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# REVIEW

*For QSD and QSP Registration and Renewal*



## A General Review

Erosion and Sediment Control Overview / Highlights from the 2017 CASQA QSD/QSP Forum / Notice of Termination Photograph: Best Management Practices / Sampling Guidelines

## ***A Note to the Reader:***

*The CGP Review is meant to help you, the intended reader—either Qualified SWPPP Developer (QSD) or Qualified SWPPP Practitioner (QSP)—to stay up-to-date on the latest issues affecting compliance with the Construction General Permit (CGP). Reading the annually updated CPG Review training materials is one of the required steps to renewing your QSD or QSP qualifications. The current publication of CPG Review addresses the regulators' top concerns regarding erosion and sediment control, notice of termination (NOT), and sampling. Having their insight will help you understand how your construction site will be assessed and the permit enforced. This issue also provides highlights from the 2017 QSD/QSP Forum held at the annual CASQA conference in Sacramento.*

***Authored by the Construction General Permit (CGP) Training Team***

***Contributors:*** Office of Water Programs at California State University, Sacramento;  
Southern California Edison; State Water Resources Control Board staff

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# EROSION AND SEDIMENT CONTROL OVERVIEW

During construction processes, soil is highly vulnerable to erosion by wind and water. Eroded soil has the potential to endanger water resources by reducing water quality and causing the siltation of aquatic habitat for fish and other desirable species. To mitigate the negative impacts associated with soil erosion caused by construction processes, implementing effective erosion and sediment control measures is essential to any construction site. Erosion control focuses on preventing soil erosion and protecting exposed soils while sediment control focuses on limiting the transport of sediment that has already eroded. Erosion control should always be considered the primary means of protecting water quality while sediment controls should be considered a “back up plan” for when erosion control measures are unable to adequately prevent soil loss, typically during intense storm events. Erosion and Sediment Control Plans must always meet or exceed local state requirements and should always strive to accomplish the following objectives:

- Minimize the amount of disturbed soil within the construction site
- Prevent offsite runoff from flowing across disturbed areas
- Slow down the runoff flowing across the site
- Remove sediment from project site runoff before it leaves the site

## **Erosion Control**

Typically, common erosion control measures focus on stabilizing disturbed areas by revegetating, covering disturbed areas with materials (such as wood mulch or gravel), or both after grading and construction activities

occur. Methods vary from preserving existing vegetation to applying various combinations of hydromulch and rolled erosion control products (RECPs). Additional erosion control measures are described in detail in Table 1. Utilizing the correct combination of appropriate erosion control measures at the right time during construction processes maximizes the efficiency of soil protection. Installing erosion control measures with sufficient time before rain events is essential for methods that rely on seed germination or need time to dry (like bonded fiber matrices) to provide adequate protection.



## **What is Man-Made Erosion?**

Man-made erosion is caused by clearing, grading, or otherwise altering a landscape, which can greatly accelerate the natural erosion process, and includes the breakdown of soil aggregates and the increased removal of organic and mineral particles.

Advanced planning, communication, maintenance, and diligence in tracking incoming storms are all essential components of developing and implementing an effective erosion control plan.

Table 1 lists a variety of common erosion control measures, their typical applications, and their limitations. In addition to knowledge of the advantages and limitations of various

erosion control measures, a thorough understanding of existing site conditions is essential for successful implementation. Selection of erosion control measures should be based on site-specific conditions related to soil types, soil moisture content, slopes, and climate, as well as the frequency and intensity of incoming storm events.

