FINAL

Caltrans Stormwater Quality Handbook
Risk Level Determination Guidance for Contiguous and Non-contiguous Highway Projects

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List of Abbreviations, Terms

ASTM	American Society for Testing and Materials
BMPs	Best Management Practices
CGP	Construction General Permit
CWA	Clean Water Act
DEA	Division of Environmental Analysis
DSA	Disturbed Soil Area
EPA	Environmental Protection Agency
GIS	Geographic Information System
HOV	High-occupancy vehicle
long/lat	Longitude/Latitude
LUP	linear underground and overhead project
MS4	Municipal separate storm sewer system
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
OHSD	Office of Hydraulics and Stormwater Design
PA/ED	Project Approval/Environmental Document
PE	Project Engineer
PID	Project Information Document
PRDs	Permit Registration Documents
REAP	Rain Event Action Plan
RL	Risk Level
RUSLE	Revised Universal Soil Loss Equation
RUSLE2	Revised Universal Soil Loss Equation, Version 2 Computer Program
RWQCB	Regional Water Quality Control Board
SMARTS	Stormwater Multi-Application and Reporting System
SWDR	Stormwater Data Report
SWRCB	State Water Resources Control Board
TDC	Targeted Design Constituents
TMDLs	Total Maximum Daily Loads
WQPT	Water Quality Planning Tool

Section 1

Introduction to Project Risk Level Determination

1.1 Overview

This document contains guidance on project risk level (RL) determination for contiguous and non-contiguous type highway construction projects. Methods for developing the RL are included as required by the Construction General Permit (CGP) State Water Resources Control Board (SWRCB) Order WQ 2022-0057-DWQ, effective September 1, 2023. Generally, projects that disturb more than one acre of soil must apply for coverage under the CGP and will require a project RL determination. Projects that disturb between 1 and less than 5 acres of soil and are scheduled to last less than one year, may be exempt from the CGP through a Rainfall Erosivity Waiver. Refer to the Project Planning and Design Guide for more information.

This guide is intended to assist the Project Engineer (PE) in developing a project RL for the Stormwater Data Report (SWDR). The project RL determination documentation is a required attachment to the SWDR and should be summarized in Section 3 of the SWDR.

1.2 Limitations

This guide is limited to supporting projects subject to the California CGP and does not include linear underground and overhead projects (LUPs) or projects subject to other CGPs, such as those in the Lake Tahoe Hydrologic Unit or on Tribal Lands. This guide does not include risk level determination guidance for LUPs. LUPs are determined to be one of three types of risk (Type 1, 2, and 3) based on the project area or segment's threat to water quality. To determine the risk type for LUPs, refer to the Caltrans Middle-Mile Broadband Network Stormwater design guidance.

Projects within the Lake Tahoe Hydrological Unit are covered under the Tahoe CGP (Order No. R6T-2016-0010). There is no risk level in the Tahoe CGP. All projects are considered the same risk. Additionally, there is no option for an erosivity waiver in the Tahoe CGP.

Projects on tribal lands are covered under the EPA's NPDES Construction Stormwater Permitting Program (EPA CGP) and are not required to determine risk level. If a project on tribal lands disturbs less than 5 acres of soil and the rainfall erosivity factor value is less than five during the period of construction activity, the project may be eligible for a Low Erosivity Waiver. See Section 2.1.2 and online at: https://lew.epa.gov/

1.3 Sediment risk

The sediment risk is determined by using the Revised Universal Soil Loss Equation (RUSLE) to obtain sheet and rill erosion expressed in tons/acre

- **Low Sediment Risk:** < 15 tons/acre
- **Medium Sediment Risk:** >=15 and <75 tons/acre
- **High Sediment Risk:** >= 75 tons/acre

Inputs to the RUSLE equation are based on the following:

- location of the site
- construction work window
- top soil layer of the site
- “non-vegetated”/bare ground condition of the site (e.g., lengths and slopes), and
- disturbed soil areas only

Sediment yield is based on a variation of the RUSLE equation that only uses R, K, and LS so that the Watershed Erosion Estimate (R x K x LS) is expressed in tons/acre (NOT the tons/acre/year of the RUSLE equation).

The primary factor driving the Watershed Erosion Estimate is the Erosivity Factor, R, representing rainfall energy causing erosion. The Erosivity Factor is prescriptively calculated using the EPA Rainfall Erosivity Factor Calculator for Small Construction Sites. The value of R is proportional to the length of the construction. The easiest way to reduce the site sediment yield is to reduce the construction window and/or shift the construction into the dry season.

1.4 Receiving water risk

Receiving water risk is either high or low. Receiving water risk is based on whether a project drains to a sediment-sensitive waterbody or watershed. A water body or watershed is considered high risk if the receiving waters are listed as impaired for sediment, siltation and/or turbidity in the California 2020 - 2022 Integrated Report 303(d) list, or are designated with the beneficial uses of COLD, SPAWN, and MIGRATORY. A project that meets at least one of the above criteria has a high receiving water risk.

The SWRCB Division of Water Quality staff has developed an interactive map tool to graphically display areas draining to high-risk receiving waters or watersheds that may apply to dischargers with regulatory coverage under the CGP. The tool is shown in Figure 1-1 with high-risk receiving waters areas shown (red areas). These areas meet one of the two criteria: impaired by sediment, siltation, and/or turbidity or have COLD, SPAWN, and MIGRATORY beneficial uses as determined by the appropriate Regional Water Quality Control Board (RWQCB). This is not a determination made by Caltrans. Areas draining to high risk receiving water bodies are shown in mapping on the SWRCB High Risk Receiving Water Map Tool and as a layer on the Caltrans Water Quality Planning Tool (WQPT, found at: http://svctenvims.dot.ca.gov/wqpt/wqpt.aspx). Note that if there are discrepancies between the WQPT and the SWRCB Map Tool, the SWRCB Map Tool will take precedence. The SWRCB High Risk Receiving Water Map Tool is found at: https://gispublic.waterboards.ca.gov/portal/home/item.html?id=cf80c11f7f514c4598662aeea76ccc38

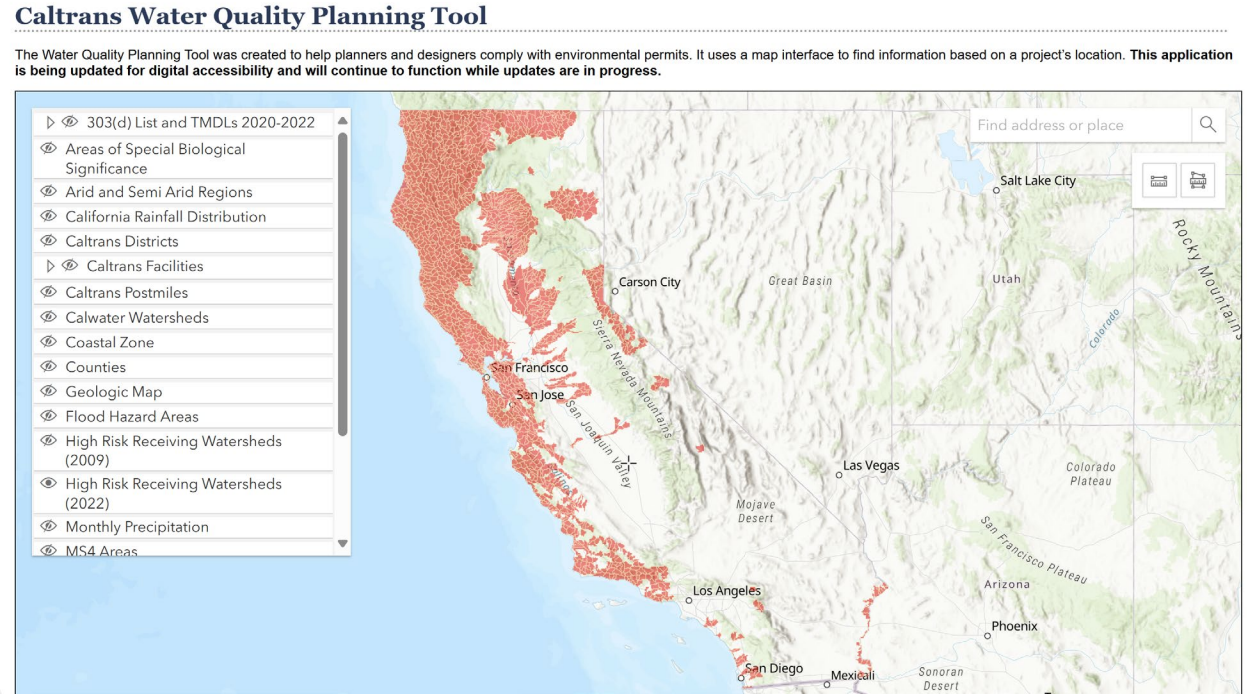


Figure 1-1. Caltrans Water Quality Planning Tool - High Risk Receiving Watersheds (2022)

1.5 Combined risk level determination

The CGP is a risk-based permit that establishes three levels of environmental risk possible for a construction site. The Risk Level is calculated in two parts:

- Sediment Risk (Section 1.2), and
- Receiving Water Risk (Section 1.3).

The CGP Risk Level determination quantifies sediment and receiving water characteristics and uses these results to determine the project's overall Risk Level as RL 1, 2, or 3.

		Sediment Risk		
		Low	Medium	High
Receiving Water Risk	Low	Level 1	Level 2	
	High	Level 2		Level 3

Figure 1-2. Combined risk level matrix

The lowest risk level a project can be that has a High Risk Receiving Water is RL2. Therefore, expending a lot of effort to reduce the sediment yield of the project site may not result in a reduced RL. Highly erodible soils, in higher rainfall areas, on steep slopes increase the 'sediment risk'.

In a narrative sense, RL1 projects are projects that do not drain to a High Risk Receiving Water Body or Watershed and have a Watershed Erosion Estimate of less than 15 tons/ac. RL3 projects are those that drain to a High Risk Receiving Water Body or Watershed and have a Watershed Erosion Estimate of 75 tons/ac or more. All other projects are RL2.

Any questions in regard to the Risk Level determination should be directed to the District/Regional Design Stormwater Coordinators or the Headquarters Office of Hydraulics and Stormwater Design (OHSD).

