #4 (40.484432°, -123.645238°) Two small Class II watercourses confluence at the road: 1) an undersized 18-inch diameter steel culvert with a partially obscured inlet and 2) a fill crossing with no formal drainage structure. Active stream flow currently occupies the fill structure and no surface flow was observed at the culverted crossing. Additionally, both the culvert and the fill crossing are undersized for stream 100-year flows and associated debris. The crossing exhibits a moderate erosion potential threat to water quality (Photos 11-13).

We recommend removing the existing 18-inch diameter culvert and installing a new 48 inch dia. x 30 foot long culvert sized for 100 year stream flows and associated debris, installed in line with the downhill channel (Photo 13), at channel grade, and at the base of fill (See PWA Typical Drawings 1a and 2). Additionally, the inboard ditch will need to be excavated to capture flow from the uphill crossing (Photo

12). The increased culvert diameter will require the road surface to be built up to approximately 3.75 feet to accommodate the new culvert. Due to the road bed being built up a critical dip will need to be constructed on the downhill hinge line of the crossing to prevent diversion. Notify your local call center to identify utilities within the excavation area before work commences (Use North 811 800-642-2444).

Sediment removal above Stream crossing #4 (40.4838°, -123.6451°) the stream channel downstream of the POD has been dammed up by a small pond (<500 gallons) where the stream flow splits into two channels before the channels confluence in the inboard ditch at SC#4. Historically, flow occupied the westerly channel, however, due to sedimentation in the pond, flow is currently occupying the easterly channel.

Remove the sediment plug (<1 yd<sup>3</sup>) at the pond outlet with hand tools (shovel, pick axe, etc.) to allow stream flow to occupy its natural channel. All soils will be removed and stored in a stable location far from any streams or wet areas. Adaptively manage and monitor the pond and stream channel regularly to ensure the main westerly channel is clear of sediment and flowing freely.

All disturbed areas capable of delivering sediment to a watercourse will be seeded with barley or wheat based erosion control seed not containing Annual or Perennial Ryegrass and mulched with weed free straw at a rate no less than 50 lb/acre of seed and 4,000 lb/acre of straw. Any spoils generated during construction will be stored in a stable location and mulched to prevent surface erosion.

The stream crossing upgrades proposed in this Agreement are recommendations from the Highway 36 Homestead Water Resource Protection Plan (WRPP) that was developed by PWA as part of the Regional Water Quality Control Board Waiver of Waste Discharge Program. Methods for determining the 100-year design discharge include the Rational Method. The Rational Method is limited to watersheds less than 100 acres. The method is based on this equation:

$$Q_{100} = CIA$$

**Where:**

**Q<sub>100</sub>**= predicted peak runoff from a 100-year runoff event (in cubic feet second)

**C**= runoff coefficient (percent of rainfall that becomes runoff)

**I**= uniform rate of rainfall intensity (inches/hour)

**A**= drainage area (in acres)

All of the stream crossing upgrades will be constructed according to standards provided in the "Handbook for Forest, Ranch and Rural Roads," (Weaver, Weppner and Hagans, 2015), and the California Salmonid Stream Habitat Manual, Part X (Weaver, Hagans and Weppner, 2006). Implementation of the WRPP will also disconnect hydrologically connected road reaches and road side ditches from stream crossings to the greatest degree feasible through the installation of rolling dips and ditch relief culverts (Figure 2).

**Table 4.2. Culvert Sizing Recommendations APN 210-191-049**

Stream crossing number	Existing culvert diameter (in)	Watershed area (acres)	Mean annual rainfall (in)	Q100 – discharge estimate for 100-yr storm (cfs)	Recommended culvert diameter (in) <sup>1, 2, 3</sup>
SC #1	N/A	12	66	16	Armored Fill
SC #3	30	41	66	56	60
SC #4	18	25	66	34	48

<sup>1</sup> The Rational Method was used to estimate the 100-year flood discharges for this notification  
<sup>2</sup> The 100-year Return-Period precipitation data was sourced from: [http://hdsc.nws.noaa.gov/hdsc/pfds/pfds\\_map\\_cont.html?bkmrk=ca](http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html?bkmrk=ca)  
<sup>3</sup> A 0.35 runoff coefficient (C) and a headwater depth ratio (HW/D) of 0.67 was used to determine culvert sizing.

## 11. PROJECT IMPACTS

The disturbance area at the point of diversion is limited to the diversion structure and will include the installation of off-channel flow (water) meters where necessary.

Approximately 61 linear feet of “channel” has been affected by the installation of the pond. The enhancement of the pond spillway at SC#2 will be limited to 8 feet wide x 20 feet long.

Permanent impacts to existing native channel bed, channel, watercourse banks, and associated riparian habitat will be negligible and avoided. Incidental destruction of small areas of riparian vegetation growing on existing road fill or in disturbed channel areas is expected at some upgrade crossings during remediation.

Stream crossing #1 Disturbance within the bed and banks of the stream will be limited to the road footprint of the crossing measuring approximately 12 feet wide x 100 feet long.

Stream crossing #3 Disturbance within the bed and banks of the stream will be limited to the road footprint of the crossing measuring approximately 8 feet wide x 40 feet long.

Stream crossing #4 Disturbance within the bed and banks of the stream will be limited to the road footprint of the crossing measuring approximately 8 feet wide x 40 feet long.

Sediment Removal upstream of Stream Crossing #4- Disturbance is limited to the removal of a small sediment plug measuring approximately 5 feet wide x 5 feet long.

The property was assessed using the California Natural Diversity Database (CNDDB) to preliminarily check if the parcel contained a known occurrence of a rare plant or animal, and specifically spotted owls. It is important to note that the lack of data does not positively affirm the absence of notable species within the parcel in question. According to the CNDDB there is one elemental occurrence within parcel boundaries, and two in close proximity. The EO within parcel boundaries shows the occurrence of *Falco peregrinus anatum* (American peregrine falcon) mapped with an 80 meter accuracy radius. The first EO outside of parcel boundaries occurs 0.15 miles to the north east in a specifically mapped area and shows the occurrence of *Atractelmis wawona* (Wawona riffle beetle). The second EO outside of parcel boundaries also occurs 0.15 miles to the north east and shows the occurrence of *Emys marmorata* (western pond turtle). In regards to spotted owls, no observations were mapped close enough to warrant a survey.

Additionally, the landowner is under contract with Tami Camper, a professional biologist to conduct a biological assessment of the project site. A preliminary biological assessment of the Project Site was conducted on September 22, 2018.

## **12. MEASURES TO PROTECT FISH, WILDLIFE, AND PLANT RESOURCES**

Standards of work will conform to CDFW California Salmonid Stream Habitat Restoration Manual Part X and the Handbook for Forest, Ranch and Rural Roads, and will occur during the summer months. Care will be taken not to unnecessarily disturb the native channel outside of the identified areas. Fill to be permanently removed will be stored in designated locations with no risk of sediment delivery. All disturbed areas where sediment delivery from surface erosion processes is feasible will be seeded and mulched to reduce surface erosion and transport processes.

The proposed stream crossing upgrades associated with this project will occur on in-use roads. All disturbance associated with this project will be limited to the road and immediately adjacent stream channel reaches as necessary to improve road drainage, storm-proof the stream crossings, and prevent sediment delivery to watercourses. When necessary, water will be pumped around all stream excavations to be restored prior to backfilling with native material to prevent delivery of turbid water to the downstream channel (See Typical Drawings).

Work will only occur during the period of June 15 through October 15 (or first significant rainfall) to limit and avoid impacts to aquatic habitat and salmonids. Vegetation will only be removed from sites where it is growing on anthropogenically placed fill material, where erosion is likely to deliver to active watercourses, or where necessary for the implementation of effective storm-proofing treatments.

## **13. PERMITS**

Permits include:

Regional Water Quality Control Board Waiver of Waste Discharge Order number R1-2015-0023

Enrolled: April 25, 2016

Site WDID: 1B16626CHUM

CMMLUO: Application #12572

## **14. ENVIRONMENTAL REVIEW**

14G. The project described in this Agreement was identified in a property inspection conducted by Pacific Watershed Associates (PWA) under contract with the property owner in order to develop the Water Resource Protection Plan (WRPP), and enroll in the Regional Water Quality Control Board Waiver of Waste Discharge Program. The storm-proofing encroachments proposed in this application will be implemented in conjunction with the installation of rolling dips, in order to establish a hydrologically disconnected road network and reduce sediment delivery. Hydrologic disconnection of the road network will reduce sediment delivery to the Redwood Creek watershed. Project is confined to existing in use roads and is exempt from CEQA. However, in the event CEQA is required, Humboldt County will be the lead CEQA agency for all landowners pursuing permits under the Humboldt County Commercial Medical Marijuana Land Use Ordinance (CMMLUO).

**Remediation Plan:** As described above, there are three stream crossings recommended for upgrade, in addition to sediment removal upstream of SC#4 and the pond spillway enhancement at SC#2 which require remediation. The combined disturbance to remediate these sites is approximately 2,025 square feet.



### Place of Diversion (POD)



**Photo 1-** POD- view of concrete cistern located on a Class II stream. The diversion structure is embedded in the stream channel (Photo April 2016).



**Photo 2-** POD view of concrete cistern looking upstream at diversion structure (Photo April 2016).





**Photo 3-** Downstream view of Class II stream channel standing above POD (Photo April 2016).

#### **Stream Crossings (SC)**



**Photo 4-** Downstream view of Stream Crossing (SC) #1- looking at the road bed. SC#1 is a fill crossing on Class III watercourse with no formal drainage structure. Note the small headcut at the outboard road (Photo April 2016).





**Photo 5**– View of SC #1- looking upstream at a headcut forming in the outboard road on Class III watercourse (Photo April 2016).



**Photo 6**– View of large active headcut below SC#1 (Photo April 2016).





**Photo 7**– View of pond/SC#2 and pond spillway denoted with orange arrow and embankment looking east (Photo December 2018).



**Photo 8**– View of pond/SC#2 and pond spillway denoted with orange arrow and embankment looking west (Photo December 2018).





**Photo 9**– View of SC #3 looking downstream at 30-inch diameter culvert inlet on Class II watercourse. The culvert inlet is slightly obscured by poorly place rock armor (Photo April 2016).



**Photo 10**– View of SC #3 looking upstream at 30-inch diameter culvert outlet on Class II watercourse. The culvert is installed high in the fill with a 3 foot plunge at the culvert outlet which does not allow for the passage of aquatic organisms (Photo April 2016).





**Photo 11**– View of SC #4 looking perpendicular to the road. There are two small Class II watercourses which confluence at the road each conveyed across the road by different means (18-inch dia. culvert and no drainage structure) (Photo December 2018).