Table 1: Erosion Control Measures

<b>Erosion Control Measure</b>	<b>Description and Purpose</b>	<b>Applications</b>	<b>Limitations</b>	<b>Photos</b>
<b>Preservation of Existing Vegetation</b>	Preservation of existing vegetation can provide both erosion and sediment control benefits	Can be implemented year-round; Clearly designate areas to be protected in the field	Protection of vegetation requires advanced planning and can limit space necessary for construction activities	
<b>Hydraulic Mulch</b>	Application of a mixture of shredded wood fiber or a hydraulic matrix and stabilizing emulsion or tackifier with hydroseeding equipment	Disturbed soil areas requiring temporary protection until permanent vegetation is established	Generally short lived (only lasts part of the rainy season); requires ongoing maintenance  Must be installed at least 24 hours before rainfall to be effective  Ineffective on steep slopes, particularly if soil is already saturated  *Some of the limitations listed above do not hold true of all hydraulic mulches. Refer to the CASQA BMP Handbook Appendix F for additional information.	
<b>Hydroseeding</b>	Mechanical application of a mixture of wood fiber, seed, fertilizer, and stabilizing emulsion to temporarily protect soils from erosion caused by water and wind	Disturbed soil areas requiring temporary protection until permanent vegetation is established	Steep slopes are difficult to protect  Seeds must have time to germinate to provide effective protection  Insufficient water during drought conditions may slow or stop growth or germination	
<b>Drill Seeding</b>	Mechanized technique to plant seeds for temporary or permanent cover	Applicable to all disturbed areas accessible by drill equipment	Drilling equipment generally limited to slopes 3:1 (H:V) or less  Drill seeding applies no surface treatment; therefore, no surface soil protection is provided until seedlings germinate	
<b>Soil Preparation, Roughening</b>	Modifying soil to create a surface that will slow runoff and promote infiltration	Applicable to any disturbed slope, including stockpiles and sediment basins; complementary method that should be used in conjunction with other BMPs	Not effective when soil is already saturated  Not effective for intense rain events  Not considered effective for slopes steeper than 2:1	

<b>Erosion Control Measure</b>	<b>Description and Purpose</b>	<b>Applications</b>	<b>Limitations</b>	<b>Photos</b>
<b>Grassy Swales and Buffers</b>	Drainage swales used to divert off-site runoff around the construction site, divert runoff from stabilized areas around disturbed areas, and direct sediment laden runoff into sediment basins or traps	Can be used below steep grades, where runoff may begin to concentrate, and at bottom and mid-slope locations to intercept sheet flow, converting it to concentrated flow by the drainage swale	Berms and swales must be designed by a registered P.E.  Grass buffers should not be used along slopes greater than 10 percent or for drainage areas greater than 10 acres	
<b>Rolled Erosion Control Products (RECPs)</b>	Mattings of a broad range of materials used to cover and protect the soil surface	Slopes where erosion is a hazard and vegetation would be slow to establish  In channels to be vegetated where new vegetation may be washed away  Stockpile protection	Application reduces soil temperatures that may result in delayed seed germination  Avoid using plastic net, fixed aperture blankets for permanent erosion control applications to protect wildlife	

Table 1: Erosion Control Measures (Continued)



## **Sediment Control**

Sediment control techniques are used to capture and prevent the discharge of soil that becomes eroded. The CGP requires that perimeter control measures such as installing silt fences or placing straw wattles below slopes should always be considered on a construction site. As discussed previously, sedimentation controls are the “back up plan” for adequate erosion control products. Sufficient erosion control measures will prevent the overwhelming of sedimentation controls and reduce maintenance costs.

## **What Factors Influence Erosion?**

Erosion of the land surface may be caused by water, wind, ice, or other geological events. Water erosion is the loosening and removal of soil from the land by running water, including runoff from melted snow and ice. The major factors affecting soil erosion are soil type, climate, rainfall intensity and duration, vegetation or other surface cover, and slope. Understanding the factors that affect erosion makes it possible to predict the extent and consequences of onsite erosion.

Find out more at:

▼ [https://www3.epa.gov/npdes/pubs/chap03\\_conguide.pdf](https://www3.epa.gov/npdes/pubs/chap03_conguide.pdf)

Table 2 identifies some common sediment control methods as well as their applications and limitations. As with erosion control measures, sediment controls should always be selected based on site-specific conditions related to soil types, soil moisture content, slopes, and

climate, as well as the frequency and intensity of incoming storm events. Both erosion control and sediment control techniques require regular maintenance and inspections by qualified practitioners to optimize efficiency and assist with CGP compliance.