1.6 Reporting requirements and document preparation difference between risk levels

The practical differences between Risk Levels are relatively small and involve an escalation of reporting requirements and document preparation. All risk levels require SWPPPs, good site management 'housekeeping' BMPs, non-stormwater management, preservation of existing topsoil, erosion and sediment control BMPs, surface water buffers, demolition BMPs, visual inspections, and non-visible sample collection. RL2 and RL3 require additional erosion control and sediment control BMPs, stormwater sampling and analysis, and have escalating levels of action based on reporting.

As mentioned in Section 1.2, projects subject to the Tahoe CGP do not have risk levels. However, all Tahoe CGP projects are required to meet similar minimum BMPs as the CGP including stormwater sampling and analysis and also prepare REAPs. A summary of the differences between the Tahoe CGP and the CGP can be found in the Tahoe CGP Attachment I, Table 1.

1.7 Types of projects being considered for risk level determination

There are three types of highway projects that are considered in this guidance:

- Contiguous Linear Highway Construction Site Projects
- Multiple (non-contiguous) Construction Sites within a Project. This type of project is usually not a Common Plan of Development (refer to PPDG, Appendix G for definition).
- Non-highway facility projects.

For each type of project, the SWRCB allows two different methods when using the Risk Determination Worksheet from Attachment D.1 of CGP:

- **GIS Map Method** (EPA Rainfall Erosivity (R) Factor Calculator and Map Tool),
- **Individual Method** (EPA Rainfall Erosivity (R) Factor Calculator and Individual Data).

Both methods are explained in detail in this guidance.

1.8 Definitions

The PE must understand the following definitions:

Direct Discharge – A direct discharge means a discharge of surface runoff directly to the surface water body without first flowing through a municipal separate storm sewer system (MS4).

Indirect Discharge – An indirect discharge means the discharge of surface runoff to the surface water body through an MS4 stormwater conveyance system, unlisted tributary to the surface water, or a stormwater discharge that otherwise reaches the water body.

Tributary Rule - There are some ambiguities regarding connecting waterbody downstream. The CGP (Attachment D.2 Section II.B.4) states that "sites that discharge to an unlisted receiving water that is tributary to a sediment-sensitive waterbody, within the Hydrologic Unit Code 10 (HUC 10) watershed scale, are considered high receiving water risk sites."

1. **Question** - If there are a couple of creeks in the immediate downstream area of the project site which are not listed as the 303 (d) waterbodies but they are connecting to another creek or river more than a mile or two downstream that is impaired for sediment, how is this considered in risk assessment? This can result to classification of the project to risk level 3 and subject the project to more monitoring and reporting requirements.
   Answer - Consult with District/Regional Design Stormwater Coordinator for logical tributary boundaries in regards to waterbody impairment for sediment.
2. **Question** – Is there a distance threshold or guideline for consideration of any downstream adjoining waterbody?
   Answer – No. Consult with District/Regional Design Stormwater Coordinator

1.9 Planning watersheds

As many Caltrans projects are linear in nature, there is a reference in the CGP that needs to be considered. Risk Level Determination Attachment D.2 Section II.B of CGP Order states, "SMARTS will assign the higher Risk Level to the entire site for any site spanning two or more planning watersheds." The SWRCB High-Risk Receiving Water Map Tool uses Hydrologic Unit Code (HUC) Level 12 watersheds. A combination of HUC Level 10 watershed boundaries and physical barriers (e.g. dams) were used to delineate the upstream extent of the High-Risk Receiving Watersheds. The Regional Water Board Water Quality Control Plans (Basin Plans) and 2020 - 2022 Integrated Report were referenced when determining which watersheds should be considered high-risk.

This means that when evaluating the Risk Level for a project, be cognizant of where the project is in relation to separate planning level watersheds. More information is provided within this guidance.

Not all watersheds have been mapped to the planning watershed level. The watersheds shown on the Caltrans Water Quality Planning Tool (WQPT) and the Caltrans Stormwater GIS Library are the most recent and up to date watershed maps available by the State. Additionally, CalWater 2.2 ArcGIS watershed boundaries are available for viewing and download from the SWRCB. These maps are not true hydrologic datasets following ridgelines and are approximate. The PE should document which hydrologic boundaries are being used for the project. Table 1-1 shows the different boundaries (symbol column) available that have been mapped.

- The Caltrans WQPT can be accessed at: https://svctenvims.dot.ca.gov/wqpt/wqpt.aspx
- The Caltrans Stormwater GIS Library can be accessed by Caltrans employees at: https://svgcdeaprod.dot.ca.gov/Stormwater_GIS_Library/
- The CalWater dataset and map viewer can be accessed at: https://gispublic.waterboards.ca.gov/arcgis/rest/services/Hydrography/CalWater_Boundaries/MapServer

Table 1-1. California System (CalWater 2.2)

Symbol	Description	Approx. Acres	# in CalWater 2.2
HR	Hydrologic Region	8,150,000	10
HU	Hydrologic Units	430,000	190
HA	Hydrologic Areas	156,000	522
HSA	Hydrologic Sub-Areas (vary greatly from 50,000 to >450,000)	125,000	655
SPW	Super Planning Watersheds	50,000	1623
PW	Planning Watersheds	3,000-10,000	6271

1.10 Website references

A reference section is included with this guidance with internet websites. These websites can be used to obtain additional information pertaining to this guidance such as the Construction General Permit, Risk Determination Worksheet, and Geotechnical Services contacts.

1.11 Goals when determining a project risk level

- When a project spans an area with more than one Risk Level, consult with the District/Regional Design Stormwater Coordinator to determine if the project should be broken up at the planning watershed boundary or if an argument can be made to use the lower RL.
- It may be desirable to have the lowest RL possible.
- Planning and scheduling construction during the dry season usually reduces the RL, especially in central and southern California, and may be a cost-effective alternative to extensive BMPs and more rigorous monitoring and reporting requirements.

Section 2

Procedures for a Contiguous Linear Highway Construction Site Project or Non-Highway Facility

2.1 GIS map method – EPA rainfall erosivity calculator and GIS map

If a quick analysis is desired, the GIS Map Method is sufficient. This method may produce a higher watershed erosion estimate in tons/acre than the Individual Method. Designers should be aware that SMARTS will auto-populate values for the soil erodibility factor (K factor), length-slope factor (LS factor), and the receiving water risk (the risk sediment poses to receiving waters) based on the provided latitude and longitude coordinates for the project. For projects that span more than one planning watershed, the latitude and longitude reported in SMARTS should be chosen in the highest risk planning watershed for the overall project.

2.1.1 Determine sediment risk

1. Download Attachment D.1 Risk Determination Worksheet of the CGP at the following URL: https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction/general_permit_reissuance.html
   a. Fill in the R, K and LS factor values in accordance with the guidance below to determine the site sediment risk factor. The Risk Determination Worksheet is a required attachment to the SWDR.

   Use the Caltrans WQPT, the Caltrans Stormwater GIS Library (internal access only) or the SWRCB 2022 CGP GIS Map Tools to determine the project's K factor and LS factor values. Note that if there are discrepancies between the Caltrans WQPT or Stormwater GIS Library and the SWRCB Map Tool, the SWRCB Map Tools will take precedence. For projects that span more than one planning watershed, determine the K and LS factor values for the planning watershed with the highest RL. Input these values into the Risk Determination Worksheet. Create a separate Worksheet for each planning watershed. Save a screen print of the R, K, and LS Factor values for the highest RL planning watershed as back-up documentation.

   If using the WQPT to determine the K factor value:

   b. Navigate to the project location with the **Find address or place** search bar at the top right of the screen.

c. In the menu of layers at the left side of the screen, scroll down to **Soil Risk Level Determination** and expand the layer by clicking the triangle. Click on the eye next to the layer **Soil K Factor** to turn on the visibility of the layer. Click on the map within the project site to show the K factor value. For large projects with multiple K factors within the project site, use the highest K factor value (or use the Individual Method).

d. Save a screen print of the K factor value as shown in Figure 2-1 to include with the Risk Determination Worksheet in the SWDR as back-up documentation. For projects that span multiple K factors, use the highest K factor value for the site (or use Individual Method).

e. Insert the K factor value into the Risk Determination Worksheet.