**Photo 12**– View of 18-inch diameter culvert inlet at SC #4 (Photo December 2018).





**Photo 13**– View of fill crossing at SC #4 (Photo December 2018).



**Photo 14**– View of the spring fed pond (Photo April 2016).





**Photo 15**– View of the pond embankment, pond spillway, and CA#3 (Photo April 2016).

#### **Places of Use (POU)**



**Photo 16**– POU- house (Photo April 2016).





**Photo 17**– POU- Cultivation Area (CA) #1 (Photo April 2016).



**Photo 18**– POU- CA#2 (Photo April 2016).



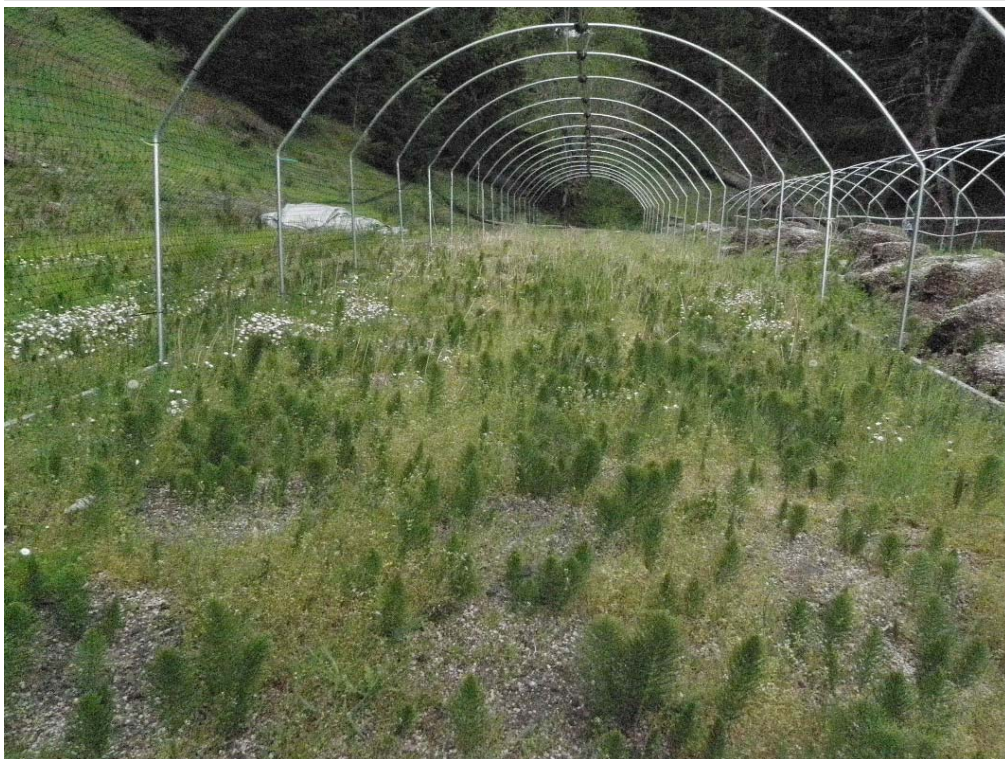


**Photo 19**– POU- CA#2 (Photo April 2016).



**Photo 20**– POU- Outdoor garden area at CA#3 (Photo April 2016).





**Photo 21**– POU- CA#3 (Photo April 2016).

### **Water Storage**



**Photo 22**– View of leaking 1,000 gallon water tank downstream of POD (Photo December 2018).





**Photo 23**– View of two water tanks (Photo April 2016).



**Photo 24**– View of water tank (Photo April 2016).





**Photo 25**– View of two water tanks (Photo April 2016).

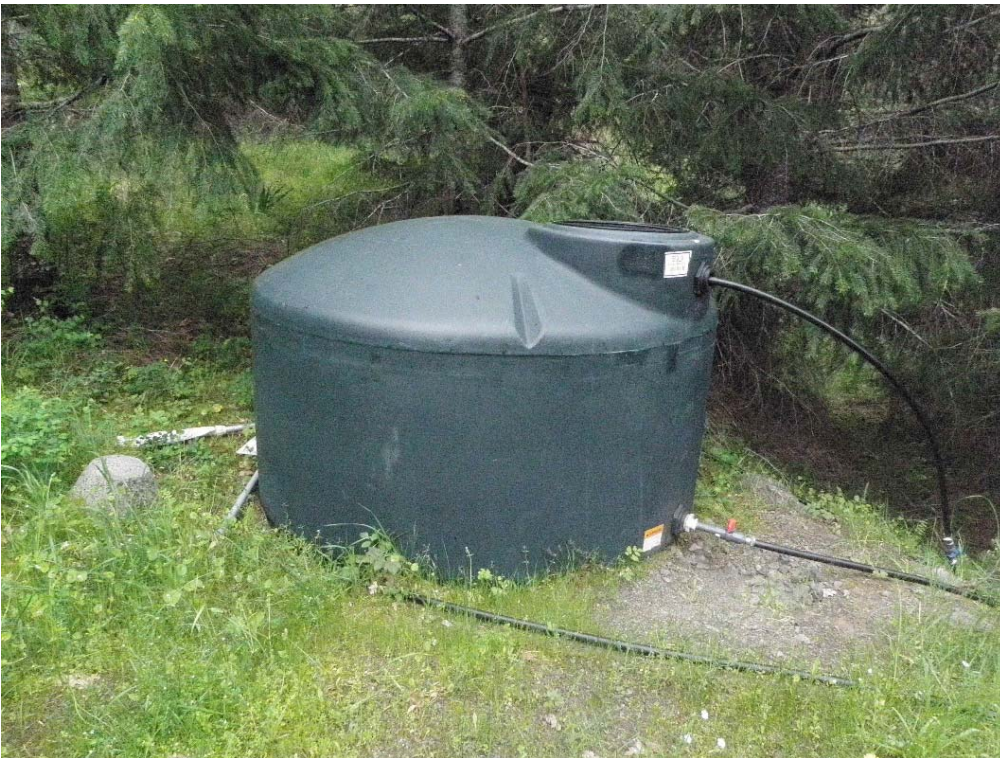


**Photo 26**– View of leaking 3,000 gal water tank (Photo December 2018).





**Photo 27**– View of water tank (Photo April 2016).

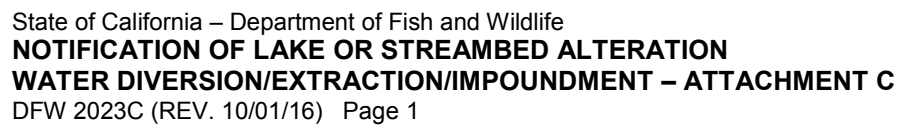


**Photo 28**– View water tank (Photo April 2016).





**Photo 29**– View of 3,000 gallon water tank (Photo April 2016).



Project Name: \_\_\_\_\_

## Water Diversion/Extraction/Impoundment

## I. Diversion or Obstruction

- | SEASON OF DIVERSION           |                            | PURPOSE OF USE | DIVERSION RATE<br>(cfs or gpm) | AMOUNT USED<br>(acre feet) |              |
|-------------------------------|----------------------------|----------------|--------------------------------|----------------------------|--------------|
| BEGINNING DATE<br>(Mo. & Day) | ENDING DATE<br>(Mo. & Day) |                |                                | FROM STORAGE               | BY DIVERSION |
|                               |                            |                |                                |                            |              |
|                               |                            |                |                                |                            |              |
|                               |                            |                |                                |                            |              |
|                               |                            |                |                                |                            |              |
|                               |                            |                |                                |                            |              |

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State of California – Department of Fish and Wildlife  
**NOTIFICATION OF LAKE OR STREAMBED ALTERATION**  
**WATER DIVERSION/EXTRACTION/IMPOUNDMENT – ATTACHMENT C**  
DFW 2023C (REV. 10/01/16) Page 2

E. Check each box below that applies to the project water rights and attach supporting documents.

☐ Riparian. *Attach the most recent Statement of Water Diversion and Use filed with the SWRCB.*

☐ Diversion for immediate use.

☐ Diversion to storage (for less than 30 days).

☐ Appropriative.

☐ Pre-1914. *Attach the most recent Statement of Water Diversion and Use filed with SWRCB.*

☐ Post-1914. *Attach a copy of the applicant's water right application, permit, or license filed with or issued by SWRCB.*

☐ Small domestic, livestock stockpond, or small irrigation use registration. *Attach a copy of the applicant's registration of water use form filed with, or registration certificate issued by, SWRCB (See Water Code section 1228 et seq.).*

☐ Diversion for immediate use.

☐ Diversion to storage.

☐ Purchased or contracted water. *Attach a copy of the applicant's contract or letter from the applicant's water provider.*

☐ Other. *Describe below or attach separate page.*

F. Approximate lowest level of flow in the river, stream, or lake at the point of diversion during the proposed season of diversion in gpm or cfs:

G. *Other information.* After the Department reviews the project description, and based on the project's location and potential impacts to fish and wildlife resources, the Department will determine if additional information is needed before accepting the notification as complete. Such information could include more site-specific information to ensure that the terms and conditions in the Agreement issued to the applicant will be adequate to protect the fish and wildlife resources the diversion or obstruction could adversely affect. Site-specific information could include biological or hydrological studies or surveys based on the season of diversion, the location of the diversion relative to other diversions in the watershed, the method of diversion, and the quantity of water to be diverted, such as the following:



**NOTIFICATION OF LAKE OR STREAMBED ALTERATION**

**WATER DIVERSION/EXTRACTION/IMPOUNDMENT – ATTACHMENT C**

DFW 2023C (REV. 10/01/16) Page 3

1. *Water Availability Analysis* to determine if the water can be diverted without causing substantial adverse effects on downstream fish and wildlife resources. Water availability analyses are based on a comparison of flows without any diversions (unimpaired flows) and flows available when all known diversions are “subtracted” (impaired flows).
2. *Instream Flow Study* to determine the minimum bypass flows needed and maximum rates of withdrawal possible to provide adequate depths and velocities to protect habitat for all life stages of aquatic resources. The study plan must be prepared by a qualified fisheries biologist and approved by the Department, will determine the effects of the proposed diversion on flow depth and velocity.
3. *Water Quality Study* to assess the effects of the proposed water diversion or impoundment on water temperature and water quality at and downstream from the point(s) of diversion.

**II. Permanent or Temporary Reservoir**

Please provide the information below *if* the project includes the construction of a reservoir, whether permanent or temporary, and/or the filling of an existing reservoir by diverting or obstructing the flow of a river, stream, or lake.

A. Proposed use of the stored water:

B. Construction plans for the reservoir and dam. (*Attach plans*)

C. A complete description of the reservoir and dam, including the methods and materials that will be used to construct the reservoir and dam and the following dimensions certified by a licensed professional: the width, length, depth, and total surface area of the reservoir pool; the volume of water in acre-feet that will be stored in the reservoir; and the height and length of the dam.

D. The amount of riparian land that will be inundated (i.e., upstream from the dam): \_\_\_\_\_

E. Where vehicles will enter and exit the project site during construction and for maintenance purposes after construction. (*Attach map*)

F. The maximum distance of the disturbance that will occur upstream and downstream during construction:

G. The methods employed to ensure that the flow is maintained below the dam at all times when water is being diverted into the reservoir:



- H. Specify the time period when the area below the dam becomes dry, if at all.

- I. The methods employed to ensure that adult and juvenile fish will be able to pass over or around the dam:

- J. If a fish ladder is necessary to enable adult and juvenile fish to pass over or around the dam, provide construction plans and an operation plan for the fish ladder. (*Enclose, if applicable*)

- K. The methods employed to monitor and maintain water quality (including temperature) within the reservoir:

### III. Temporary Reservoir

Please provide the information below *if* the project includes the construction of a temporary reservoir only within the stream zone.

A. Date of dam installation: \_\_\_\_\_

B. Date of dam removal: \_\_\_\_\_

C. Amount of time it will take to construct the dam: \_\_\_\_\_

D. Amount of time it will take to remove the dam: \_\_\_\_\_

E. Methods to ensure that the reservoir pool will be drained in a manner that does not strand or otherwise harm fish:



Applicant Name: \_\_\_\_\_

Project Name: \_\_\_\_\_

## ATTACHMENT E

### Cannabis Cultivation

**Complete this attachment *if* the project includes cannabis cultivation and you are seeking authorization under an individual Lake or Streambed Alteration Agreement.** “Cultivation” means any activity involving the planting, growing, harvesting, drying, curing, grading, or trimming of cannabis (Business and Professions Code, section 26000 et seq.). *Please note that if you are seeking authorization under the General Agreement for Cannabis Cultivation you must notify online at the California Department of Fish and Wildlife (Department) website:* <https://www.wildlife.ca.gov/Conservation/LSA>.

**Complete Sections I – IV and VI for all Agreement types.**

**Complete Sections V *if* any aspect of the project includes remediation.** “Remediation” means to perform work that reduces or eliminates the direct and indirect adverse impacts on fish and wildlife resources associated with past or existing cannabis activities subject to Fish and Game Code 1602.

**Submit Attachment E with the Notification form (DFW 2023) and applicable fees.**

#### I. CULTIVATION OPERATION – Complete this section for all LSA Agreement types.

- ☐ Proposed new cannabis cultivation operation
- ☐ Existing cannabis cultivation operation

Type of CDFA Annual License you will apply for :

Specialty Cottage:

- ☐ Specialty Cottage Outdoor
- ☐ Specialty Cottage Indoor
- ☐ Specialty Cottage Mixed-Light Tier 1 and 2

Specialty:

- ☐ Specialty Outdoor
- ☐ Specialty Indoor
- ☐ Specialty Mixed-Light Tier 1 and 2

Small:

- ☐ Specialty Outdoor
- ☐ Specialty Indoor
- ☐ Specialty Mixed-Light Tier 1 and 2





Medium:

- ☐ Specialty Outdoor
- ☐ Specialty Indoor
- ☐ Specialty Mixed-Light Tier 1 and 2

☐ Nursery

☐ Processor

CDFA Annual License # (if applicable): \_\_\_\_\_

CDFA Temporary License # (if applicable): \_\_\_\_\_

**II. LOCAL ORDINANCE OR PERMIT – Complete this section for all Agreement types.**

Does the town, city, or county where cultivation will occur have a rule, ordinance, or other regulation or law that governs the cultivation of cannabis?

☐ Yes: Town/City

☐ Yes: County

☐ No

Are you required to have a written authorization (permit) from the city/town and/or county to cultivate cannabis within the city/town and/or county?

☐ Yes. *Enclose a copy permit(s) and/or completed application(s).*

☐ No

**III. WATER SUPPLY– Complete this section for all Agreement types.**

How is water supplied to the cannabis cultivation site(s)?

**Diversion, Obstruction, Extraction, or Impoundment of a River, Stream, or Lake**

☐ Yes

☐ No

*If yes is checked, you **must** also complete Attachment C.*

Geographic Coordinates of each diversion, obstruction, extraction, or impoundment:

Latitude \_\_\_\_\_ Longitude \_\_\_\_\_

**Spring(s)**

☐ Yes

☐ No

*If yes is checked, you **must** also complete Attachment C.*

Number of Springs \_\_\_\_\_

Geographic Coordinates of each spring:

Latitude \_\_\_\_\_ Longitude \_\_\_\_\_



**Private Well(s)**

☐ Yes

☐ No

If yes is checked, you **must** attach a map that identifies the location of the well(s).

Geographic Coordinates of each well:

Latitude \_\_\_\_\_ Longitude \_\_\_\_\_

You **must** provide the well's geographic location coordinates and a copy of the well log/well completion report filed with the Department of Water Resources pursuant to Section 13751 of Water Code. If no well log is available, provide evidence from the Department of Water Resources indicating that the Department of Water Resources does not have a record of the well log.

**Public Water System**

☐ Yes

☐ No

Name of public water system: \_\_\_\_\_

If Yes box is checked, you must enclose documentation from provider confirming authorization of service for water needed for project.

**Water Hauling**

☐ Yes

☐ No

Name of water hauler contact information, and a copy of the water hauler license issued by the California Department of Public Health:

Name of water hauler: \_\_\_\_\_

Water hauler license information: \_\_\_\_\_

☐ **Other**

Specify: \_\_\_\_\_

☐ Continued on additional page(s)

**IV. CALIFORNIA LICENSED PROFESSIONAL OR QUALIFIED ENVIRONMENTAL CONSULTANT/BIOLOGIST –  
Complete this section for all Agreement types.**

Have you consulted with or retained a California licensed professional or a qualified environmental consultant/biologist to address your cannabis cultivation?

☐ Yes (Provide the information below)

☐ No

Name of Company	Name of Professional or Consultant	Business Telephone



**V. REMEDIATION – Complete this section if *any* aspect of the project includes remediation.**

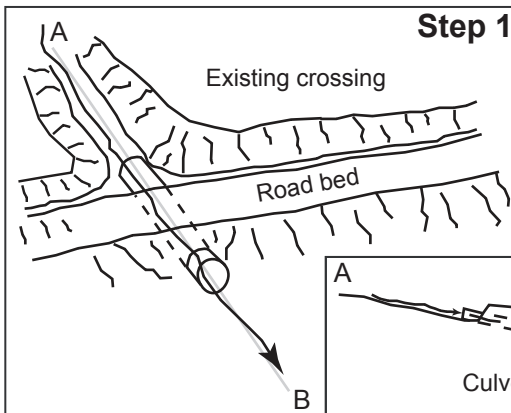
<b>A. Order or Notice.</b> Are you required to perform the work described in the notification pursuant to a court or administrative agency notice or order?	
<input type="checkbox"/> Yes ( <i>Enclose a copy of the order or notice</i> )	<input type="checkbox"/> No
Did you receive a notice of violation (NOV) from the Department that relates to the work described in the notification?	
<input type="checkbox"/> Yes ( <i>Enclose a copy of the NOV</i> )	<input type="checkbox"/> No
<b>B. Remediation Area.</b> Determine the total area that requires remediation.	
Remediation area in total:	_____ square feet
<b>C. Remediation Fee.</b> Submit the applicable fee based on the total size of the remediation area. The remediation fee is in addition to the notification fee and <b>must</b> be submitted by <b>separate</b> check or other method of payment (Cal. Code Regs., tit. 14, § 699.5, subd. (i)(3)(A)).	
<input type="checkbox"/> \$3,087.50 if the total remediation area is less than or equal to 1,000 square feet	
<input type="checkbox"/> \$5,145.75 if the total remediation area is greater than 1,000 square feet	
<b>D. Remediation Plan.</b> Has a plan to remediate the area been prepared?	
<input type="checkbox"/> Yes ( <i>Enclose the plan</i> ) <input type="checkbox"/> No	
<b>Note:</b> If “yes” is checked, submit the remediation plan with the Notification. If “no” is checked, your Notification may be incomplete and the Department may request you have a California licensed professional or qualified environmental consultant amend the plan or submit a new plan for your Notification.	