Table 2: Sediment Control Measures

<b>Sediment Control Measure</b>	<b>Description</b>	<b>Applications</b>	<b>Limitations</b>	<b>Photos</b>
<b>Silt Fence</b>	Temporary linear sediment barrier of permeable fabric designed to intercept and slow the flow of sediment-laden sheet flow runoff	Below the toe of exposed and erodible slopes Around temporary stockpiles Along streams and channels Along the perimeter of a project	Not effective unless properly keyed and trenched in Must be regularly maintained Must be removed and disposed of Should not be used to divert flows Must provide sufficient area for water to pond behind the fence	
<b>Check Dams</b>	Reduce scour and channel erosion by reducing flow velocity and encouraging sedimentation.	May be installed in small open channels that drain 10 acres or less and in temporary ditches where short length of service doesn't warrant establishment of erosion-resistant lining	Not to be used in live streams Not to be placed in channels that are already grass lined. Require extensive maintenance after high velocity flows	
<b>Sediment Traps</b>	Temporary containment area that allows sediment in collected stormwater to settle out during infiltration or before the runoff is discharged through a stabilized spillway	May be used to drain projects less than 5 acres Provides supplemental control and additional protection before entering a drainage system	Requires large areas to infiltrate Only removes large and medium sized particles Not to be located in live streams	
<b>Fiber Rolls and Compost Socks</b>	Wood excelsior, rice or wheat straw, or coconut fibers rolled or bound into tight tubular rolls placed on the toe and face of slopes to intercept runoff, reduce velocity, and remove sediment from runoff	Along the toe, top, face, and grade breaks of exposed and erodible slopes Around temporary stockpiles Along the perimeter of a project Drain inlet protection	Requires proper installation; rolls should be adequately staked and trenched in depending on installation Difficult to move once saturated Should not be used on slopes subject to creep, slumping, or landslides Should not be used on hard surfaces like asphalt Rolls with plastic nets must be removed and disposed of to protect wildlife	
<b>Stabilized Entrance and Exit</b>	Stabilized construction site entrance/exit is used to reduce the tracking of mud and dirt onto public roadways	Used where mud or dirt can be tracked onto public roads, adjacent to water bodies, and where dust is a problem during dry weather conditions	Design will be dictated by site-specific needs and constraints	



### **Planning Strategies and Procedural BMPs**

Both short-term and long-term scheduling of activities can help minimize exposed soils during the rainy season. Tailoring new development to existing terrain features minimizes the need for grading and ultimately reduces the risk of erosion. When feasible, disturbing smaller areas within a construction site during winter months will make installing and maintaining erosion and sediment controls more manageable. This requires construction to be completed in one area before beginning construction in another area of the project site.

Minimizing the disturbed area maximizes natural cover and reduces anticipated runoff volumes by maintaining increased infiltration and evapotranspiration rates. Stormwater calculations account for these factors with lower runoff coefficients and/or higher infiltration rates. Disturbing larger areas during winter months can potentially overwhelm a site and will require increased erosion and sediment control costs to comply with CGP requirements.

In addition, stockpiles should be located as far away from waterways and environmentally sensitive areas as possible. This may result in longer haul distances for heavy equipment, but it will ultimately reduce the risk of discharging stormwater containing pollutants off site. If the stockpile is not scheduled to be disturbed for at least 14 days, the stockpile should be covered. Refer to CGP Review 3.0 for proper stockpiling techniques that benefit restoration efforts.

### **Erosion and Sediment Control Resources**

- <http://www.cityofsacramento.org/-/media/Corporate/Files/DOU/Specs-Drawings/Sediment-control-manual.pdf?la=en>
- <http://www.dot.ca.gov/hq/construc/stormwater/factsheets.htm>
- <https://www.austieca.com.au/publications/download-fact-sheets/download-fact-sheets>
- <https://www.austieca.com.au/publications/download-fact-sheets/sediment-control-fact-sheets>
- <https://www.casqa.org/resources/bmp-handbooks>

### **Maintenance is Essential!**

Selecting and installing appropriate BMPs during the beginning of a project with the assistance of trained practitioners is the first step in preventing erosion control issues at any construction site. Regular maintenance of both erosion and sediment control measures is just as critical as initial installation, particularly before heavy rain events.

Typical BMP maintenance activities include:

- Removal of sediment from barriers and sedimentation devices
- Replacement or repair of worn or damaged silt fence fabrics or fiber rolls
- Replacement or repair of damaged structural controls
- Repair of damaged soil stabilization measures
- Other control maintenance as defined in BMP fact sheets or guidance manuals



# HIGHLIGHTS FROM THE 2017 CASQA QSD/QSP FORUM



## **Communication**

If you have any questions regarding maintenance requirements for BMPs or any other general questions regarding permit requirements, contact your Regional Water Board staff and begin a dialogue. Opening communication channels with Water Board staff early is the best way to avoid potential Notices of Violation (NOVs) and protect water quality. This communication may also highlight areas of confusion experienced by multiple permittees and provide Water Board staff with the input necessary to address recurring issues in future permits and CGP Reviews.