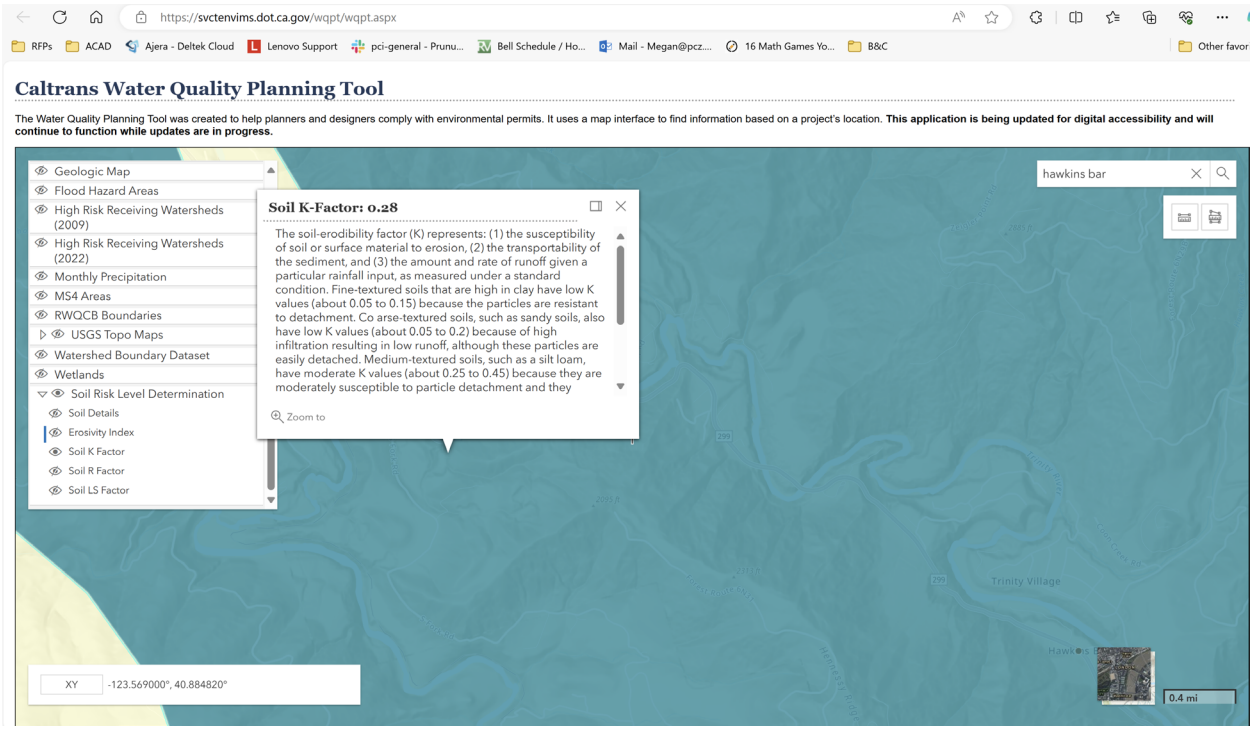


Figure 2-1. K factor value documentation on the WQPT

2. Designers may also choose to use the 2022 CGP Soil Erodibility (K) Factor GIS Map Tool, which is accessed directly at: https://gispublic.waterboards.ca.gov/portal/home/item.html?id=59bb6ae7996d415bb43d13420212a823
   a. On the Map Tool Introduction page, click on the blue **View** button on the top right to enter the Soil Erodibility (K) Factor Map Tool.
   b. In the Find address, place or tract bar, enter the project address or geo-coordinates. Use the Postmile Services Postmile Query Tool to find the geo-coordinates based on the project County, Route, and Postmile. This tool is found at: https://postmile.dot.ca.gov/PMQT/PostmileQueryTool.html
   Alternatively, Using the +/- symbols in the top-left corner or the mouse, zoom into the project location in the map.
   c. If using the project address or geo-coordinates, click on the small blue square to generate a pop-up window to view the K factor value for the project.
   If using the +/- symbols or mouse to navigate in the map, simply click on the project location in the map to generate a pop-up window containing the K factor value.
   d. Save a screen print of the K factor value as shown in Figure 2-2 to include with the Risk Determination Worksheet in the SWDR as back-up documentation. For projects that span multiple K factors, use the highest K factor for the site (or recalculate the K factor value with the individual method).
   e. Insert the K factor value into the Risk Determination Worksheet.

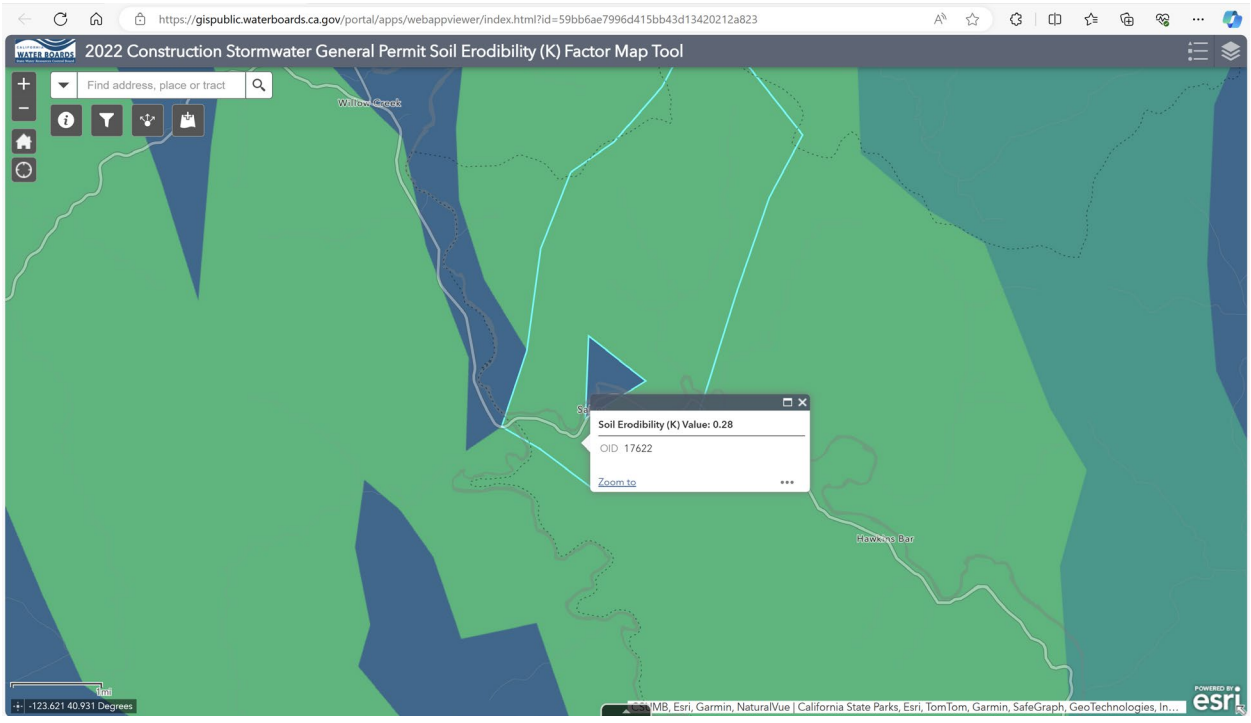


Figure 2-2. K factor documentation on the 2022 CGP Soil Erodibility (K) Factor Map Tool

3. To determine the Length-Slope (LS) factor value on the WQPT:
   a. Turn off the Soil K factor visibility by clicking the eyeball in the layer menu. Find the layer called **Soil LS Factor** and turn it on by clicking on the eyeball. Click on the map within the project site to show the LS factor value.
   b. Save a screen print of the LS factor value as shown in Figure 2-3 to include with the Risk Determination Worksheet in the SWDR as back-up documentation. For projects that span multiple LS factors, use the highest LS factor value for the site (or recalculate the LS factor value with the Individual Method).
   c. Insert the LS factor value into the Risk Determination Worksheet.

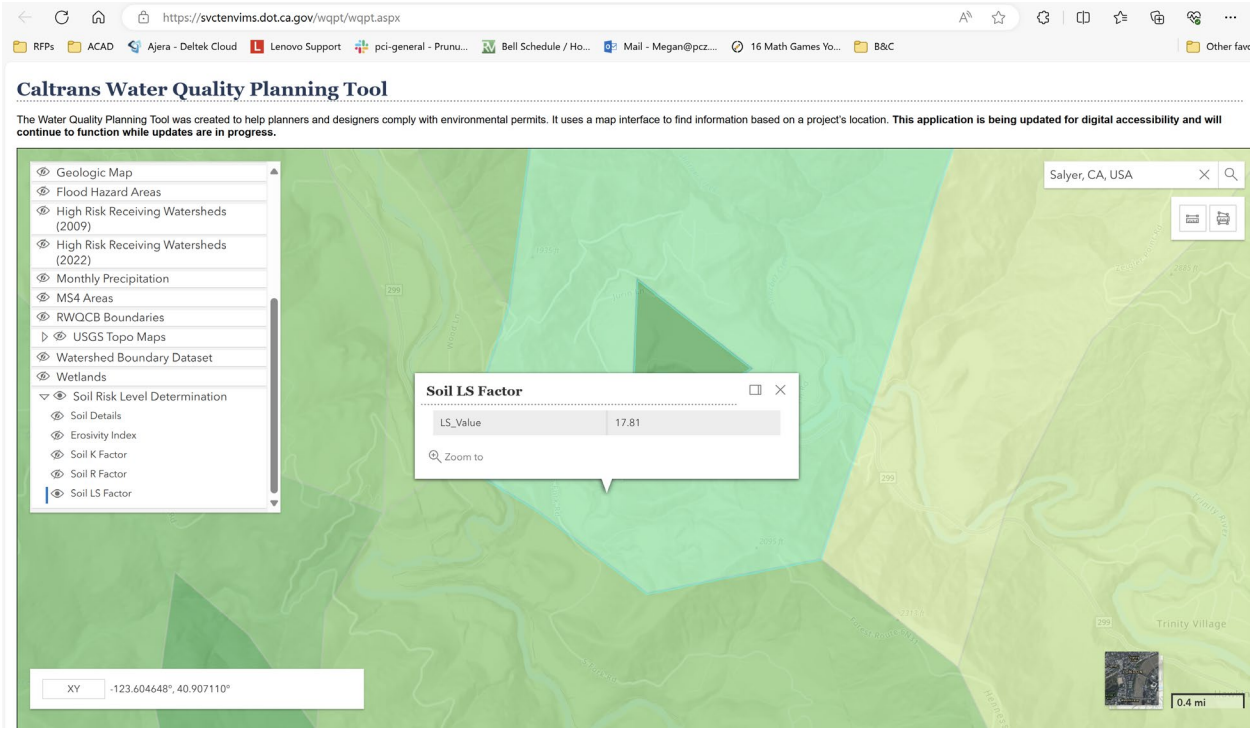


Figure 2-3. LS factor value documentation on the WQPT

4. Alternatively, designers may choose to use the 2022 CGP Length-Slope (LS) Factor GIS Map Tool which is accessed directly at: https://gispublic.waterboards.ca.gov/portal/home/item.html?id=d71546a521ed4829aaa0e6c7b245fd56
   a. On the Map Tool Introduction page, click on the blue **View** button on the top right to enter the Length Slope (LS) Factor Map Tool.
   b. In the Find address, place or tract bar, enter the project address or geo-coordinates. Use the Postmile Services Postmile Query Tool to find the geo-coordinates based on the project County, Route, and Postmile. This tool is found at: https://postmile.dot.ca.gov/PMQT/PostmileQueryTool.htmlhttps://postmile.dot.ca.gov/PMQT/PostmileQueryTool.html

      Alternatively, Using the +/- symbols in the top-left corner or the mouse, zoom into the project location in the map.
   c. Save a screen print of the LS factor value as shown in Figure 2-4 to include with the Risk Determination Worksheet in the SWDR as back-up documentation. For projects spanning multiple LS factor areas, use the highest LS factor value, or recalculate the LS factor value using the Individual Method.
   d. Insert the LS factor value into the Risk Determination Worksheet.