**VI. NOTIFICATION FEES – Entity must pay Department fee(s) at time of Notification.**

The current fee schedule is available at <a href="http://www.wildlife.ca.gov/Conservation/LSA/Forms">http://www.wildlife.ca.gov/Conservation/LSA/Forms</a> and specified in Section 699.5, subdivision (b) of the California Code of Regulations, title 14.	
Remediation fees, if applicable, are specified in Section 699.5, subdivision (i) of the California Code of Regulations, title 14. The remediation fee is in addition to the notification fee and must be submitted by <b>separate</b> check or other method of payment.	
<input type="checkbox"/> Notification Fee	<input type="checkbox"/> Remediation Fee (if applicable)



# Ten Steps for Constructing a Typical Armored Fill Stream Crossing

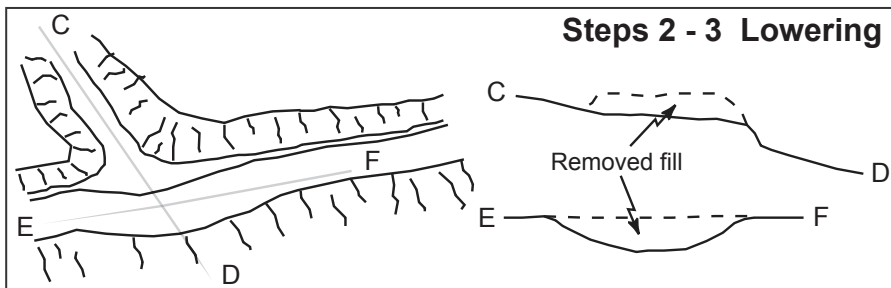


## Step 1

1. The two most important points are:

A) **The rock must be placed in a "U" shape across the channel to confine flow within the armored area.** (Flow around the rock armor will gully the remaining fill. Proper shape of surrounding road fill and good rock placement will reduce the likelihood of crossing failure).

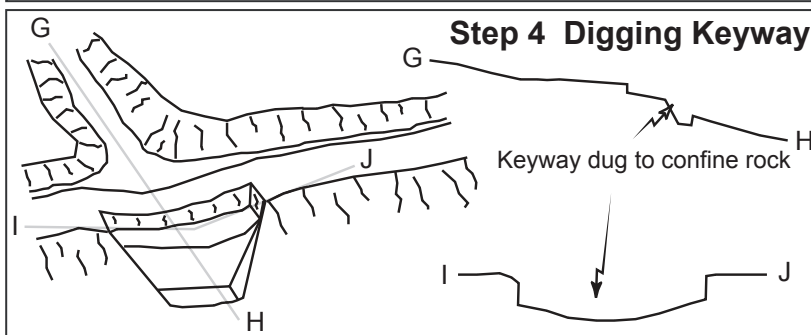
B) **The largest rocks must be used to buttress the rest of the armor in two locations:** i) The base of the armored fill where the fill meets natural channel. (This will buttress the armor placed on the outboard fill face and reduce the likelihood of it washing downslope). ii) The break in slope from the road tread to the outer fill face. (This will buttress the fill placed on the outer road tread and will determine the "base level" of the creek as it crosses the road surface).



## Steps 2 - 3 Lowering

2. **Remove any existing drainage structures** including culverts and Humboldt logs.

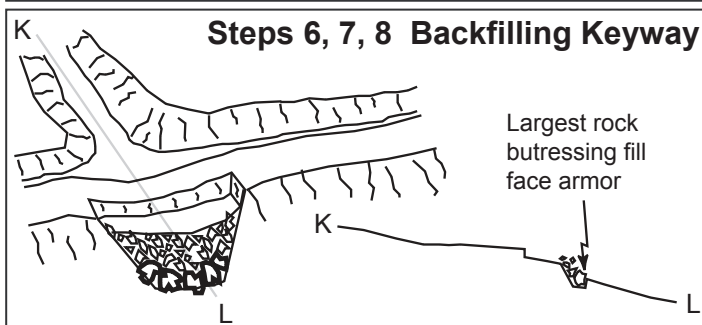
3. **Construct a dip** centered at the crossing that is large enough to accommodate the 100-year flow event and prevent diversion (C-D, E-F).



## Step 4 Digging Keyway

4. **Dig a keyway** (to place rock in) that extends from the outer 1/3 of the road tread down the outboard road fill to the point where outboard fill meets natural channel (up to 3 feet into the channel bed depending on site specifics) (G-H, I-J).

5. **Install geofabric (optional)** within keyway to support rock in wet areas and to prevent winnowing of the crossing at low flows.

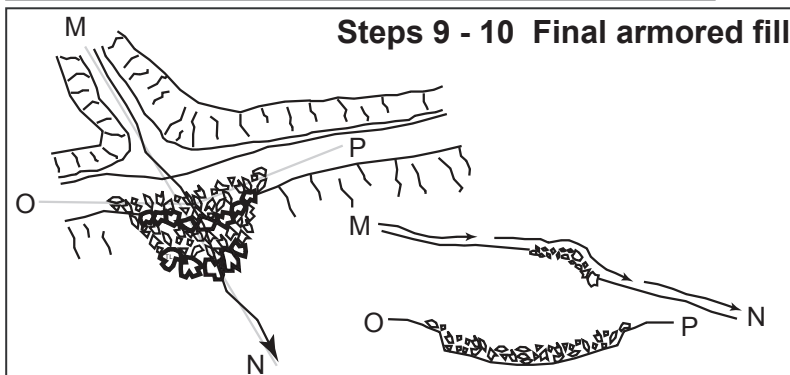


## Steps 6, 7, 8 Backfilling Keyway

6. **Put aside the largest rock** armoring to create 2 buttresses in the next step.

7. **Create a buttress using the largest rock** (as described in the site treatments specifications) at the base of fill. (This should have a "U" shape to it and will define the outlet of the armored fill.)

8. **Backfill the fill face** with remaining rock armor making sure the final armored area has "U" shape that will accommodate the largest expected flow (K-L).



## Steps 9 - 10 Final armored fill

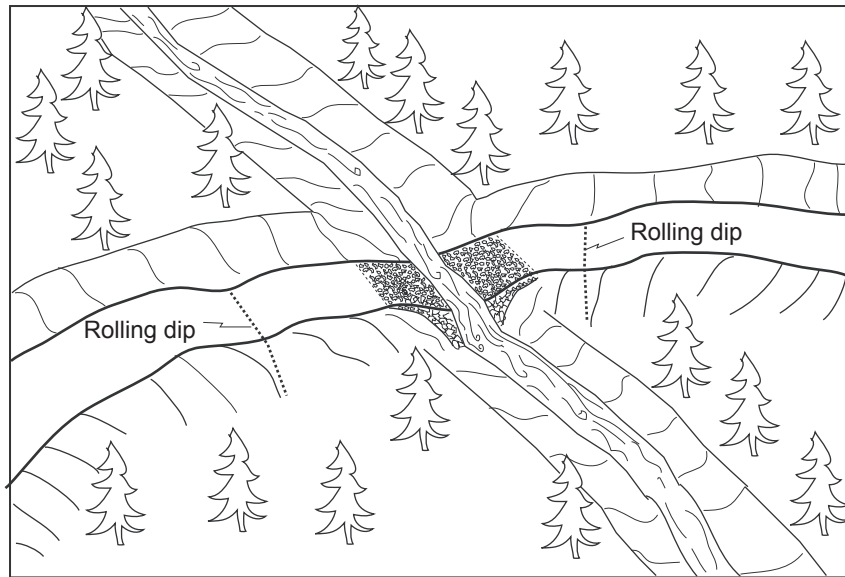
9. **Install a second buttress** at the break in slope between the outboard road and the outboard fill face. (This should define the base level of the stream and determine how deep the stream will backfill after construction) (M-N).

10. **Back fill the rest of the keyway** with the unsorted rock armor making sure the final armored area has a "U" shape that will accommodate the largest expected flow (O-P).

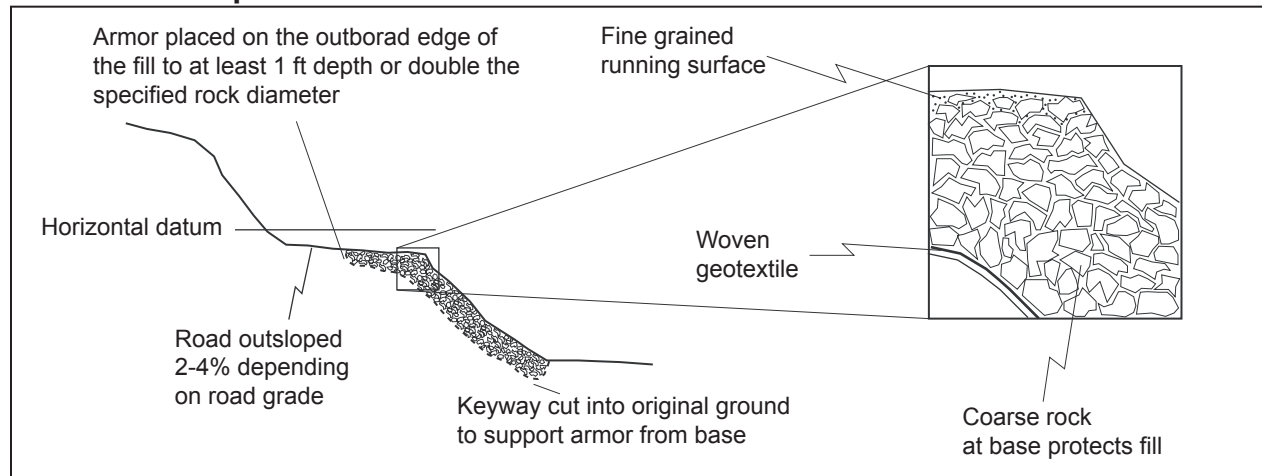
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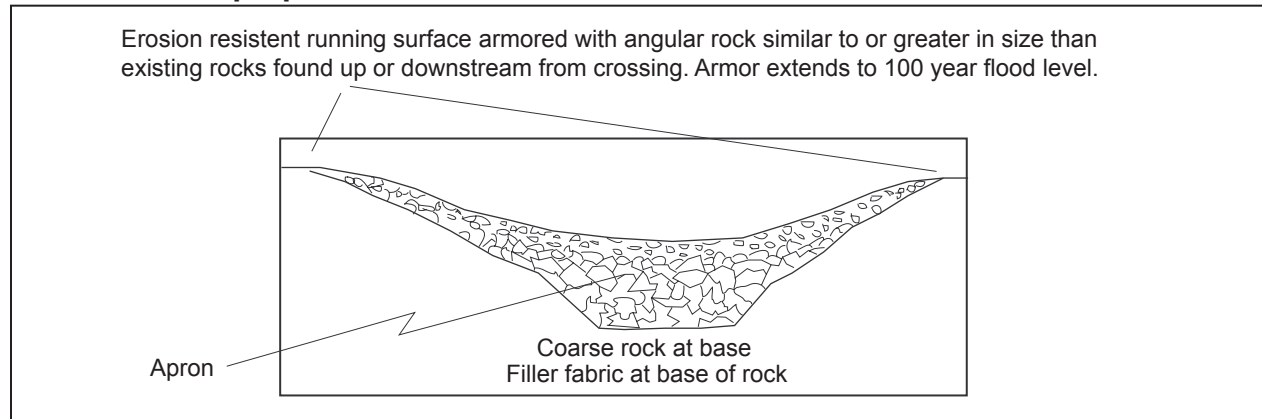
## Typical Armored Fill Crossing Installation



### Cross section parallel to watercourse



### Cross section perpendicular to watercourse

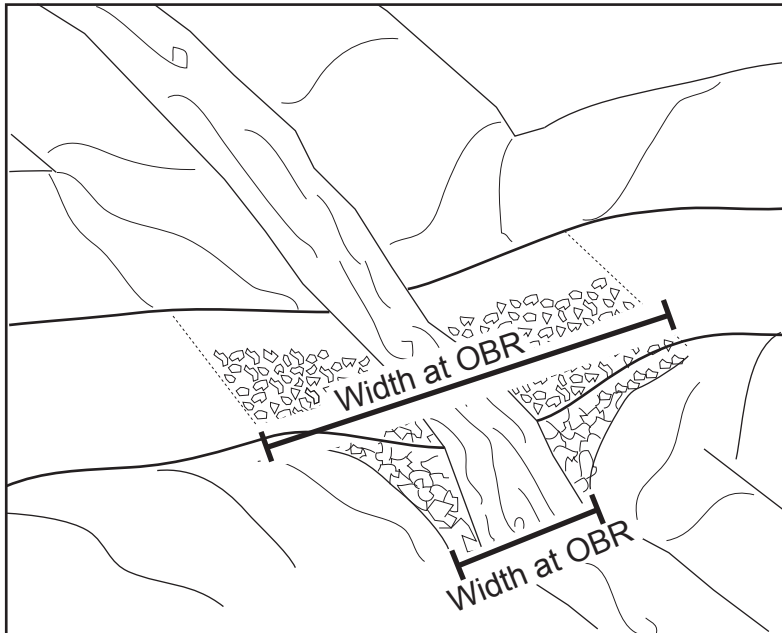


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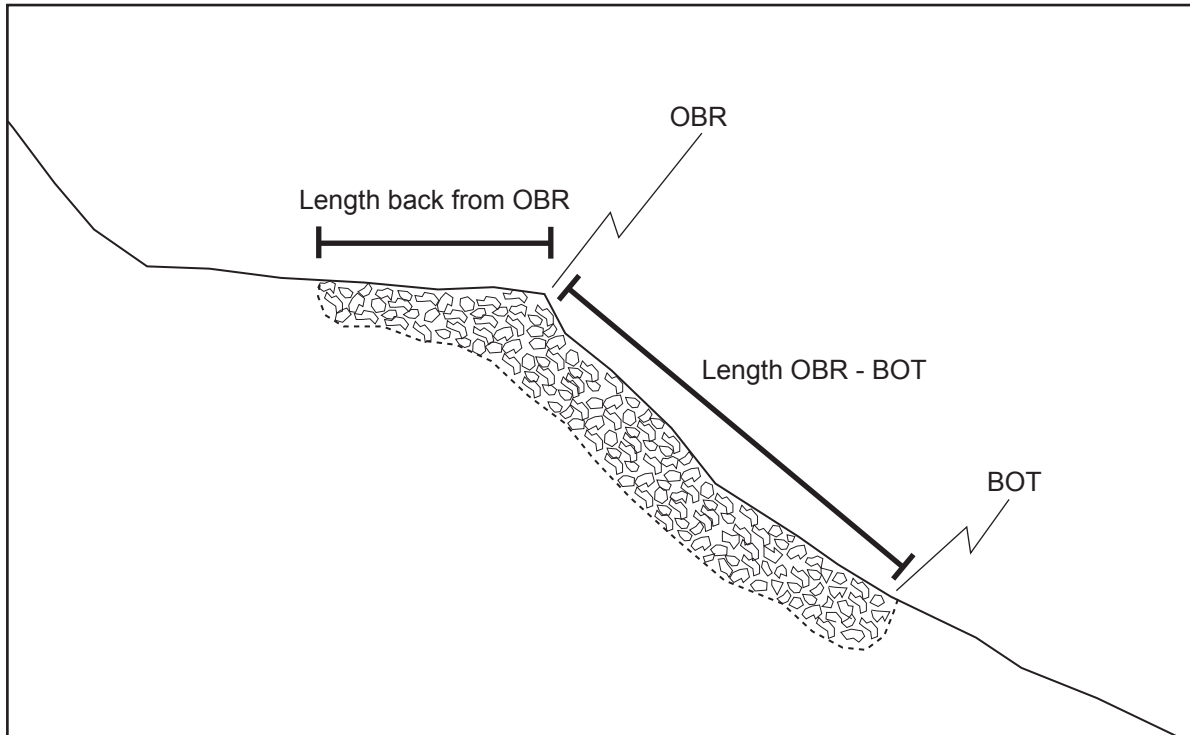
# Typical Dimensions Referred to for Armored Fill Crossings