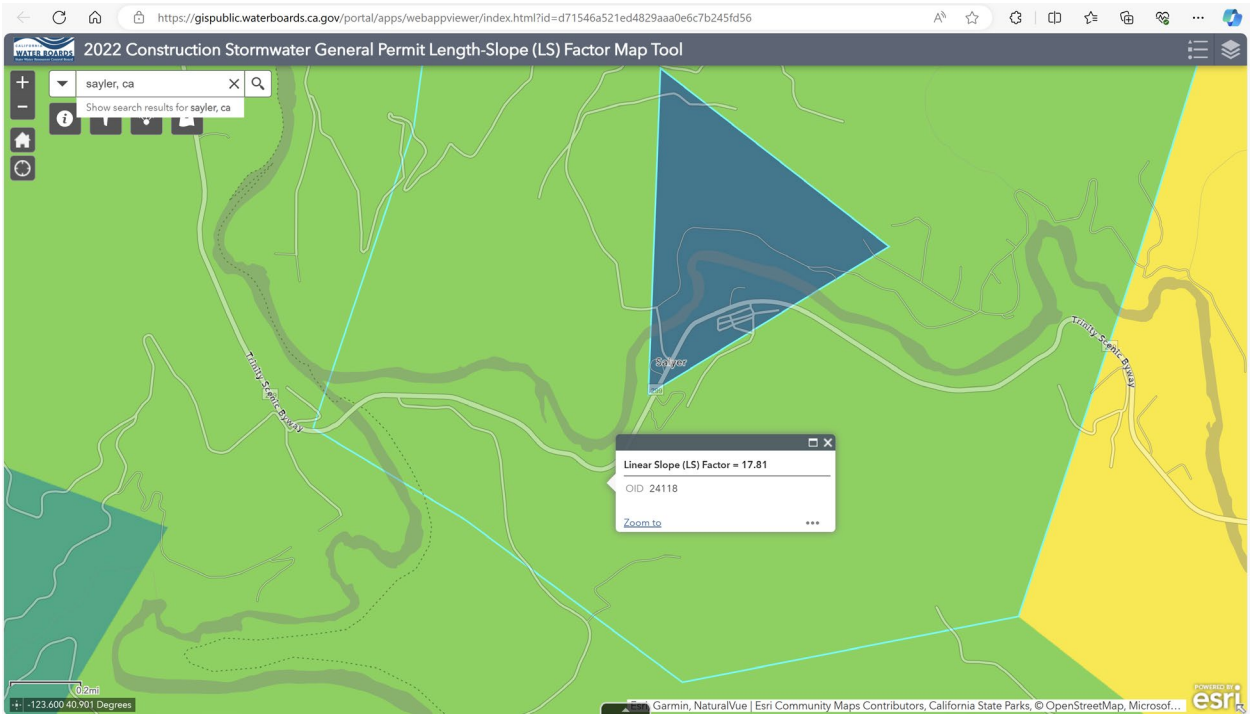


Figure 2-4. LS Factor documentation with the 2022 CGP LS Factor Map Tool

5. Determine R factor value by opening the US EPAs Rainfall Erosivity Factor Calculator for Small Construction. This site can be accessed at: https://lew.epa.gov/
   a. Enter the project geo-coordinates in the spaces provided. For large and/or long projects, test multiple coordinates along the project limits to find where the highest R factor is located. Use the highest R factor value for the project area.
   b. Enter the Start Date and End Date in the spaces provided and in the format required. Note: For projects with construction activities spanning one year or less, start date is the first day of anticipated soil disturbing activities and end date is the date that final stabilization is expected to be achieved.
   c. For multi-season projects that span more than one year, repeat the R factor value calculation for each additional year (or portion of a year) that construction activities are planned to occur and add the total R factor calculated for each year (or portion of a year) to determine the overall total R factor value. For example, a project that starts construction on November 1, 2020 and completes final stabilization on December 28, 2022 would be separated into the following construction periods shown in Figure 2-5.

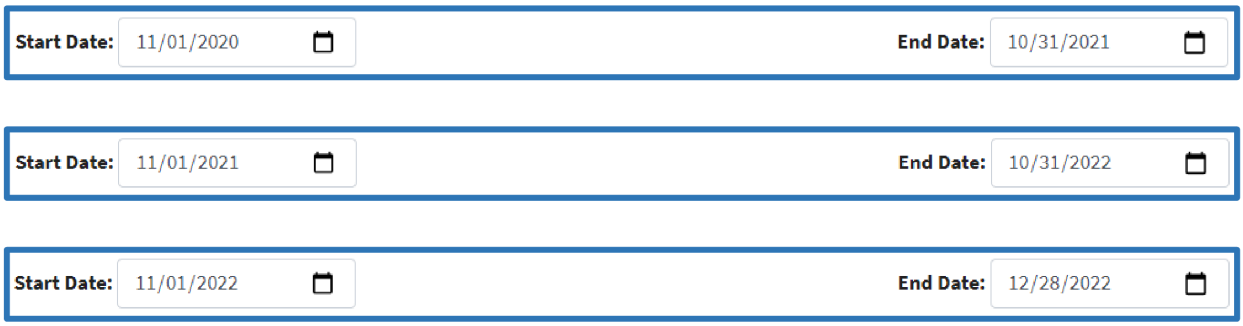


Figure 2-5. Entry of multi-year construction periods for R factor calculator

Then, add the resulting R factor for each year, or portion of a year to determine the overall R factor value for the project. The results from the calculator for each year, or portion of a year are shown in Figure 2-6 below.

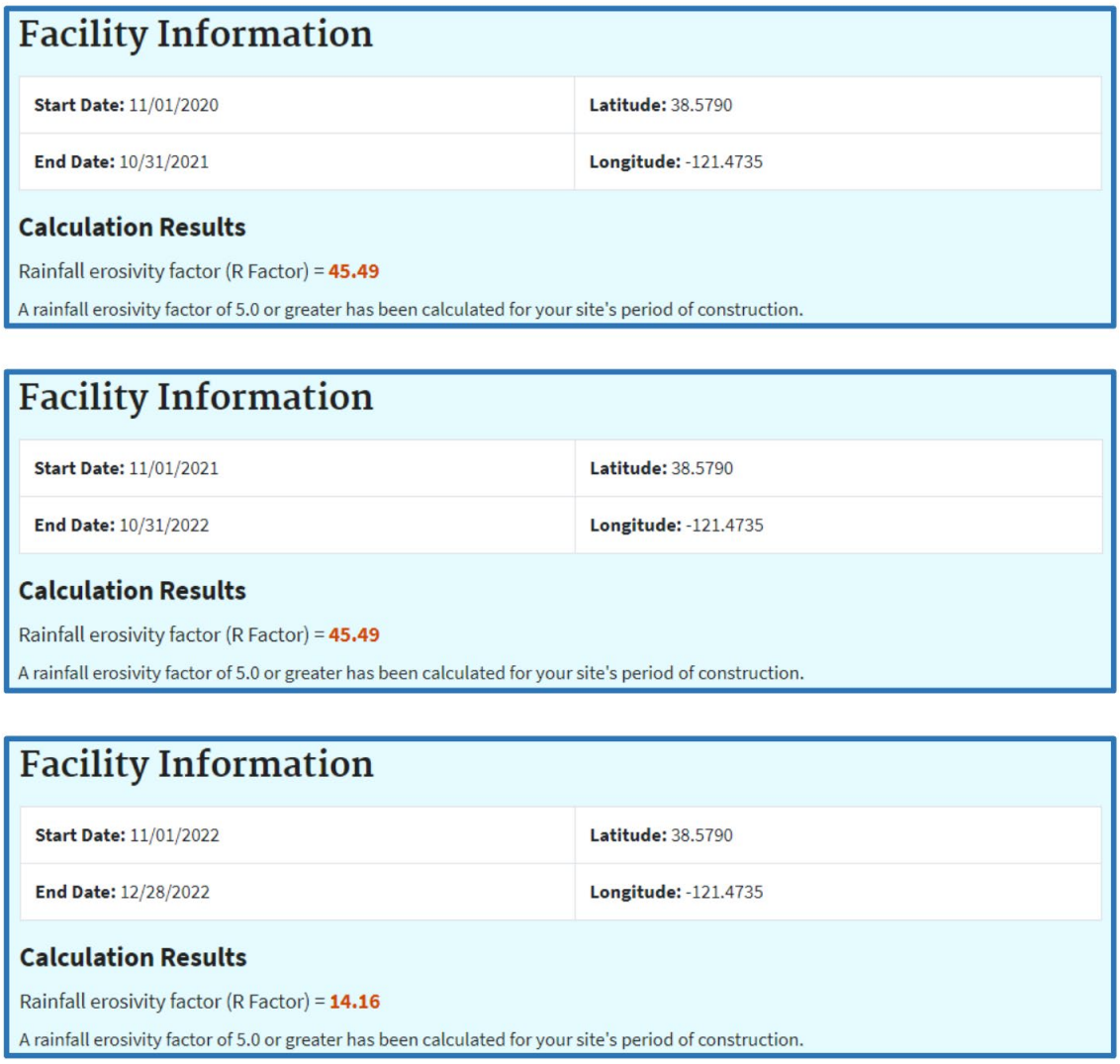


Figure 2-6. Calculation Results for multi-year construction periods

In this example, the site's overall R factor value between November 1, 2020 and December 28, 2022 would be:

Overall R Factor Value = 45.49 = 45.49 = 14.16 = 105.14

d. Save a screen print of the R Factor Calculator results as shown in Figure 2-7 as backup documentation. R Factor Calculations attached to a PID or PA/ED SWDR typically use the Approve Contract and CCA milestones. For projects that have a plant establishment contract, the end date may be within or at the end of the plant establishment contract. Coordinate with Landscape Architecture to determine an appropriate End Date that is likely to coincide with final stabilization. R Factor Calculations attached to a PS&E SWDR use the actual projected construction dates. Coordinate dates with Construction.