## Widths in oblique view



OBR - Outboard edge of road

## Lengths in profile view



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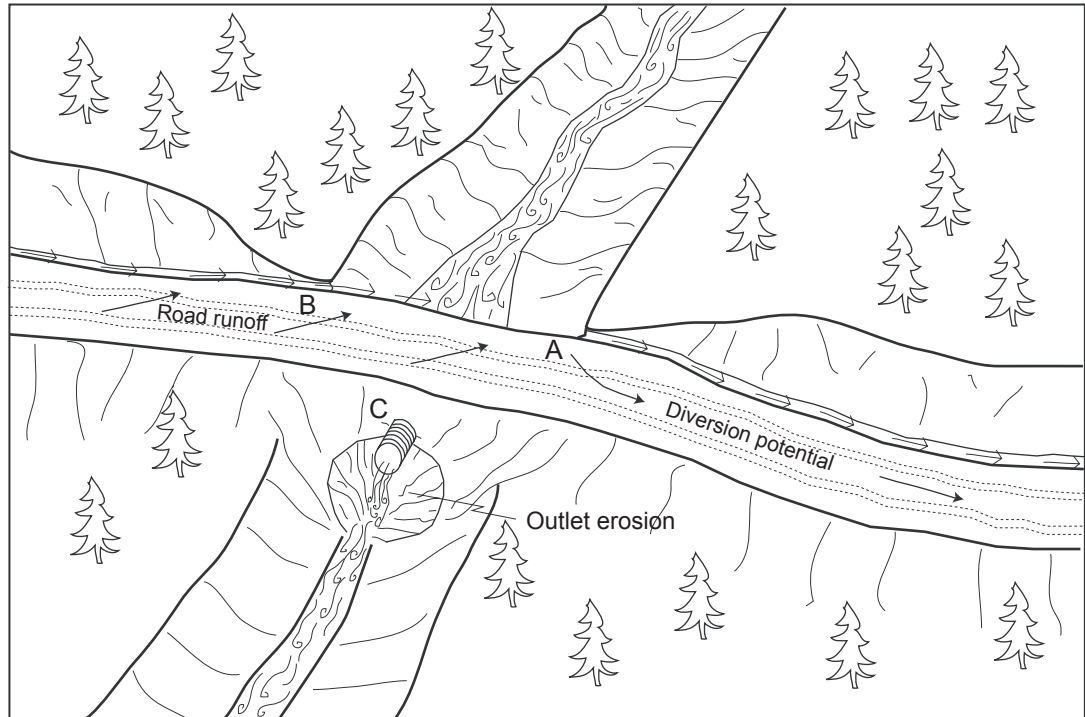
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# Typical Problems and Applied Treatments for a Non-fish Bearing Upgraded Stream Crossing

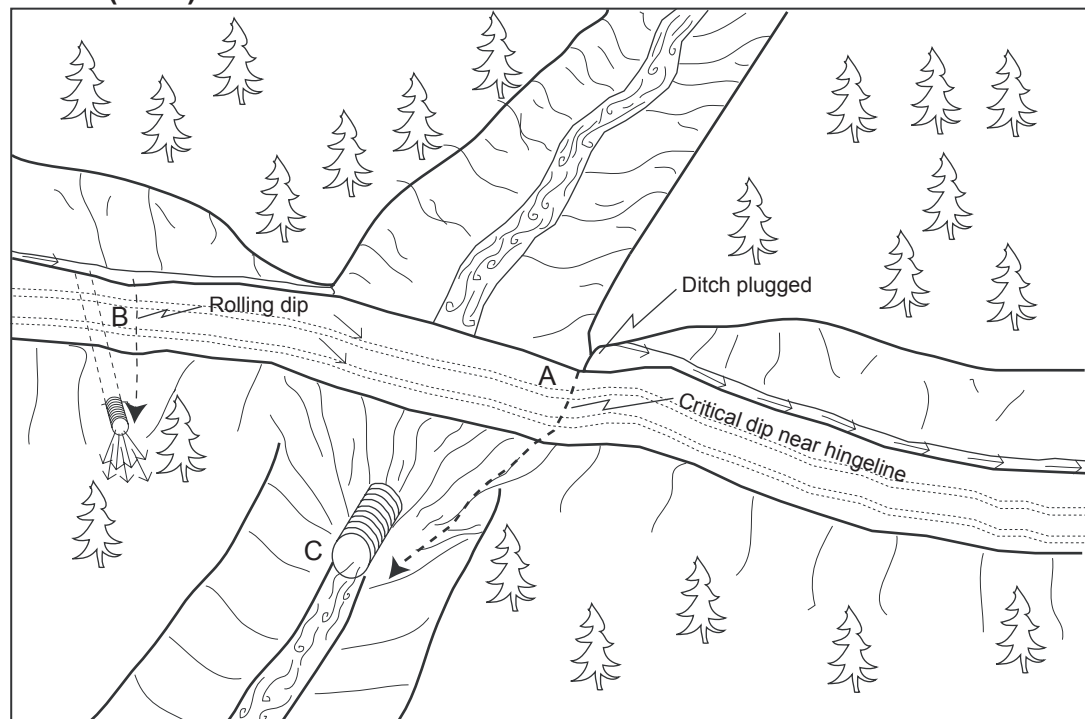
## Problem condition (before)

- A - Diversion potential
- B - Road surface and ditch drain to stream
- C - Undersized culvert high in fill with outlet erosion



## Treatment standards (after)

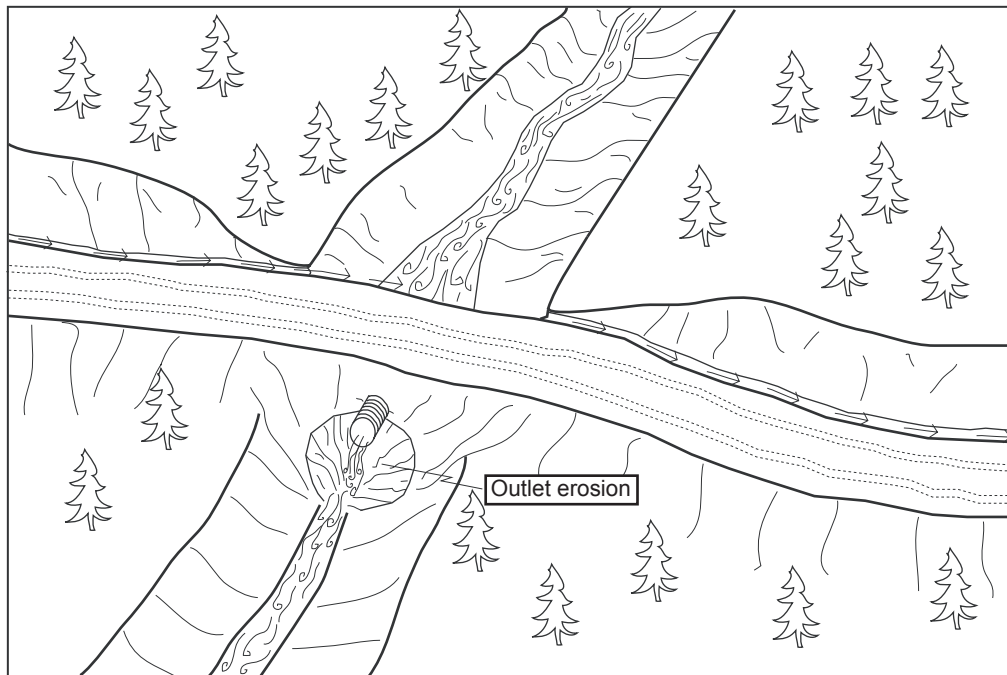
- A - No diversion potential with critical dip installed near hingeline
- B - Road surface and ditch disconnected from stream by rolling dip and ditch relief culvert
- C - 100-year culvert set at base of fill



Pacific Watershed Associates Inc.

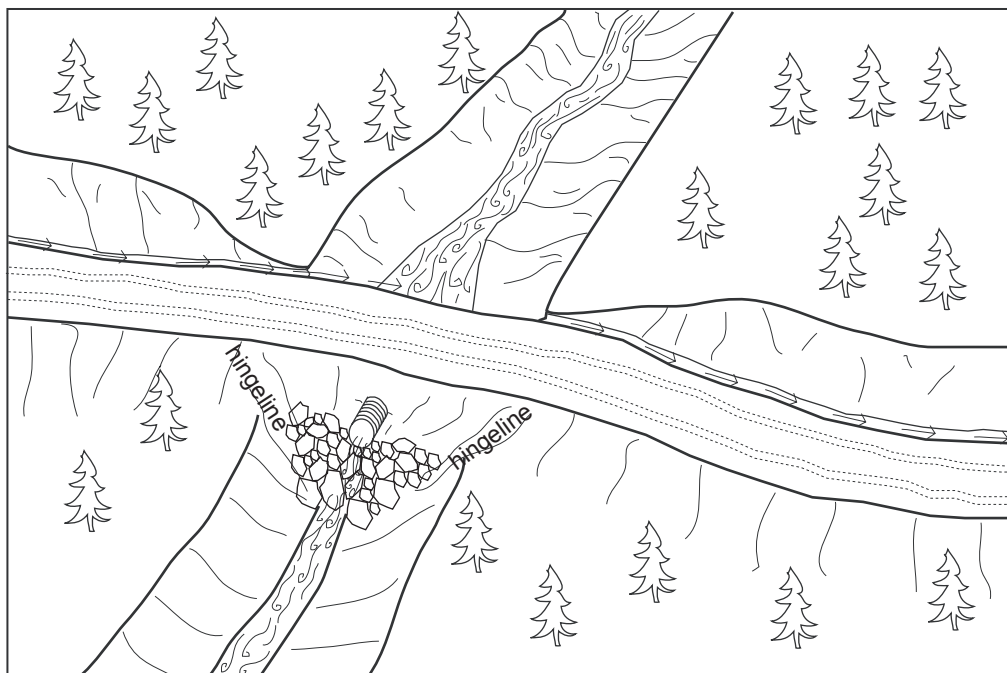
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## Armoring Fill Faces to Upgrade Stream Crossings



**Problem:** Culvert set high in outboard fill has resulted in scour of the outboard fill face and natural channel.

**Conditions:** The existing stream crossing has a culvert sufficient in diameter to manage design stream flows and has a functional life.



**Action:** The area of scour is backfilled with rip-rap to provide protection in the form of energy dissipation for the remaining fill face and channel.

**Treatment Specifications:**

- 1) Placement of rip-rap should be between the left and right hingelines and extend from a keyway excavated below the existing channel base level at the base of the fill slope up and under the existing culvert.
- 2) Rock size and volume is determined on a site basis based on estimated discharge and existing stream bed particle size range (See accompanying road log).

Pacific Watershed Associates Inc.

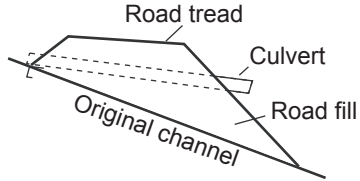
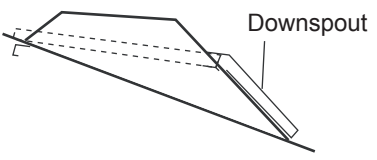
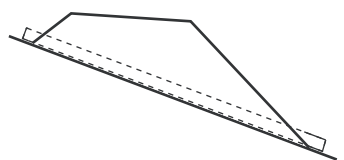
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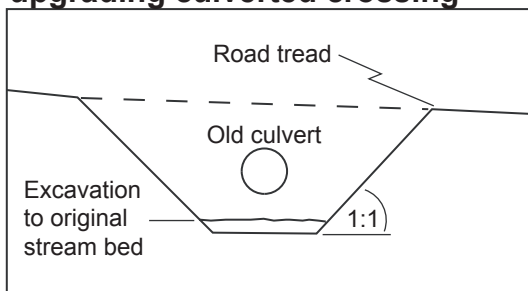
**PWA Typical Drawing #1b**



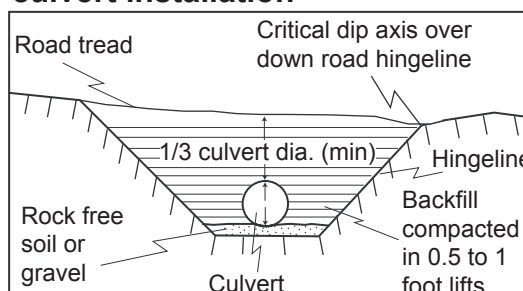
# Typical Design of a Non-fish Bearing Culverted Stream Crossing

Existing	Upgraded	Upgraded (preferred)
 <ol style="list-style-type: none"> <li>1. Culvert not placed at channel grade.</li> <li>2. culvert does not extend past base of fill.</li> </ol>	 <ol style="list-style-type: none"> <li>1. Culvert not placed at channel grade.</li> <li>2. Downspout added to extend outlet past road fill.</li> </ol>	 <ol style="list-style-type: none"> <li>1. Culvert placed at channel grade.</li> <li>2. Culvert inlet and outlet rest on, or partially in, the original streambed.</li> </ol>

## Excavation in preparation for upgrading culverted crossing



## Upgraded stream crossing culvert installation



Note:

Road upgrading tasks typically include upgrading stream crossings by installing larger culverts and inlet protection (trash barriers) to prevent plugging. Culvert sizing for the 100-year peak storm flow should be determined by both field observation and calculations using a procedure such as the Rational Formula.

## Stream crossing culvert Installation

1. Culverts shall be aligned with natural stream channels to ensure proper function, and prevent bank erosion and plugging by debris.
2. Culverts shall be placed at the base of the fill and the grade of the original streambed, or downspouted past the base of the fill.
3. Culverts shall be set slightly below the original stream grade so that the water drops several inches as it enters the pipe.
5. To allow for sagging after burial, a camber shall be between 1.5 to 3 inches per 10 feet culvert pipe length.
6. Backfill material shall be free of rocks, limbs or other debris that could dent or puncture the pipe or allow water to seep around pipe.
7. First one end then the other end of the culvert shall be covered and secured. The center is covered last.
8. Backfill material shall be tamped and compacted throughout the entire process:
  - Base and side wall material will be compacted before the pipe is placed in its bed.
  - Backfill compacting will be done in 0.5 - 1 foot lifts until 1/3 of the diameter of the culvert has been covered. A gas powered tamper can be used for this work.
9. Inlets and outlets shall be armored with rock or mulched and seeded with grass as needed.
10. Trash protectors shall be installed just upstream from the culvert where there is a hazard of floating debris plugging the culvert.
11. Layers of fill will be pushed over the crossing until the final designed road grade is achieved, at a minimum of 1/3 to 1/2 the culvert diameter.

## Erosion control measures for culvert replacement

Both mechanical and vegetative measures will be employed to minimize accelerated erosion from stream crossing and ditch relief culvert upgrading. Erosion control measures implemented will be evaluated on a site by site basis. Erosion control measures include but are not limited to:

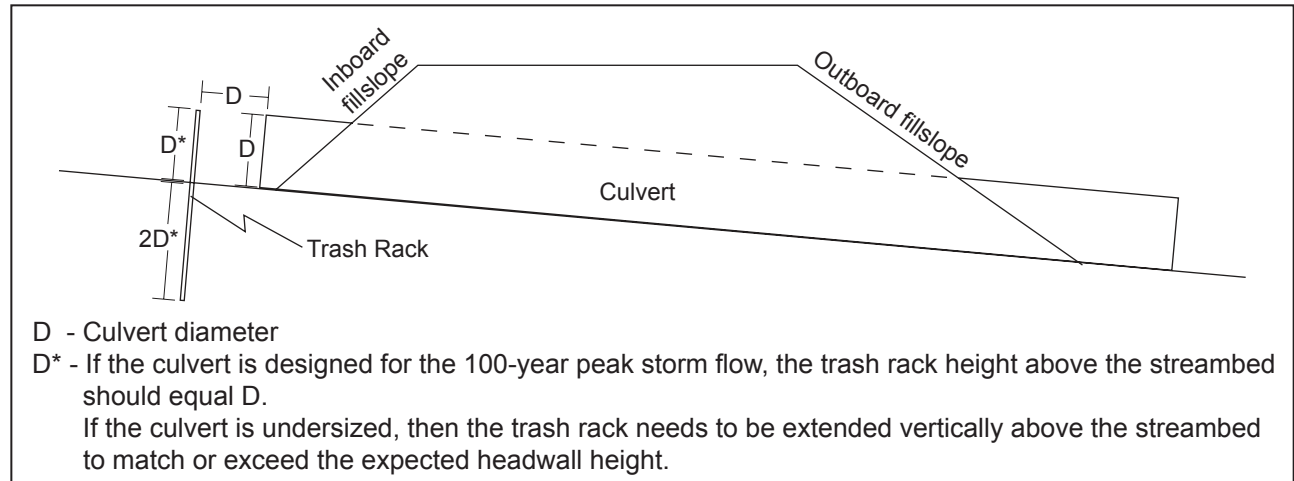
1. Minimizing soil exposure by limiting excavation areas and heavy equipment disturbance.
2. Installing filter windrows of slash at the base of the road fill to minimize the movement of eroded soil to downslope areas and stream channels.
3. Retaining rooted trees and shrubs at the base of the fill as "anchor" for the fill and filter windrows.
4. Bare slopes created by construction operations will be protected until vegetation can stabilize the surface. Surface erosion on exposed cuts and fills will be minimized by mulching, seeding, planting, compacting, armoring, and/or benching prior to the first rains.
5. Excess or unusable soil will be stored in long term spoil disposal locations that are not limited by factors such as excessive moisture, steep slopes greater than 10%, archeology potential, or proximity to a watercourse.
6. On running streams, water will be pumped or diverted past the crossing and into the downstream channel during the construction process.
7. Straw bales and/or silt fencing will be employed where necessary to control runoff within the construction zone.

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# Typical Design of a Single-post Culvert Inlet Trash Rack

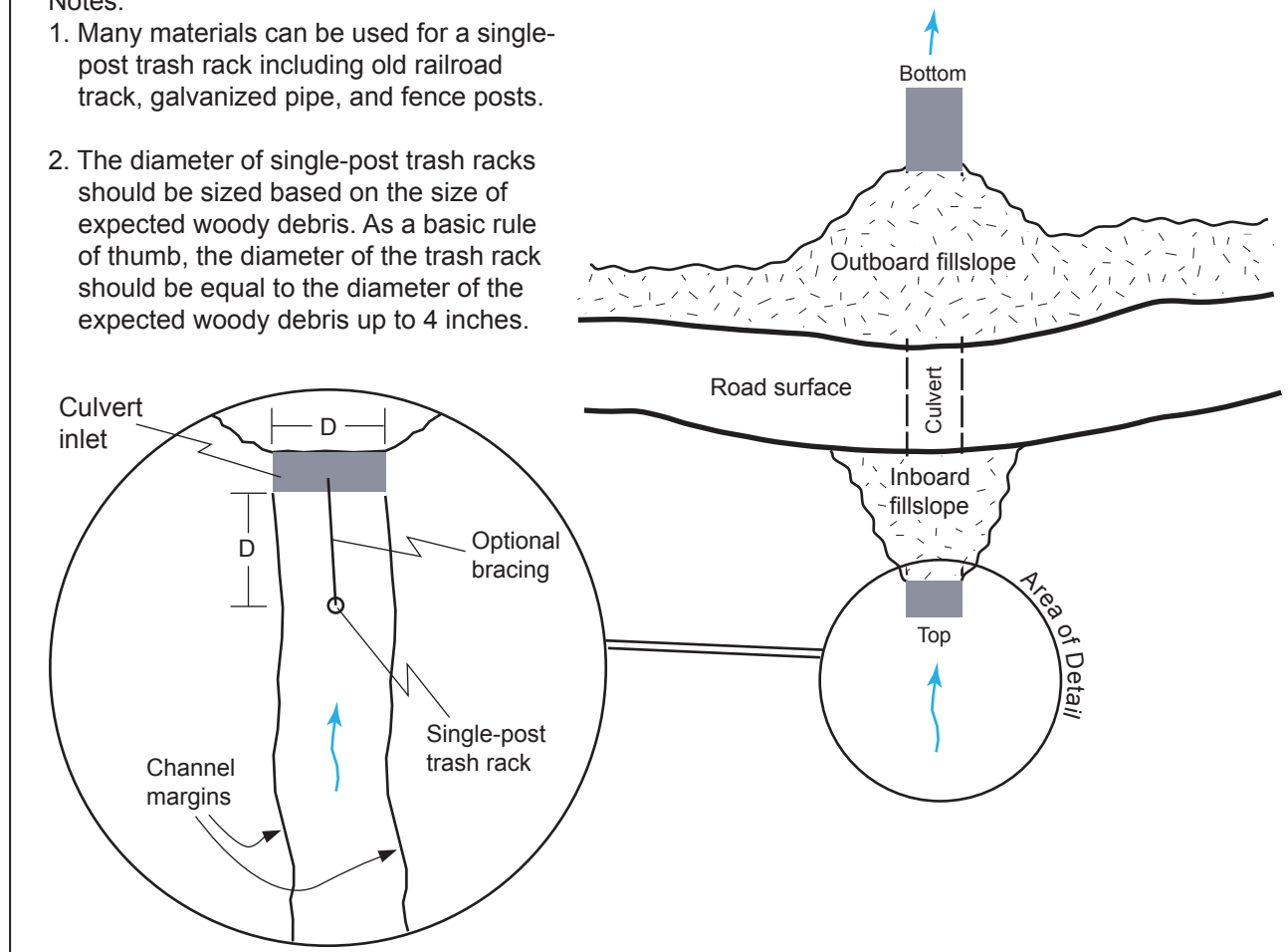
## Cross section view



## Plan view

### Notes:

1. Many materials can be used for a single-post trash rack including old railroad track, galvanized pipe, and fence posts.
2. The diameter of single-post trash racks should be sized based on the size of expected woody debris. As a basic rule of thumb, the diameter of the trash rack should be equal to the diameter of the expected woody debris up to 4 inches.

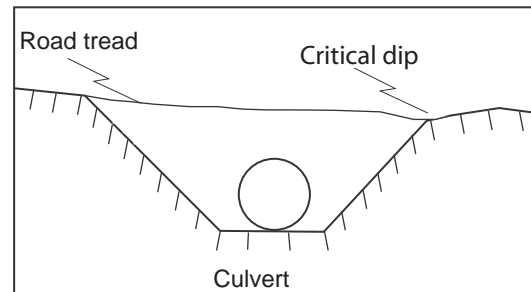
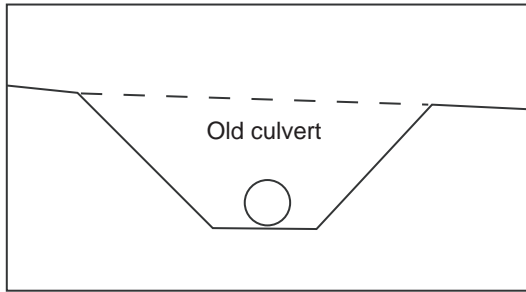


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# Typical Design of Upgraded Stream Crossings



## Stream crossing culvert Installation

1. Culverts shall be aligned with natural stream channels to ensure proper function, and prevent bank erosion and plugging by debris.
2. Culverts shall be placed at the base of the fill and the grade of the original streambed or downspouted past the base of the fill.
3. Culverts shall be set slightly below the original stream grade so that the water drops several inches as it enters the pipe.
5. To allow for sagging after burial, a camber shall be between 1.5 to 3 inches per 10 feet culvert pipe length.
6. Backfill material shall be free of rocks, limbs or other debris that could dent or puncture the pipe or allow water to seep around pipe.
7. First one end and then the other end of the culvert shall be covered and secured. The center is covered last.
8. Backfill material shall be tamped and compacted throughout the entire process:
  - Base and side wall material will be compacted before the pipe is placed in its bed.
  - backfill compacting will be done in 0.5 - 1 foot lifts until 1/3 of the diameter of the culvert has been covered. A gas powered tamper can be used for this work.
9. Inlets and outlets shall be armored with rock or mulched and seeded with grass as needed.
10. Trash protectors shall be installed just upstream from the culvert where there is a hazard of floating debris plugging the culvert.
11. Layers of fill will be pushed over the crossing until the final designed road grade is achieved, at a minimum of 1/3 to 1/2 the culvert diameter.

Note:

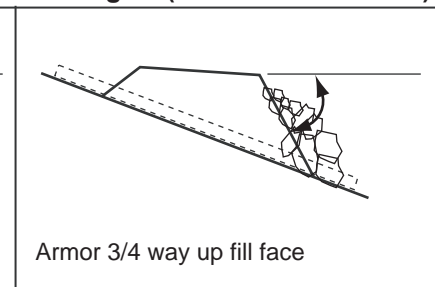
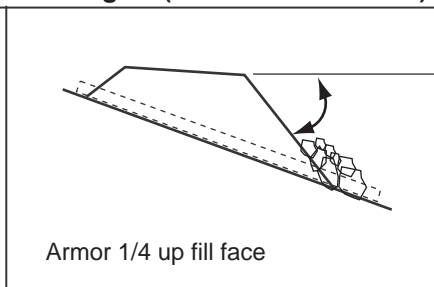
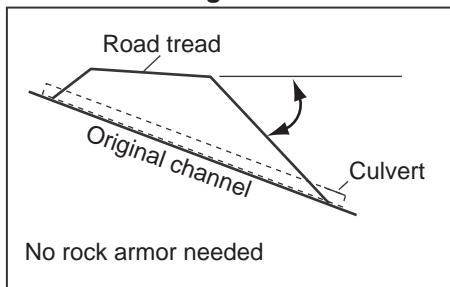
Road upgrading tasks typically include upgrading stream crossings by installing larger culverts and inlet protection (trash barriers) to prevent plugging. Culvert sizing for the 100-year peak storm flow should be determined by both field observation and calculations using a procedure such as the Rational Formula.

## Armoring fill faces

Fill angles  $\leq 2:1$

Fill angles (between 2:1 & 1.5:1)

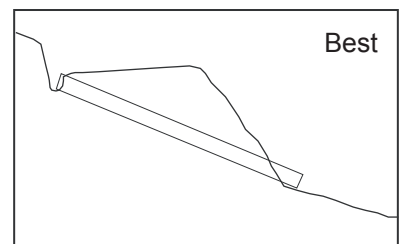
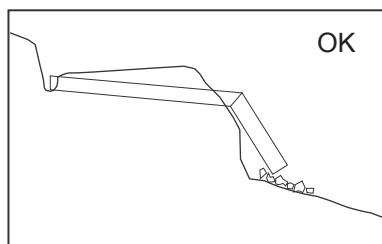
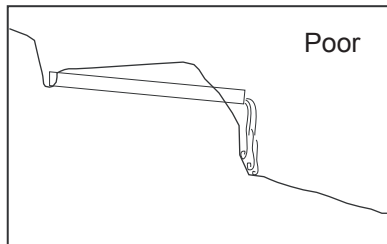
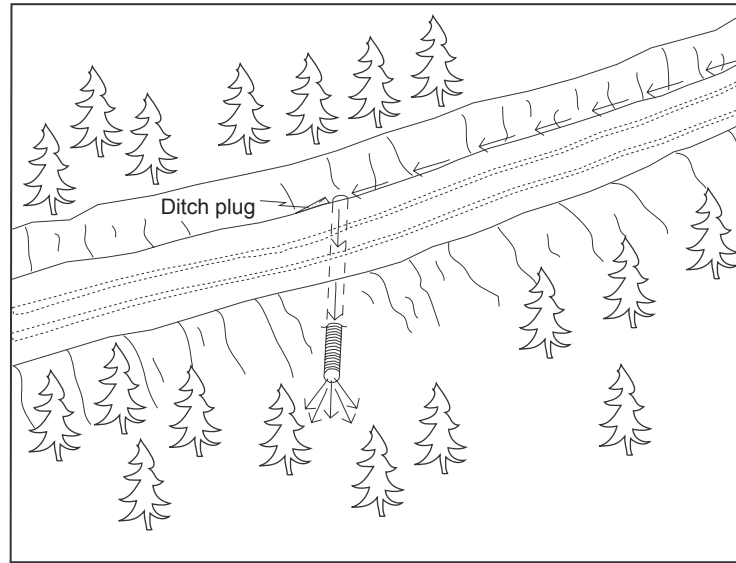
Fill angles (between 1.5:1 & 1:1)



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## Typical Ditch Relief Culvert Installation