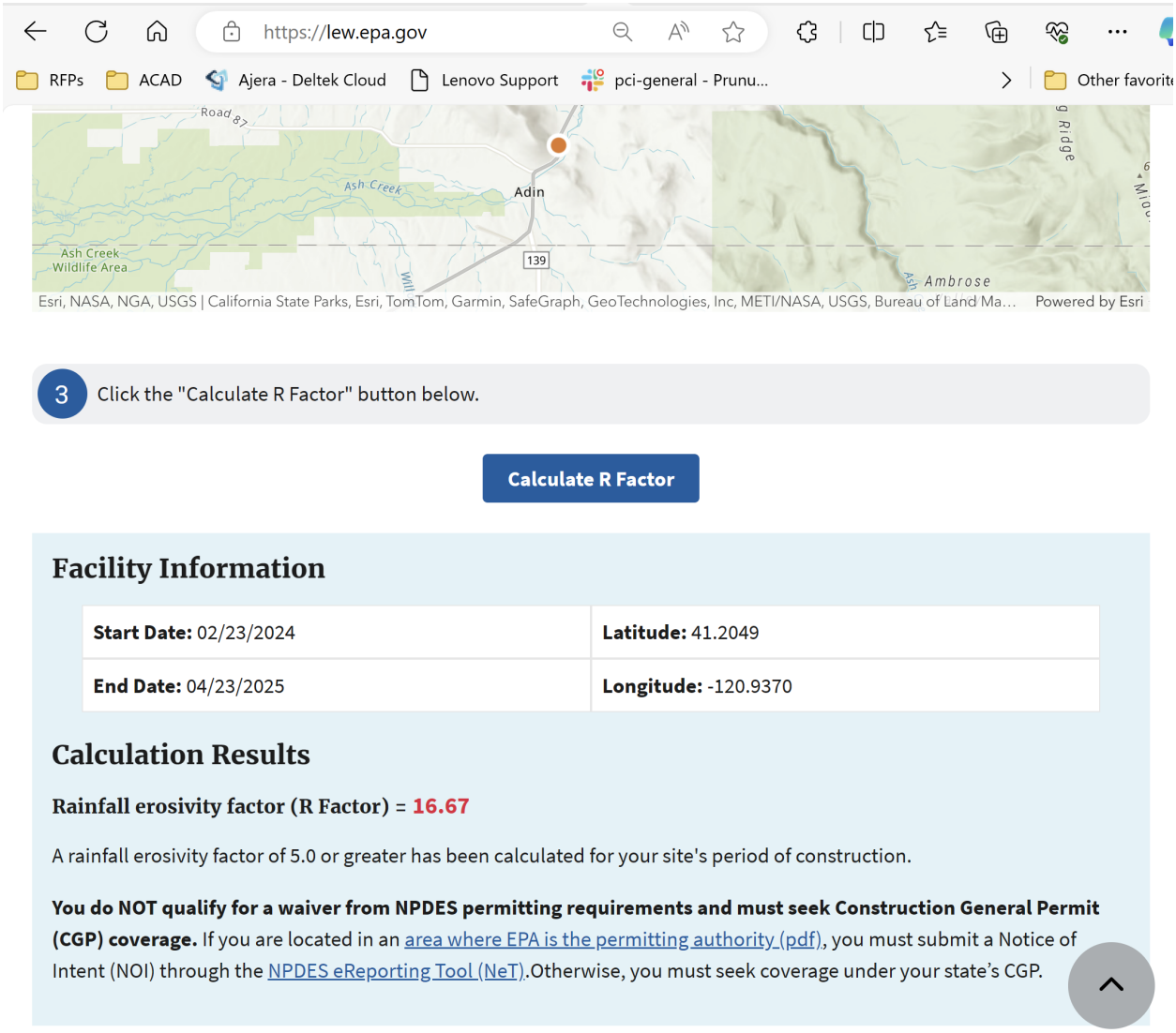


Figure 2-7. R Value documentation

e. Go back to the Risk Determination Worksheet and insert “R Factor Value”. Calculate the Watershed Erosion Estimate (tons/acre) = R x K x LS

2.1.2 Erosivity Waiver

The project may be eligible for an Erosivity Waiver from the requirements of the CGP if the R factor is less than 5.0, the DSA is greater than 1 but less than 5 acres, and the project duration is less than one year. Consult the Design Stormwater Coordinator or Construction Stormwater Coordinator to determine final eligibility.

Document the DSA and save a screenshot of the R factor calculator described in Section 2.1.1, step 6 as an attachment to the SWDR. Erosivity Waiver eligibility information must be conveyed to the RE to enter into SMARTS.

2.1.3 Determine receiving water risk

Use the following URL to get to Caltrans WQPT (Chrome or Firefox works the best). https://svctenvims.dot.ca.gov/wqpt/wqpt.aspx. Select **High Risk Receiving Watersheds** in the Layers section of the WQPT.

1. Alternatively, SWRCB has prepared a High-Risk Receiving Watershed Map Tool to assist dischargers with determining site-specific receiving water risk. Note that if there are discrepancies between the WQPT and the SWRCB Map Tool, the SWRCB Map Tool will take precedence. The Map Tool can be accessed at: https://gispublic.waterboards.ca.gov/portal/home/item.html?id=cf80c11f7f514c4598662aeea76ccc38

   On the Map Tool Introduction page, click on the blue 'View' button on the top right to enter the High-Risk Receiving Watershed Map Tool.

   In the 'Find address, place or tract' bar, enter the project address or geo-coordinates. Use the Postmile Services Postmile Query Tool to find the geo-coordinates based on the project County, Route, and Postmile. This tool is found at: https://postmile.dot.ca.gov/PMQT/PostmileQueryTool.html

   Alternatively, Using the +/- symbols in the top-left corner or the mouse, zoom into the project location in the map.
2. If your project is within a Red area it is within a High Risk Receiving Watershed. The map is prescriptive.

   If you believe your project's receiving waters should not be High Risk due to the Beneficial Uses or impairments, then consult with the District/Regional NPDES Coordinator. Exceptions MUST be in writing from the Regional Water Quality Control Board.

   Save a screen print of the High-Risk Receiving Watershed Map as shown in Figure 2-8 or Figure 2-9 to include with the Risk Determination Worksheet in the SWDR as back-up documentation. For projects spanning multiple watershed risk level areas, use the higher watershed risk factor or consider breaking the project into smaller areas.

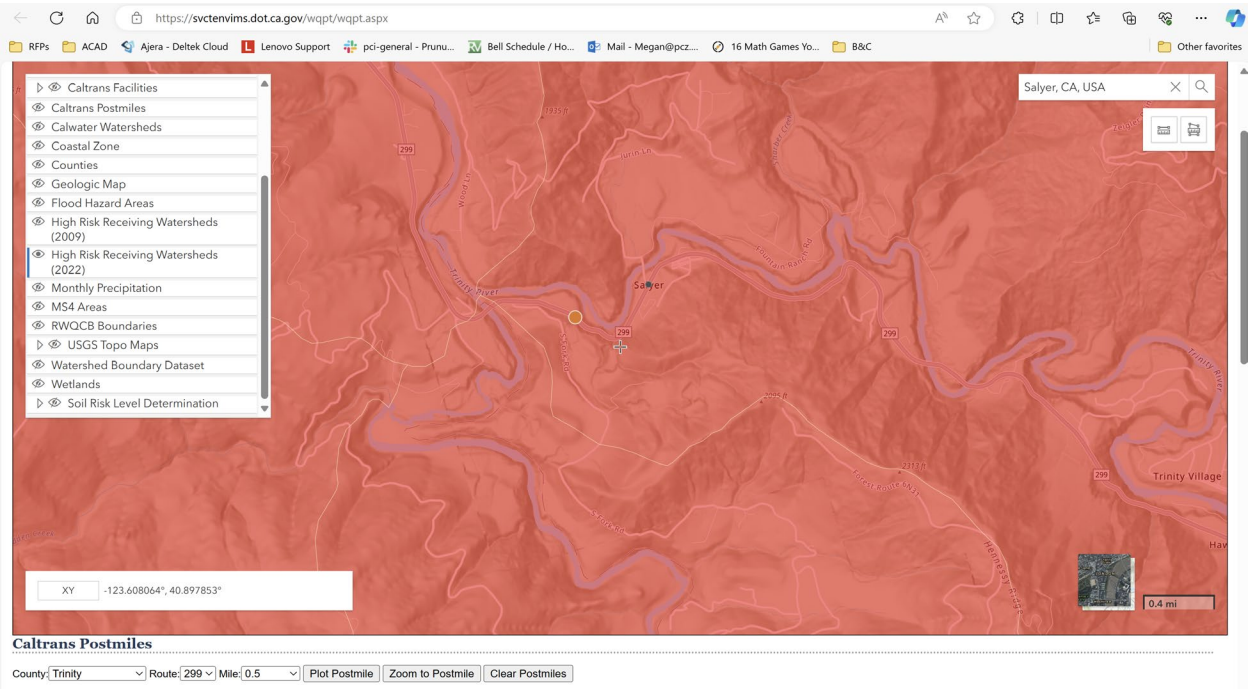


Figure 2-8. High risk receiving watershed documentation (WQPT)