### Ditch relief culvert installation

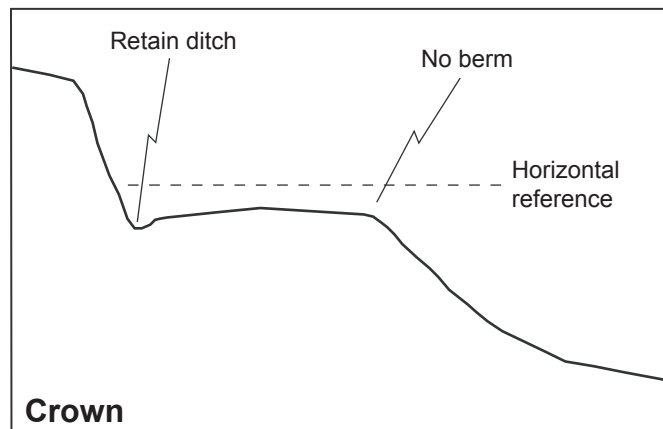
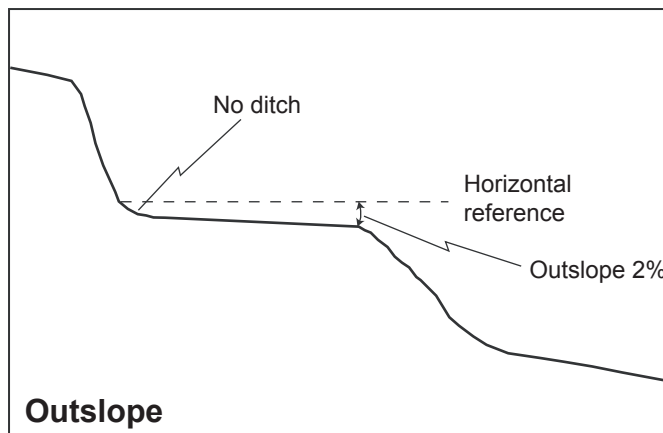
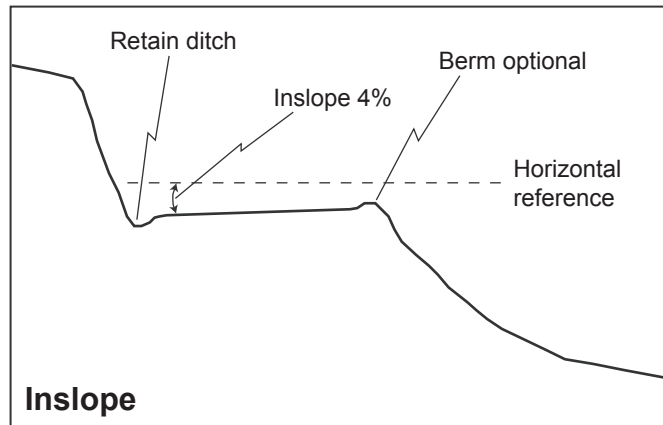
- 1) The same basic steps followed for stream crossing installation shall be employed.
- 2) Culverts shall be installed at a 30 degree angle to the ditch to lessen the chance of inlet erosion and plugging.
- 3) Culverts shall be seated on the natural slope or at a minimum depth of 5 feet at the outside edge of the road, whichever is less.
- 4) At a minimum, culverts shall be installed at a slope of 2 to 4 percent steeper than the approaching ditch grade, or at least 5 inches every 10 feet.
- 5) Backfill shall be compacted from the bed to a depth of 1 foot or 1/3 of the culvert diameter, whichever is greater, over the top of the culvert.
- 6) Culvert outlets shall extend beyond the base of the road fill (or a flume downspout will be used).  
Culverts will be seated on the natural slope or at a depth of 5 feet at the outside edge of the road, whichever is less.

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# Typical Designs for Using Road Shape to Control Road Runoff



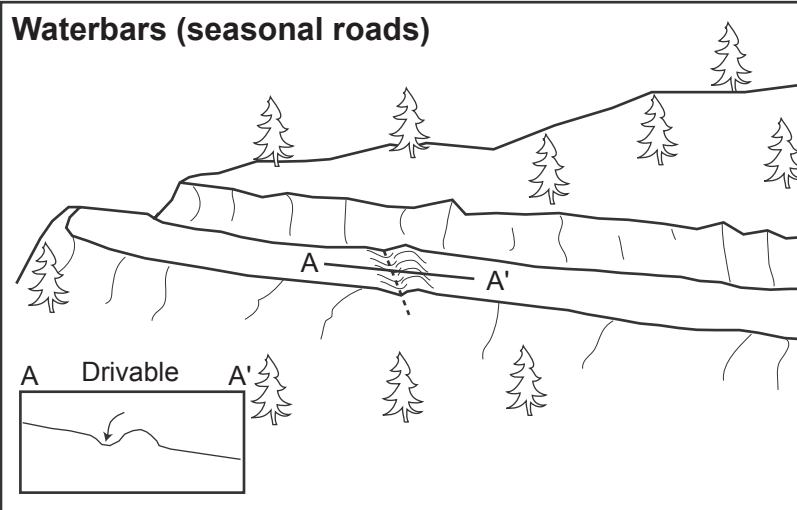
Outsloping Pitch for Roads Up to 8% Grade		
Road grade	Unsurfaced roads	Surfaced roads
4% or less	3/8" per foot	1/2" per foot
5%	1/2" per foot	5/8" per foot
6%	5/8" per foot	3/4" per foot
7%	3/4" per foot	7/8" per foot
8% or more	1" per foot	1 1/4" per foot

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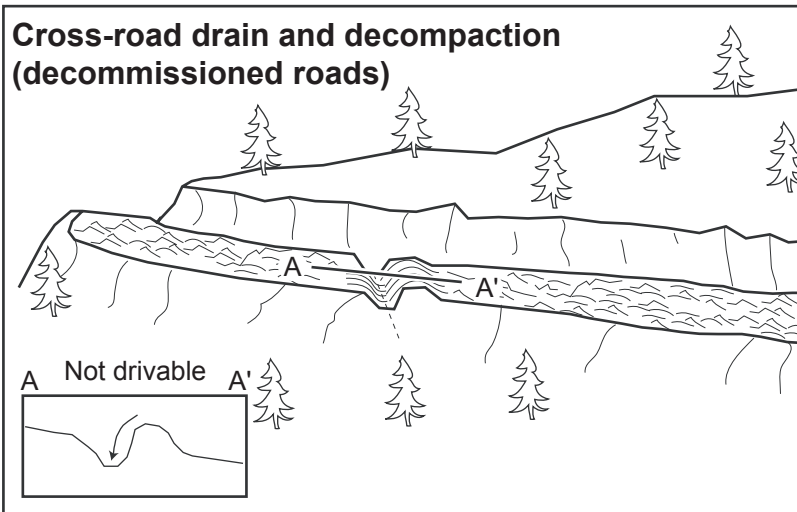
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## Typical Methods for Dispersing Road Surface Runoff with Waterbars, Cross-road Drains, and Rolling Dips

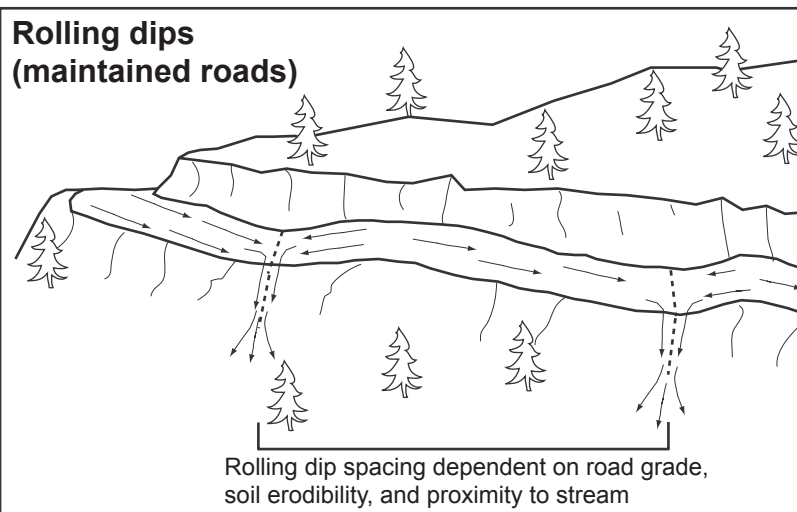
**Waterbars (seasonal roads)**



**Cross-road drain and decompaction (decommissioned roads)**



**Rolling dips (maintained roads)**

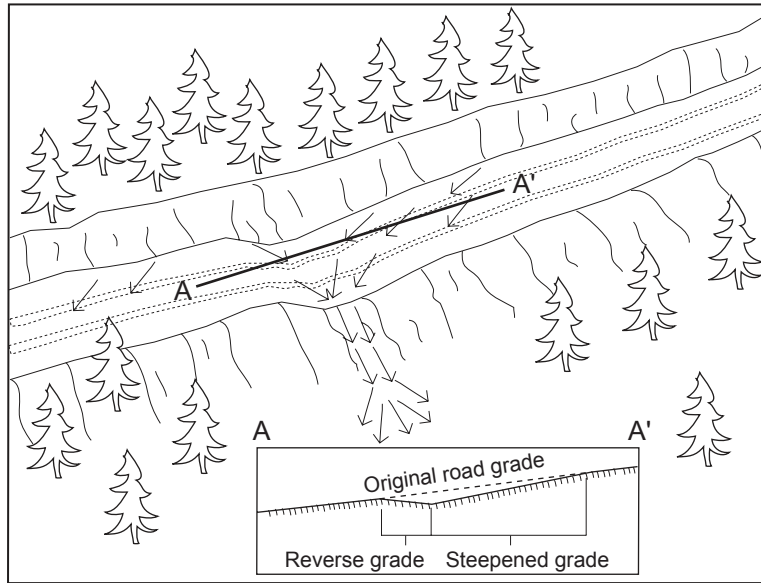


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## Typical Road Surface Drainage by Rolling Dips



### Rolling dip installation:

1. Rolling dips will be installed in the roadbed as needed to drain the road surface.
2. Rolling dips will be sloped either into the ditch or to the outside of the road edge as required to properly drain the road.
3. Rolling dips are usually built at 30 to 45 degree angles to the road alignment with cross road grade of at least 1% greater than the grade of the road.
4. Excavation for the dips will be done with a medium-size bulldozer or similar equipment.
5. Excavation of the dips will begin 50 to 100 feet up road from where the axis of the dip is planned as per guidelines established in the rolling dip dimensions table.
6. Material will be progressively excavated from the roadbed, steepening the grade until the axis is reached.
7. The depth of the dip will be determined by the grade of the road (see table below).
8. On the down road side of the rolling dip axis, a grade change will be installed to prevent the runoff from continuing down the road (see figure above).
9. The rise in the reverse grade will be carried for about 10 to 20 feet and then return to the original slope.
10. The transition from axis to bottom, through rising grade to falling grade, will be in a road distance of at least 15 to 30 feet.

**Table of rolling dip dimensions by road grade**

Road grade %	Upslope approach distance (from up road start to trough) ft	Reverse grade distance (from trough to crest) ft	Depth at trough outlet (below average road grade) ft	Depth at trough inlet (below average road grade) ft
<6	55	15 - 20	0.9	0.3
8	65	15 - 20	1.0	0.2
10	75	15 - 20	1.1	0.01
12	85	20 - 25	1.2	0.01
>12	100	20 - 25	1.3	0.01

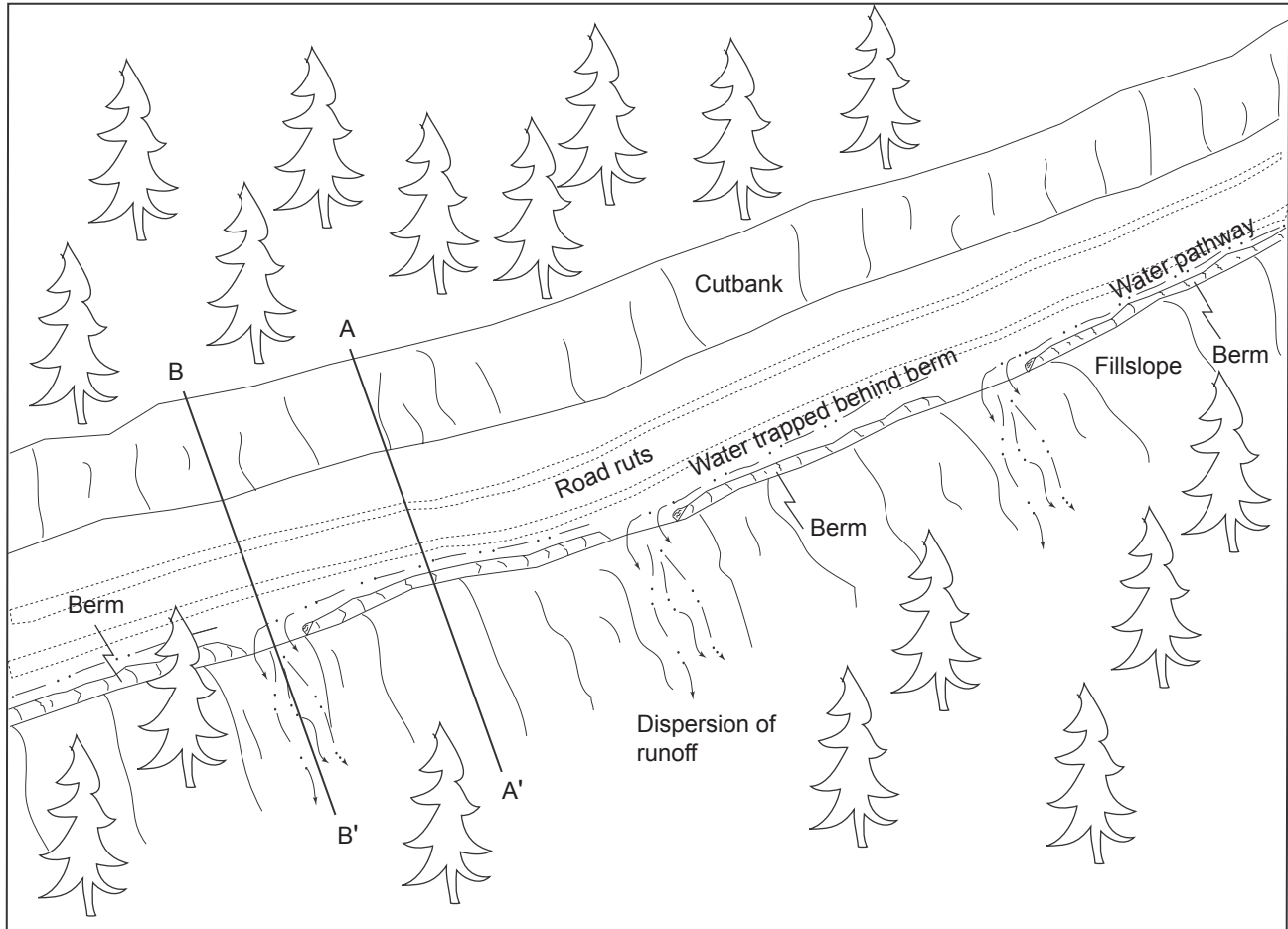
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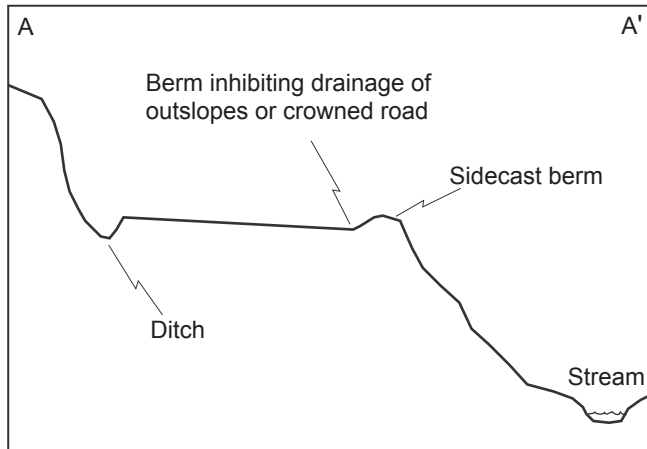


## Typical Sidecast or Excavation Methods for Removing Outboard Berms on a Maintained Road

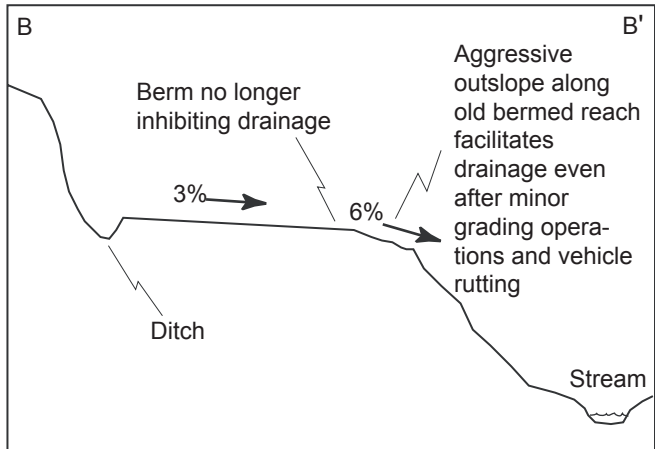
1. On gentle road segments berms can be removed continuously (see B-B').
2. On steep road segments, where safety is a concern, the berm can be frequently breached (see A-A' & B-B').  
Berm breaches should be spaced every 30 to 100 feet to provide adequate drainage of the road system while maintaining a semi-continuous berm for vehicle safety.