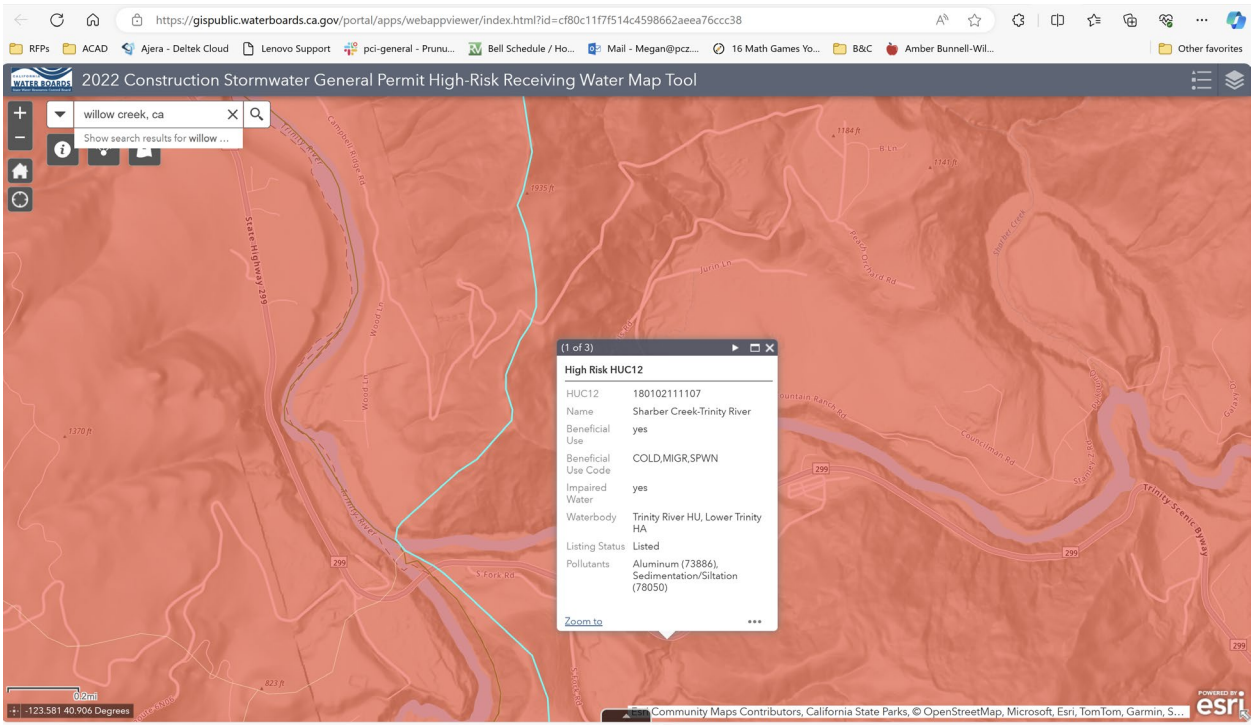


Figure 2-9. 2022 CGP High-Risk Receiving Water Map Tool

3. Enter the Site-Specific Receiving Water Risk (High or Low) into the Risk Determination Worksheet.

2.1.4 Combined Risk Matrix

Determine the Combine Risk Level of the project by consulting the Combined Risk Matrix in Figure 2-10 below. Document the Combined RL on the Risk Determination Worksheet. If a project spans more than one planning watershed with a different Combined RL, the higher RL must be assigned to the entire project.

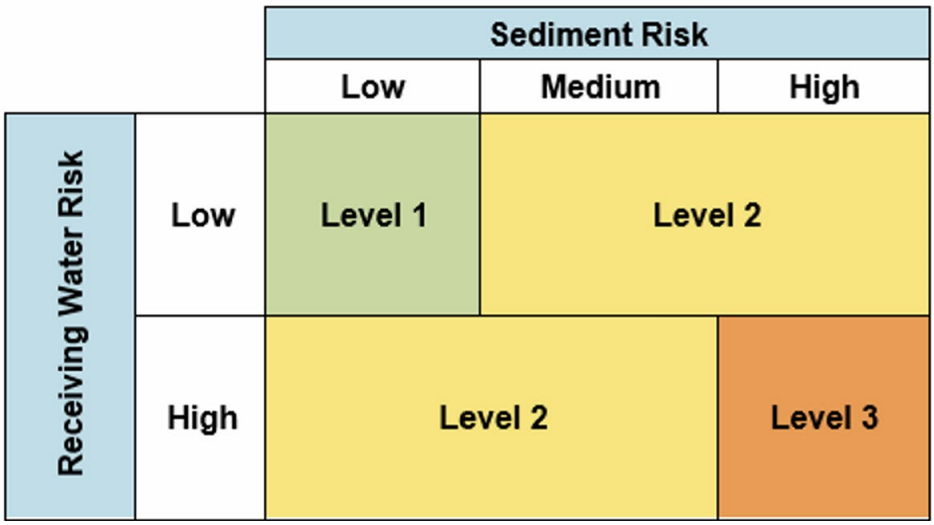


Figure 2-10. Combined Risk Matrix

2.1.5 Can the planning watershed Combined Risk Level be reduced?

There may be an opportunity to reduce the overall Combined Risk Level. Consider reevaluating the beginning and end dates of construction to reduce the length of the project or reschedule it during the dry season. Alternatively, reevaluate the sediment risk by using the Individual Method in Section 2.2. This may reduce the sediment risk factor and possibly reduce the Combined Risk Level of the project.

2.2 Individual method - EPA rainfall erosivity calculator and individual data

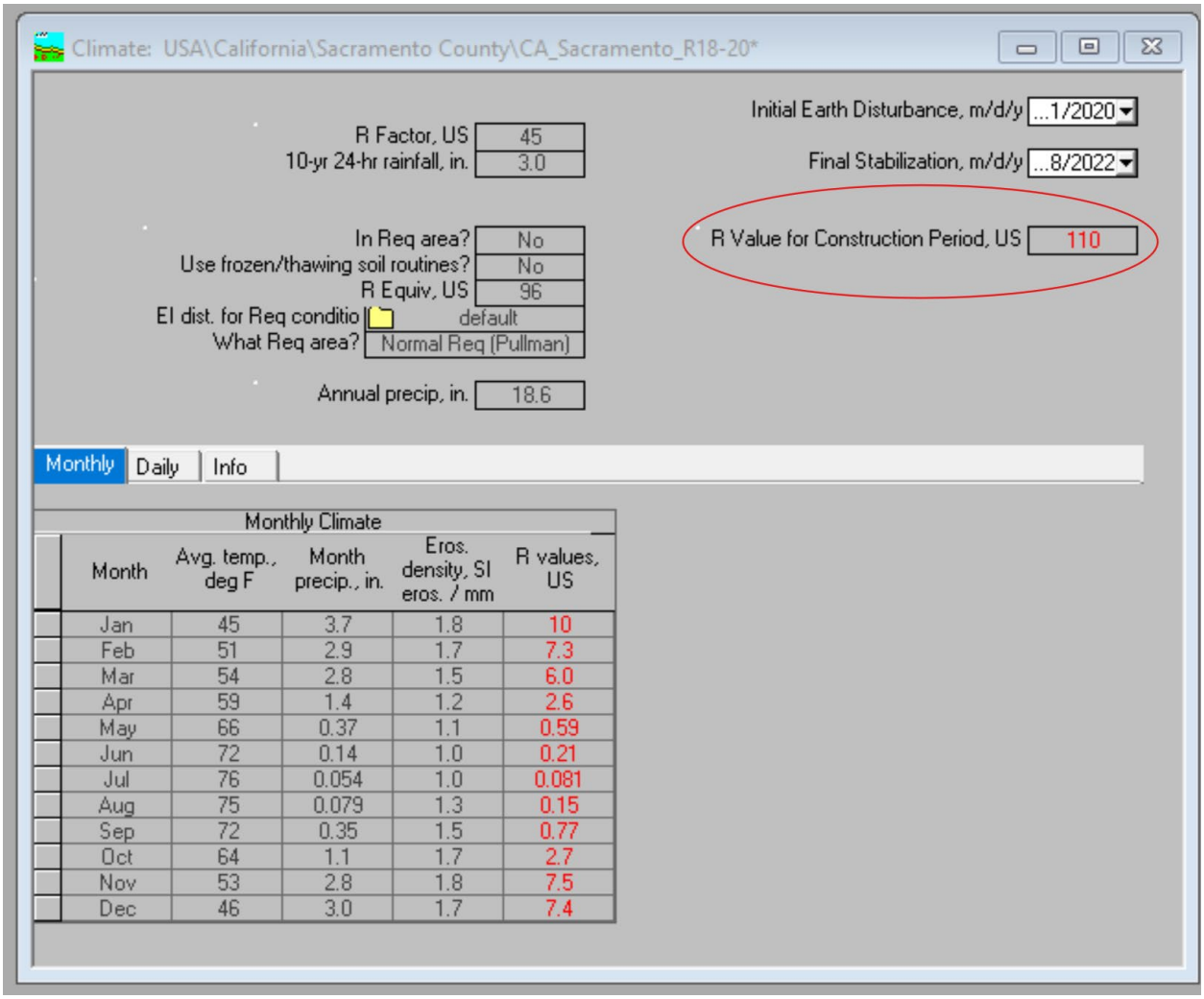
This method may be used during the design phase of a project when cross section information is available and may ultimately reduce the watershed erosion estimate in tons/acre. This method provides guidance on recalculating the sediment risk by using more refined K and LS values.

2.2.1 Determine sediment risk

Recalculate the R factor value using the same method used in the previous method (GIS Map Method) for each planning watershed with any updated information available. The RUSLE2 computer program can also be used to calculate the R factor and in many cases yields more accurate values than those generated from the EPA Erosivity Calculator and can be used when the EPA Erosivity Calculator is down. Consult the Erosion Prediction Procedure (RUSLE2) Manual (2024) available at:
https://dot.ca.gov/programs/design/hydraulics-stormwater/bsddd-erosion-prediction-with-rusle2

1. Using the manual linked above, follow the instructions for determining the precipitation (Section 7.2) for the project location. Next, in the ROME (RUSLE2) application, go to File>Open>Climate. Next drill down to select and open the appropriate rainfall record. As an example, for the project location used in Figure 2-6 select the following rainfall record: USA>California>Sacramento>CA_Sacramento_R18-20.

   Now enter the Initial Earth Disturbance and Final Stabilization dates for construction. The program calculates the R factor value as shown in Figure 2-6. Save a screen print of the RUSLE2 calculation of the R factor value as shown in Figure 2-9 to include with the Risk Determination Worksheet in the SWDR as back-up documentation.



Month	Avg. temp., deg F	Month precip., in.	Eros. density, SI eros. / mm	R values, US
Jan	45	3.7	1.8	10
Feb	51	2.9	1.7	7.3
Mar	54	2.8	1.5	6.0
Apr	59	1.4	1.2	2.6
May	66	0.37	1.1	0.59
Jun	72	0.14	1.0	0.21
Jul	76	0.054	1.0	0.081
Aug	75	0.079	1.3	0.15
Sep	72	0.35	1.5	0.77
Oct	64	1.1	1.7	2.7
Nov	53	2.8	1.8	7.5
Dec	46	3.0	1.7	7.4

Figure 2-11. R Value RUSLE2 Calculation

2. Use the same Attachment D.1 Risk Determination Worksheet as used in the GIS Method: https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction/docs/2022-0057-dwq-with-attachments/cgp2022_att_d1.pdf

   Fill in the new R factor.

3. Determine K Factor Value by using on-line soil surveys. Go to NRCS website for on-line soil surveys. Use the following URL: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm.
   a. Click on the START WSS green button.
   b. Use the Quick Navigation tool to locate site.
      Example –
      1) Click on the Longitude and Latitude box and input values.
      2) Zoom in and out until project limits are visible on map.
      3) Click on the Define AOI by Polygon button above the map and draw around the site limits. It may take several tries until desired results are obtainable. (It may be difficult to use this website if the new alignment deviates from the existing highway. If this is the case, it may be desirable to download soil mapping and place as a background level in Microstation.)
      4) Click on Soil Data Explorer tab.
      5) Click on Soil Properties and Qualities tab.
      6) Click on Soil Erosion Factors.
      7) Click on K Factor, Rock Free.
      8) Click on View Rating tab to see results.
      9) Determine a weighted average based on area for site K Factor.
      10) Document each planning watershed K Factor value.

   On the Risk Determination Worksheet, input the K Factor Value for each planning watershed. If you have difficulty in determining the K Factor, consult Geotechnical Services at the following URL: http://www.dot.ca.gov/hq/esc/geotech/
4. For a consistent statewide method, determine LS Factor Value as follows:
   a. Use the best available data for the phase of project being considered. Typically, use USGS Quad Maps or Google Earth Pro (use only when surveyed data is not available), contour mapping generated from surveyed data, or cross sections developed from surveyed data.
   b. Designate cross sections uniformly spaced along the alignment. It is recommended to use cross sections spaced approximately every 1,000 feet (a minimum of two to three for a very small project, which can be defined as a quarter mile or less in length). For most projects it is recommended to use five or more cross sections along the construction alignment for each RL determination. The PE must review the locations of each cross section to insure reasonableness. For instance, if one of the locations falls at a bridge location within a creek crossing, the PE should take another representative cross section either side of the bridge location away from the non-standard cross section. Since the cross sections are uniformly spaced, a simple average will provide a weighted average. For statistical reliability, determine a minimum number of cross sections; especially if the topography is variable.

c. For each cross section, obtain the **existing** hillside slope length (ft) and slope (%) **within the disturbed soil area limits** that are within Caltrans right of way and easements. Typically, one to six hillside slopes should be used to determine an overall length of disturbed area and weighted average slope based on length.

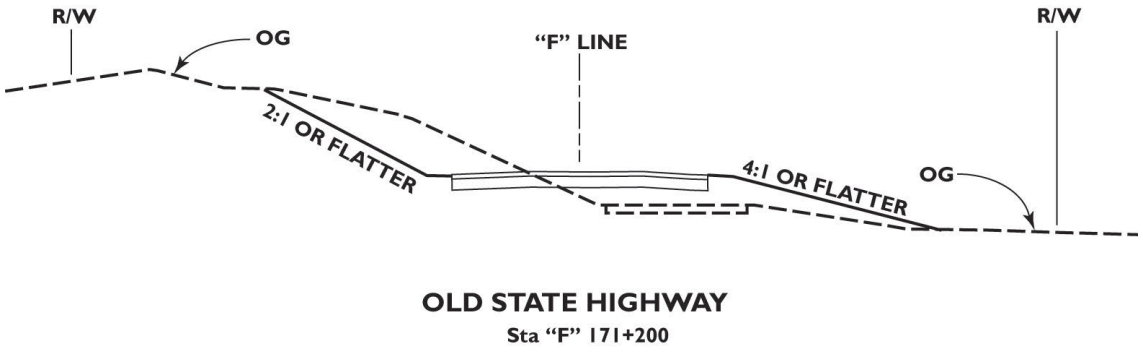


Figure 2-12. Cross section Sta "F" 171 + 200

Figure 2-12 Cross Section Sta "F" 171 + 200. Above is a cross section showing the original grade, proposed work, and right of way limits. Anticipated DSA includes cut and fill slopes.

d. Refer to Figure 2-12 for an example of a typical cross section. This cross section at station F 171+200 shows existing ground, proposed shoulders, side slopes, and proposed pavement.

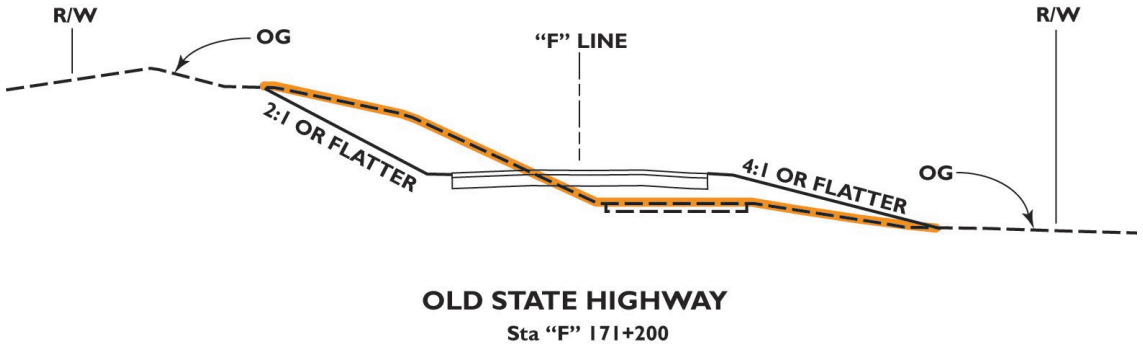


Figure 2-13. Cross section showing existing slope

Figure 2-13 Cross section showing existing slope. The orange line indicates the existing slopes affected by the proposed work.

e. Figure 2-13 shows the original ground surface associated with the proposed work in orange. Next, divide the existing slope into segments based upon uniform slope steepness as shown in Figure 2-14.

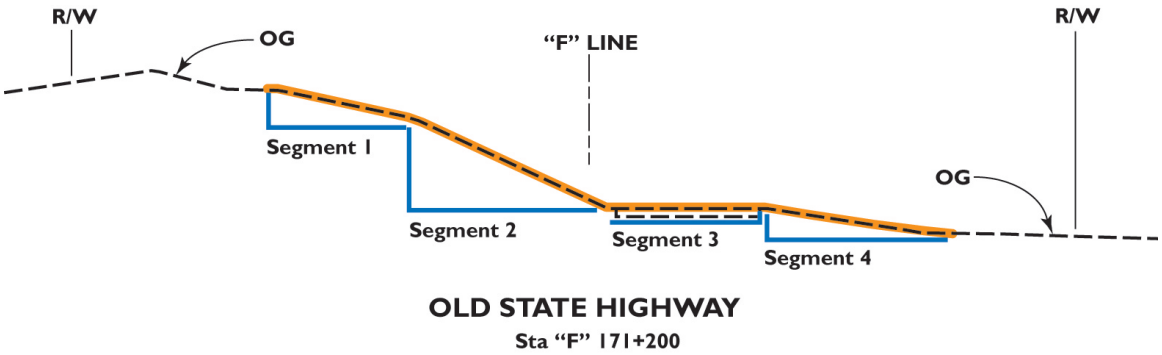
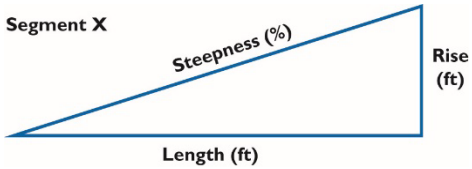


Figure 2-14. Cross section showing four slope segments

Figure 2-14 Cross section showing four slope segments. For this cross section, the existing slope can be characterized by four segments. The number of segments will vary per cross section.

Table 2-1. Cross Sectional Slope Characterization



Segment	Length (ft)	Rise (ft)	Steepness (%)	LS
1	16.40	4.26	25.97	1.15
2	22.96	10.49	45.68	2.51
3	18.04	1.31	7.26	0.33
4	22.96	3.61	15.72	0.90

Table 2-1. For each segment, provide the length and rise in feet. If you use the Topography Tool, it will calculate the steepness and LS value. The Topography Tool is available from the District/Regional Design Stormwater Coordinators or OHSD.

f. For each cross section, determine an LS factor from the LS Table in the Risk Determination Worksheet also shown in Figure 2-15 below.

Sheet Flow Length (ft)	Average Watershed Slope (percent)									
	0.2	0.5	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0
< 3	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.35
6	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.37
9	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.38
12	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.39
15	0.05	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.32	0.40
25	0.05	0.07	0.10	0.16	0.21	0.26	0.31	0.36	0.45	0.57
50	0.05	0.08	0.13	0.21	0.30	0.38	0.46	0.54	0.70	0.91
75	0.05	0.08	0.14	0.25	0.36	0.47	0.58	0.69	0.91	1.20
100	0.05	0.09	0.15	0.28	0.41	0.55	0.68	0.82	1.10	1.46
150	0.05	0.09	0.17	0.33	0.50	0.68	0.86	1.05	1.43	1.88
200	0.06	0.10	0.18	0.37	0.57	0.79	1.02	1.25	1.72	2.34
250	0.06	0.10	0.19	0.40	0.64	0.89	1.16	1.43	1.99	2.72
300	0.06	0.10	0.20	0.43	0.69	0.98	1.28	1.60	2.24	3.09
400	0.06	0.11	0.22	0.48	0.80	1.14	1.51	1.90	2.70	3.75
600	0.06	0.12	0.24	0.56	0.96	1.42	1.91	2.43	3.52	4.95
800	0.06	0.12	0.26	0.63	1.10	1.65	2.25	2.89	4.24	6.03
1000	0.06	0.13	0.27	0.69	1.23	1.86	2.55	3.30	4.91	7.02

Sheet Flow Length (ft)	Average Watershed Slope (percent)								
	12.0	14.0	16.0	20.0	25.0	30.0	40.0	50.0	60.0
< 3	0.36	0.38	0.39	0.41	0.45	0.48	0.53	0.58	0.63
6	0.41	0.45	0.49	0.56	0.64	0.72	0.85	0.97	1.07
9	0.45	0.51	0.56	0.67	0.80	0.91	1.13	1.31	1.47
12	0.47	0.55	0.62	0.76	0.93	1.08	1.37	1.62	1.84
15	0.49	0.58	0.67	0.84	1.04	1.24	1.59	1.91	2.19
25	0.71	0.85	0.98	1.24	1.56	1.86	2.41	2.91	3.36
50	1.15	1.40	1.64	2.10	2.67	3.22	4.24	5.16	5.97
75	1.54	1.87	2.21	2.86	3.67	4.44	5.89	7.20	8.37
100	1.88	2.31	2.73	3.57	4.59	5.58	7.44	9.13	10.63
150	2.51	3.09	3.68	4.85	6.30	7.70	10.35	12.75	14.89
200	3.07	3.81	4.56	6.04	7.88	9.67	13.07	16.16	18.92
250	3.60	4.48	5.37	7.16	9.38	11.55	15.67	19.42	22.78
300	4.09	5.11	6.15	8.23	10.81	13.35	18.17	22.57	26.51
400	5.01	6.30	7.60	10.24	13.53	16.77	22.95	28.60	33.67
600	6.67	8.45	10.26	13.94	18.57	23.14	31.89	39.95	47.18
800	8.17	10.40	12.69	17.35	23.24	29.07	40.29	50.63	59.93
1000	9.57	12.23	14.96	20.57	27.66	34.71	48.29	60.84	72.15

Figure 2-15. Nomograph from Erickson 1977, as referenced in Goldman et. al., 1986. Length-Slope (LS) Factor Table for Construction Sites

g. Average all cross section LS factor values to obtain a planning watershed average LS factor.