Road cross section between berm breaches



Road cross section at berm breaches



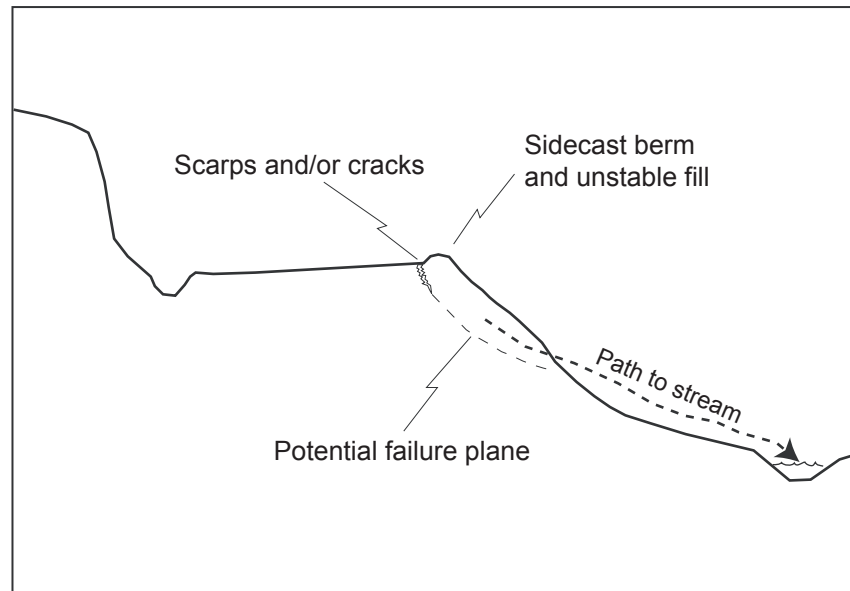
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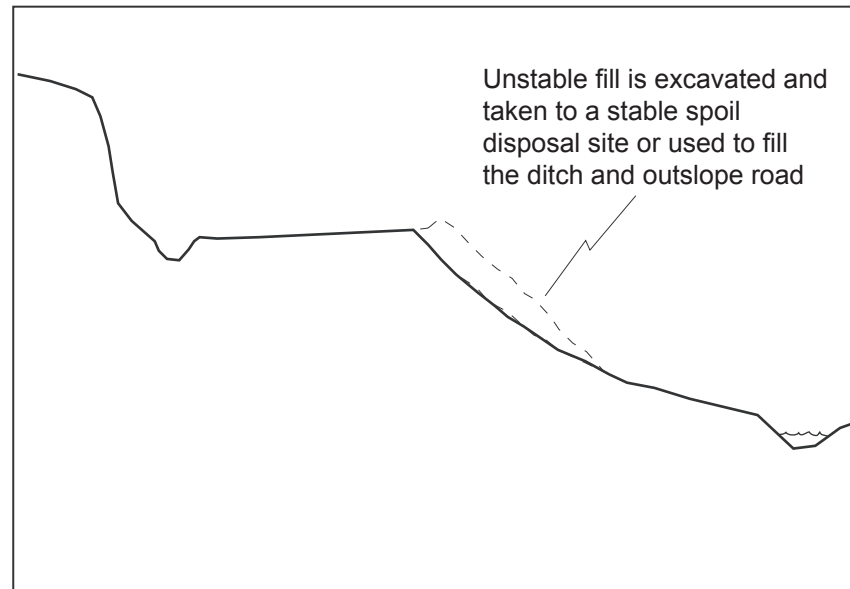


# Typical Excavation of Unstable Fillslope on an Upgraded Road

**Before**



**After**

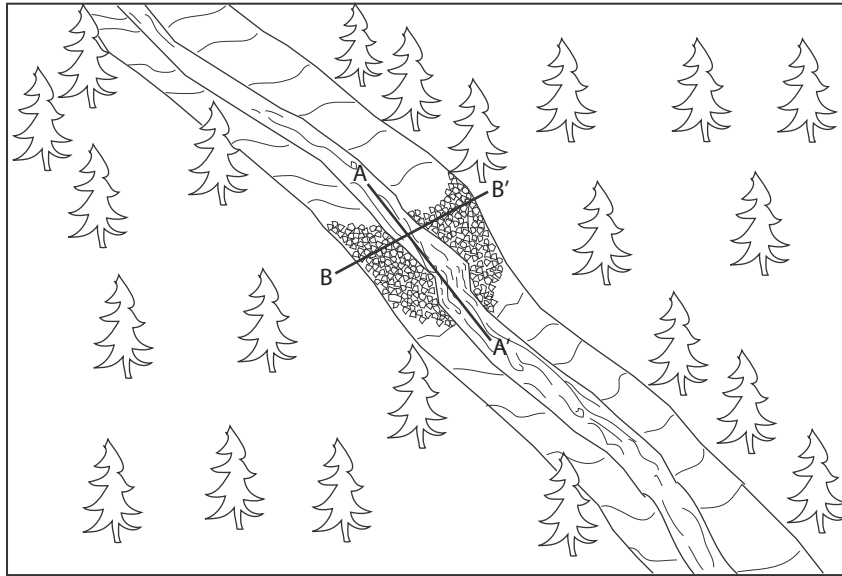


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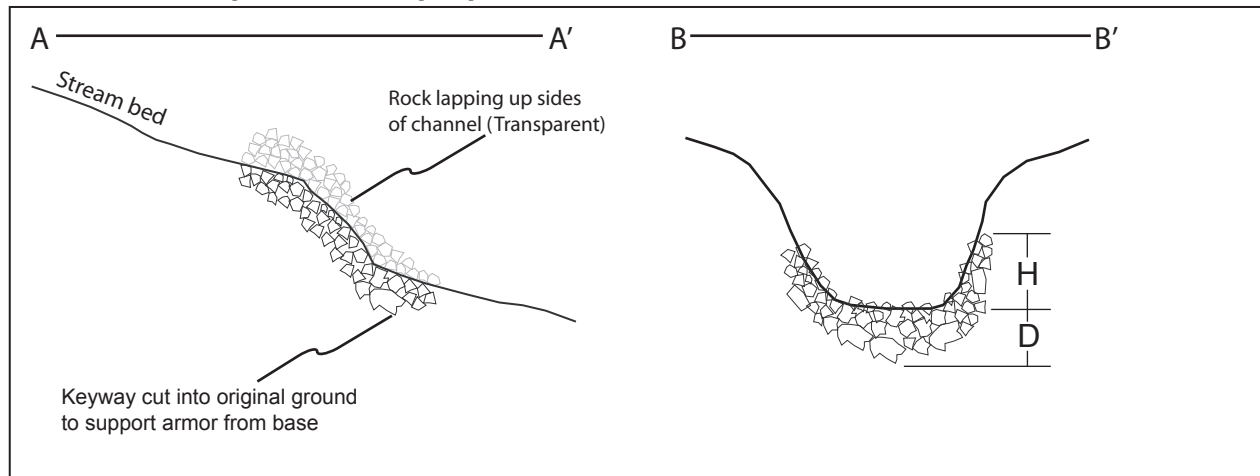
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## Typical Rock Grade Control Structure Installation in a non-fish bearing Stream Channel



### Cross section parallel and perpendicular to watercourse



### Notes

The main objective is to create a structure that will not be flanked, undercut, or eroded by the stream

The critical elements of a successful grade control structure are:

- 1) rock selection- rock should be selected that is resistant to abrasion and physical disintegration and has a mixture of sizes with the largest size larger than the D100 of the stream.
- 2) The rock must be placed in a "U" shape that will confine the 100 yr. return interval stream flow and won't restrict the channel
- 3) The rock must be imbedded into the channel at least two rock diameters thick
- 4) The largest rock should be used at the base of the grade control structure to buttress the other rock

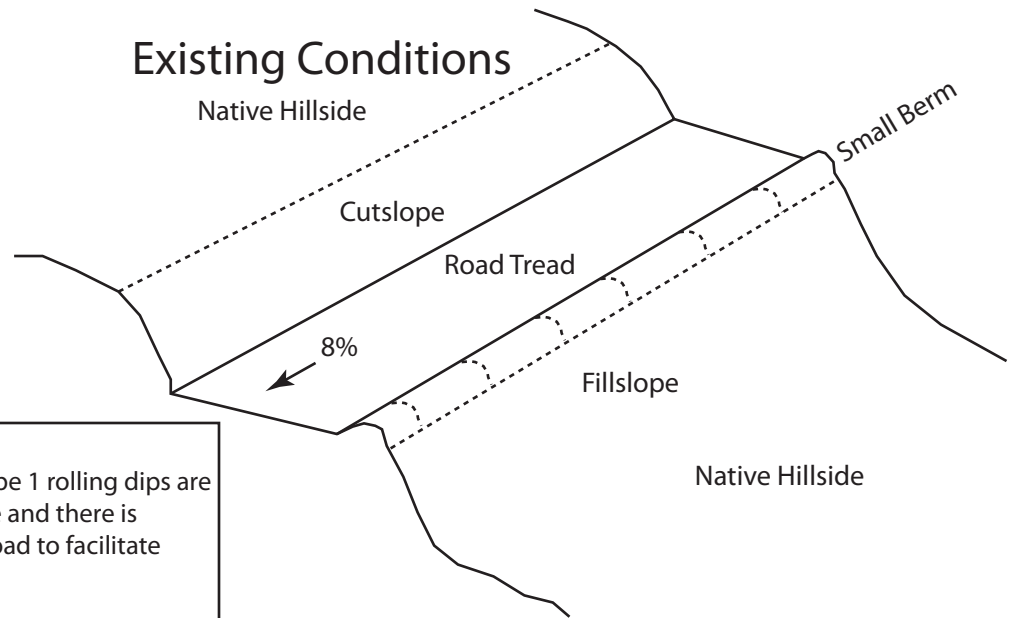
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# Rolling Dip Construction (Type 1)

## Existing Conditions



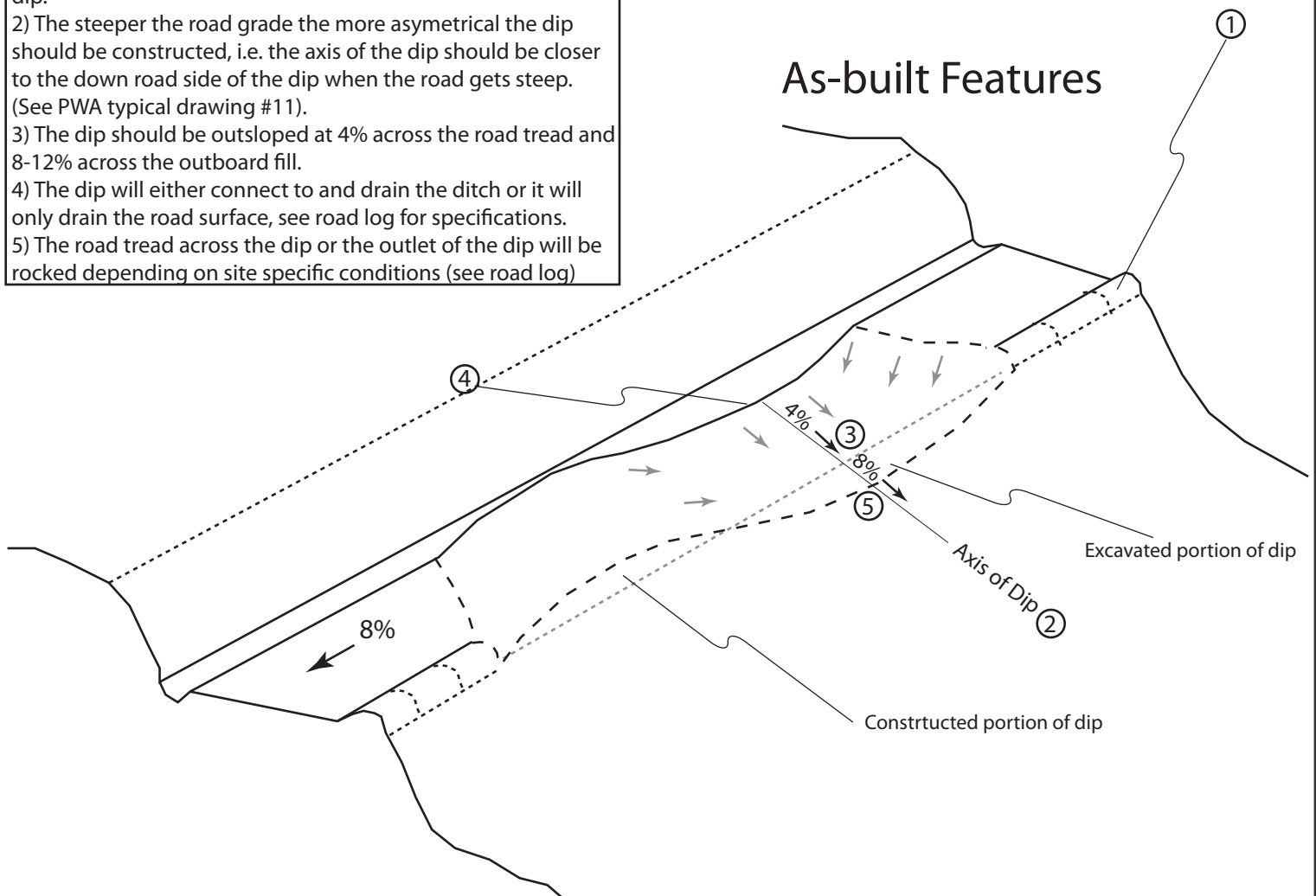
### Notes

**Rolling dip type 1 existing conditions:** Type 1 rolling dips are utilized when roads are less than 12% grade and there is proximal outfall adjacent to the outboard road to facilitate road drainage.