Table 2-2. LS Table Values

Site Specific Analysis of LS Factor
Project XX-XXXXXX

Planning Level Watershed:

Number of X-Sections = 6

Alignment		Number of	Slope Segment 1				Slope Segment 2				Weighted Average for All segments	
Station	Line	Segments	Length (ft)	Rise (ft)	Steepness (%)	LS	Length (ft)	Rise (ft)	Steepness (%)	LS	Total Slope Length (ft)	Weighted LS
171+ 00	F	1	12.600	3.600	28.57	1.07	0.000	0.000	N/A	0.00	12.600	1.07
171+100	F	2	15.300	4.100	26.80	1.13	16.700	3.500	20.96	0.95	32.000	1.04
171+200	F	4	16.400	4.260	25.98	1.15	22.960	10.490	45.69	2.51	80.720	1.28
171+300	F	4	16.100	3.800	23.60	1.04	20.600	9.200	44.66	2.25	73.900	1.16
171+400	F	3	15.300	4.100	26.80	1.13	16.700	3.500	20.96	0.95	50.400	0.77
171+500	F	1	12.200	3.800	31.15	1.12	0.000	0.000	N/A	0.00	12.200	1.12

Area Weighted LS = **1.07**
(Composite Weigthed LS / Number of X-Sections)

Table 2-2. The slope length, rise, steepness, and LS value are tabulated by cross section. This table was produced using the Topography Tool. Slope Segments 3-6 were omitted for readability.

Note: Several references have been made to the Topography Tool. Briefly:

Purpose: This tool will assist Caltrans staff in developing a weighted average, by area, for slopes as required for the Construction General Permit's Risk Level Determination, Individual Method.

Synopsis: *For any given cross section, there will be one or more existing hillside slopes within the disturbed soil area limits of the planned work. For each of these existing slopes, the designer will provide the horizontal slope length (feet) and vertical rise (feet). For each slope, called segments, this Excel Worksheet will use these inputs to calculate slope steepness in percent and return a RUSLE 'LS Value' using the "LS values for Construction Slopes" table from Attachment D.1 of the Construction General Permit. For each cross section, a weighted average for LS is returned based upon slope length dominance (e.g., the longer slopes will dominate the average). Finally, a composite LS for the entire alignment is returned as a simple average of all cross sections.*

Input the LS Factor Value on the Risk Determination Worksheet.

5. Calculate the Watershed Erosion Estimate for each planning watershed: R x K x LS and obtain the Site-Specific Sediment Risk (Low, Medium, High)
   a. Document each planning watershed Sediment Risk Factor. Compare this Sediment Risk Factor to the GIS Map Method.
6. If the risk has not been reduced, document the results and consider reevaluating the K Factor.
   a. The PE must use engineering judgment to decide if obtaining soil samples using this method might reduce the RL.
   b. The PE should document the decision process if not using this method.

c. OSWM and Geotechnical Services has discussed obtaining site soil samples and agree that few projects should be using this method because the NRCS soil maps in most instances will be reliable.
d. There may be times where a high K value soil type might be within a significant portion of the project and site soil testing necessary.
e. Another reason for testing would be if top layers of hillside soils on the project site have been disturbed and NRCS soils may not be the type of soils mapped.
f. There may be instances where NRCS soil maps are not available. If this is the case, see if soil information has already been collected.
g. Make sure to only use top soil because this is the soil of concern.
h. Consult with Geotechnical Services if in doubt when to grab field samples or no previous soil samples available.
i. Request Caltrans Geotechnical Services to perform a particle size analysis (ASTM D-442) for a representative number of cross section locations within the planning watershed to determine a Soil Erodibility Factor (K) using the nomograph in the Risk Determination Worksheet. It is recommended to download "K" Value mapping and use as a background drawing to project Layout Sheets in order to determine representative soil sample locations.
j. Coordinate with Geotechnical Services for soil sample locations, number of samples to be taken, and if areas defined on NRCS maps for each soil type can be used in weighted average area calculation.
k. An average "K" Value can be calculated using a weighted average based on area.
l. It should be noted that the **soil-erodibility factor K represents: (1) susceptibility of existing surface material to erosion**, (2) transportability of the sediment, and (3) the amount and rate of runoff given a particular rainfall input, as measured under a standard condition.
m. Once the information is determined go back to the K factor on the Risk Determination Worksheet.
n. Input the K Factor Value for the planning watershed. Recalculate the Watershed Erosion Estimate and obtain the Site-Specific Sediment Risk Factor.
o. Document the planning watershed Sediment Risk Factor. Compare this Sediment Risk Factor to previous calculations. If the risk has been reduced, go to step 7.
p. If the risk has not been reduced, the PE should review the K values of the soil samples versus the NRCS K values at the representative locations.
q. If the values are reasonable, stop and document.
r. If not, discuss with Geotechnical Services and document decisions if a Combined RL can be determined with the K values obtained.

7. Go to the Combined Risk Level Matrix in the Risk Determination Worksheet to determine the project combined RL for the planning watershed. Document the planning watershed Combined RL.

If there is more than one RL determination for multiple planning watersheds, the PE shall notify the District/Regional Design Stormwater Coordinator. The Regional Water Board may choose to break the project into separate levels of implementation. Early coordination is recommended during the initial planning stages (PID and/or PA/ED) of a project. The Coordinator will decide if coordination with the Regional Water Board is required to determine if the project should be broken into more than one RL.

Section 3

Procedures for Multiple Construction Sites (Non-Contiguous) within a Project

Caltrans projects vary in type. An example of a non-contiguous project would be an HOV ramp widening project where several ramps are being widened and the construction area of each of the ramps are separated by ¼ mile where no construction occurs. The proposed work would consist of widening the existing ramps, installing meters, and modifying the existing drainage systems at several locations. If no construction occurs for ¼ mile between construction sites, the project would be considered non-contiguous. Multiple construction sites within the project exist. This section focuses on these types of projects where construction areas are not contiguous and usually not defined as a Common Plan of Development (refer to PPDG, Appendix G for definition).

The CGP has more information on non-contiguous projects and how to apply to Caltrans projects.

CGP Section I.J.4 (page FS-67, 2nd paragraph):

The 2008 U.S. EPA NPDES General Permit for Discharges from Construction Activity (2008 Construction General Permit) provided further clarification on the common plan of development or sale regarding non-contiguous construction activities. Where discrete construction projects within a larger common plan of development or sale are located at least 1/4 mile apart and the area between the projects is not being disturbed, each individual project can be treated as a separate plan of development or sale provided any interconnecting road, pipeline, or utility project that is part of the same "common plan" is not concurrently being disturbed. For example, oil and gas well pads separated by 1/4 mile could be treated as separate projects. However, if the same two well pads and an interconnecting access road were all under construction at the same time, they would generally be considered as part of a single "common plan" for permitting purposes. If a utility company was constructing new trunk lines off an existing transmission line to serve separate residential subdivisions located more than 1/4 mile apart, the two trunk line projects could be considered separate projects.

3.1 Disturbed Soil Area

The Disturbed Soil Area (DSA) for multiple location sites within a project will be calculated based on each site. Sites must be separated by at least ¼ mile where there is no construction for the entire contract. DSA is not calculated based on adding all the sites together. For each site determined to be one acre or more, a separate RL determination will need to be performed for those locations. The sites that are less than one acre will not require a RL determination.

Use Section 2 "Procedures for a Contiguous Linear Highway Construction Site Project" to determine the RL for each site when DSA is one acre or more. Document the sites that are eligible for an Erosivity Waiver in accordance with Section 2.1.2.

Section 4

References

Internet Websites:

Use the State Water Resources Control Board website to download Construction General Permit.
https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction/general_permit_reissuance.html

Review Attachment D.1 Risk Determination Worksheet in CGP Order.
https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction/docs/2022-0057-dwq-with-attachments/cgp2022_att_d1.pdf

Review Risk Determination section in CGP Fact Sheet on pages 97 through 98.
https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction/docs/2022-0057-dwq-with-attachments/cgp2022_factsheet.pdf

US EPA Rainfall Erosivity Factor Calculator for Small Construction Sites (determination of "R" value)
https://lew.epa.gov/

NRCS website for on-line soil surveys (determination of 'K" value)
http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

Use the CGP Fact Sheet for clarification of the Common Plan of Development definition of non-contiguous projects. See 2nd paragraph of page FS-67)
https://www.waterboards.ca.gov/water_issues/programs/stormwater/construction/docs/2022-0057-dwq-with-attachments/cgp2022_factsheet.pdf

Obtain the most recent version of "Project Risk Level Determination Guidance" at:
https://dot.ca.gov/programs/design/hydraulics-stormwater

Caltrans Geotechnical Services Contacts
http://www.dot.ca.gov/hq/esc/geotech/

SWRCB High Risk Receiving Water Map Tool
https://gispublic.waterboards.ca.gov/portal/home/item.html?id=cf80c11f7f514c4598662aeea76ccc38

SWRCB K Factor Map Tool
https://gispublic.waterboards.ca.gov/portal/home/item.html?id=59bb6ae7996d415bb43d13420212a823

SWRCB LS Factor Map Tool
https://gispublic.waterboards.ca.gov/portal/home/item.html?id=d71546a521ed4829aaa0e6c7b245fd56

Erosion Prediction Procedure (RUSLE2) Manual (2024)
https://dot.ca.gov/programs/design/hydraulics-stormwater/bsddd-erosion-prediction-with-rusle2