#### Design Notes:

- 1) The berm should be removed for the entire length of the dip.
- 2) The steeper the road grade the more asymmetrical the dip should be constructed, i.e. the axis of the dip should be closer to the down road side of the dip when the road gets steep. (See PWA typical drawing #11).
- 3) The dip should be outsloped at 4% across the road tread and 8-12% across the outboard fill.
- 4) The dip will either connect to and drain the ditch or it will only drain the road surface, see road log for specifications.
- 5) The road tread across the dip or the outlet of the dip will be rocked depending on site specific conditions (see road log)

## As-built Features

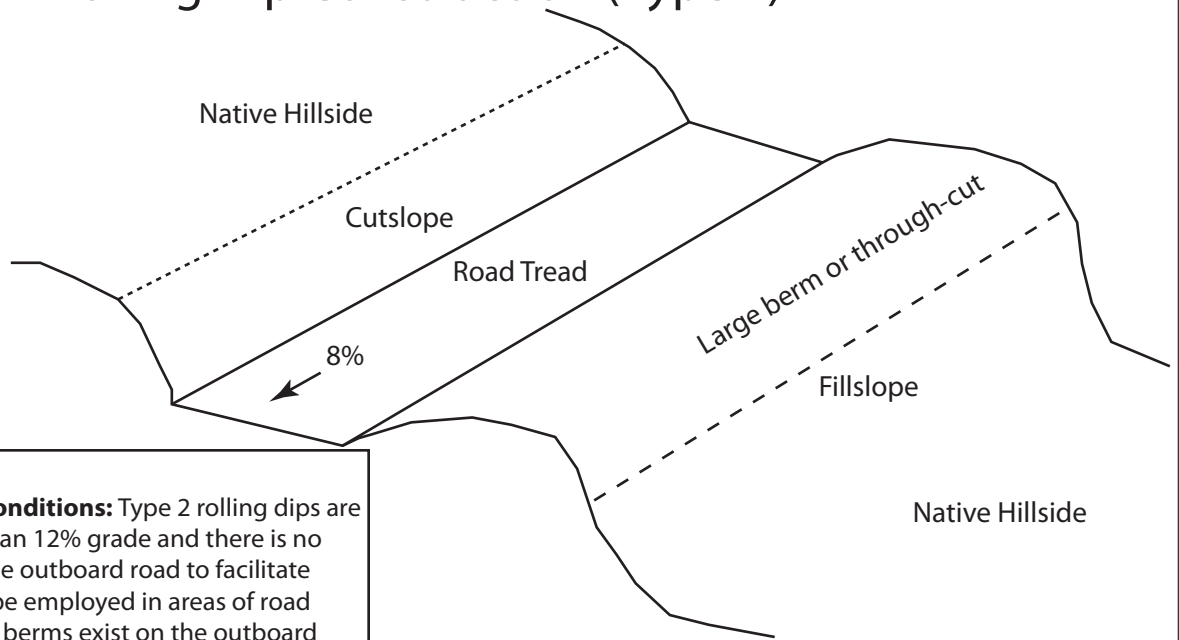


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# Rolling Dip Construction (Type 2)



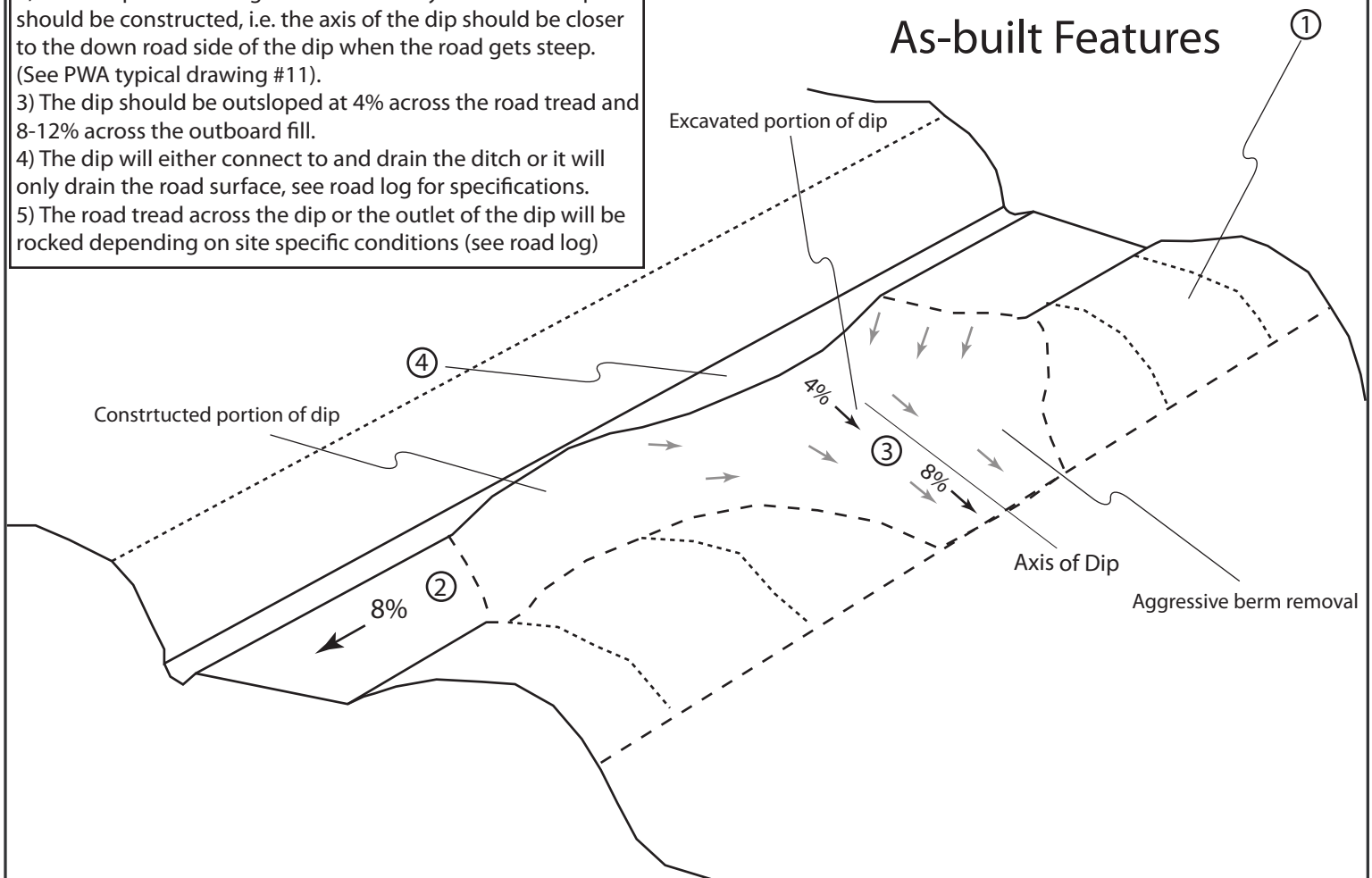
## Notes

**Rolling dip type 2 existing conditions:** Type 2 rolling dips are utilized when roads are less than 12% grade and there is no proximal outfall adjacent to the outboard road to facilitate road drainage. These should be employed in areas of road through-cuts and where large berms exist on the outboard road

### Design Notes:

- 1) The berm should be removed for the entire length of the excavated portion of the dip.
- 2) The steeper the road grade the more asymmetrical the dip should be constructed, i.e. the axis of the dip should be closer to the down road side of the dip when the road gets steep. (See PWA typical drawing #11).
- 3) The dip should be outsloped at 4% across the road tread and 8-12% across the outboard fill.
- 4) The dip will either connect to and drain the ditch or it will only drain the road surface, see road log for specifications.
- 5) The road tread across the dip or the outlet of the dip will be rocked depending on site specific conditions (see road log)

## As-built Features

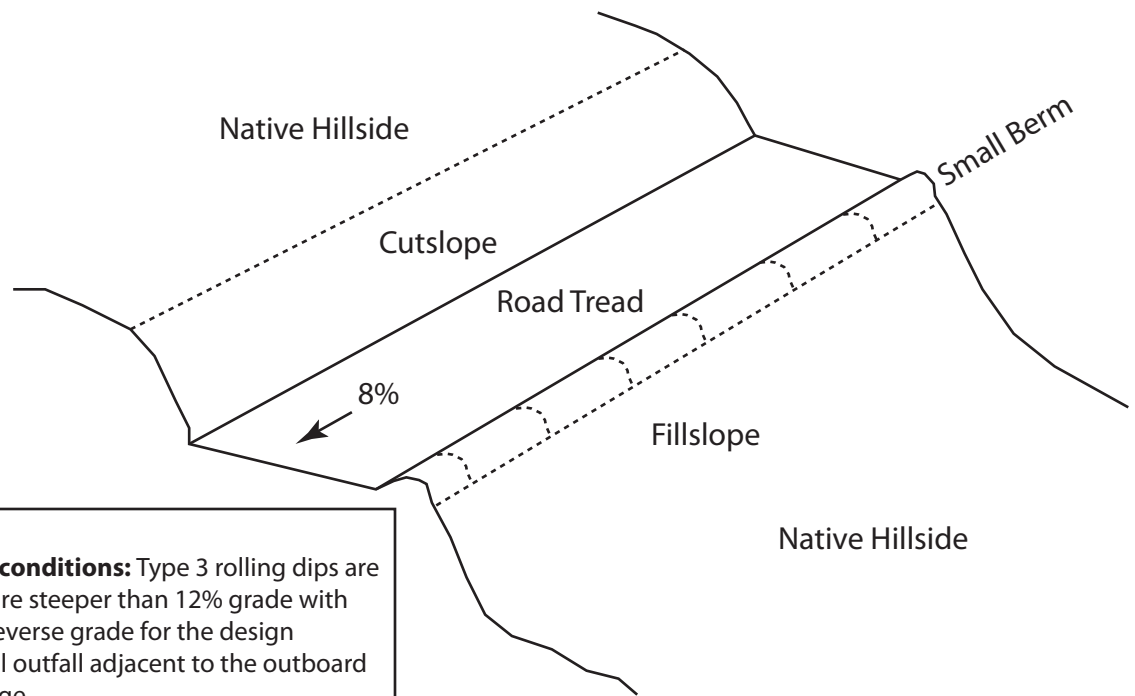


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# Rolling Dip Construction (Type 3, aggressive outslope)

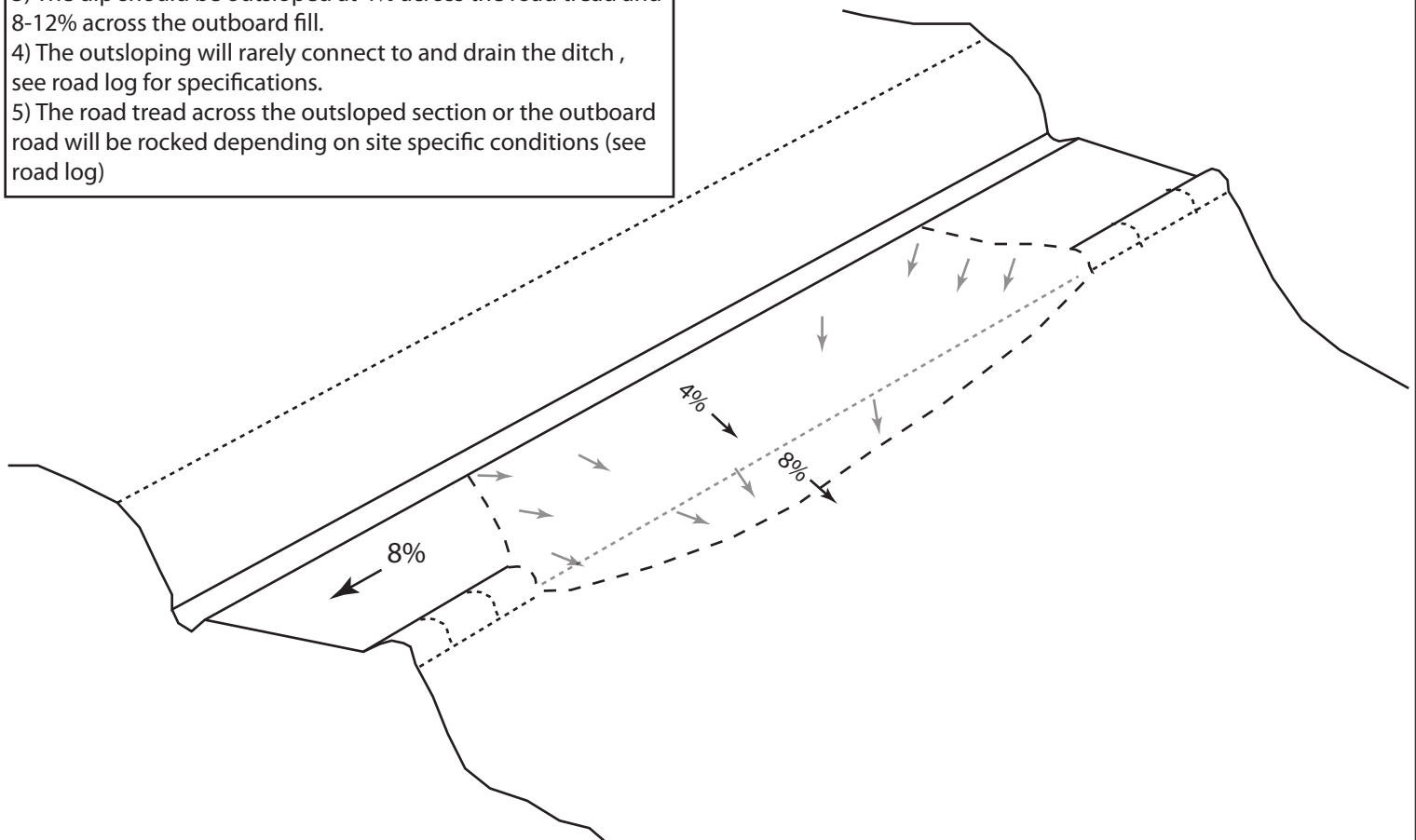


## Notes

**Rolling dip type 3 existing conditions:** Type 3 rolling dips are utilized when roads grades are steeper than 12% grade with little opportunity to create reverse grade for the design vehicle, and there is proximal outfall adjacent to the outboard road to facilitate road drainage.

### Design Notes:

- 1) The berm should be removed for the entire length of the outsloped section.
- 3) The dip should be outsloped at 4% across the road tread and 8-12% across the outboard fill.
- 4) The outsloping will rarely connect to and drain the ditch, see road log for specifications.
- 5) The road tread across the outsloped section or the outboard road will be rocked depending on site specific conditions (see road log)



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