Education and effective communication among the construction crews, owner, QSP, QSD, and superintendent is also essential to increasing program buy-in and improving collaboration that will likely result in minimizing the likelihood of NOV issuance. Creating a plan to implement BMPs and discussing it with crews on site will increase awareness and improve the possibility of identifying problem areas before they escalate. For example, educating construction crews to avoid driving over fiber rolls, maintaining a clean site,

keeping waste receptacles covered, and remaining vigilant for failing BMPs can greatly increase the likelihood that a site can avoid water quality issues altogether.

## **Saturated Conditions**

It is important to monitor incoming storms and ensure that the appropriate erosion and sediment control measures are in place well in advance of rain events. The 2016-17 season was particularly wet with a number of intense storms. Once soils became saturated, application of erosion control BMPs on even minor slopes became difficult and was often ineffective. The lack of adequate erosion control measures to protect soils led to sediment loading that frequently overwhelmed sediment controls. High demand during the rainy season and just prior to storm events limits the availability of products and equipment, further highlighting the importance of advanced planning. As stated in the first section of this review, minimizing exposed slopes and having a strategy to protect vulnerable areas are essential components of avoiding water quality issues.



## Good Housekeeping BMPs

Good housekeeping procedures can provide some of the cheapest and most effective measures to protect water quality. A permittee must implement good housekeeping measures for construction materials, waste management, vehicle and equipment storage and maintenance, landscape materials, and other potential pollutant sources. For example:

- Maintain a clean and orderly construction site



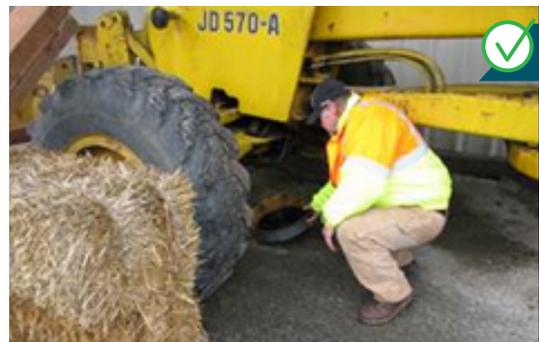
Plastic waste and other waste materials have the potential to clutter a site and compromise water quality.



Keep portable toilets off of impervious surfaces where possible and located away from storm drains. A containment tray must always be used and portables should be secured to ensure they don't blow over in high wind conditions.



Cover dumpsters before rain events to prevent them from discharging pollutants in stormwater through leaks or drainage holes.



Place drip pans underneath vehicles and equipment to catch any potential oil and fluid drips.

# NOTICE OF TERMINATION PHOTOGRAPH: BEST MANAGEMENT PRACTICES

Explaining final stabilization in writing will never be as effective as providing photographic proof. Adequately documenting pre- and post-construction conditions assists Regional Water Board staff in processing the Notice of Termination (NOT). Particularly for the 70% final cover method, adequately characterizing pre-project conditions can mean the difference between having to achieve 70% total coverage of the site as opposed to 70% of pre-project coverage. This section provides recommendations for adequately documenting pre- and post-construction site conditions.

Photographic documentation helps demonstrate that the site conditions meet the conditions for termination. The goal is to demonstrate stabilization or re-establishment of pre-project conditions on the disturbed areas of the site. Figure 5 provides an example format for organizing your photographic documentation for the NOT.

Some general tips to keep in mind when taking photos before and after construction:

1. Ensure that quality photographs are taken. If a photo is poorly lit or out of focus, it may not provide the level of photographic evidence needed to identify soil conditions or vegetative cover.
2. Be systematic about taking photographs from the same vantage point so that pre- and post-construction photos are easily compared. A site map identifying where photos are taken can help ensure photos are consistently taken from the same location (See #8).
3. Take a number of photographs from different vantage points and include a combination of close up and wide ranging views to ensure the site characteristics are sufficiently documented and recorded.

4. Date and time stamp the photographs (turn on this feature on digital cameras or smart phones).
5. If possible take pre-project photographs at the same time of the year (season) when the project is expected to be completed.
6. If a project is being stabilized in phases, photograph each phase as it is stabilized.
7. Written notes accompanying site photographs are helpful when filing and saving photographs and for providing notes in the NOT to explain the site to the Regional Water Board staff reviewing the NOT. The following details should be recorded:
  - Date/Time
  - Season
  - Direction of view (by compass point)
  - Note any unusual circumstances or features of the site
8. Key photographs to a site map to demonstrate that the entire site has been characterized. A final stabilization map should also be provided and can be combined with a keyed map for photographs to help identify where and from which direction photos were taken, and the different final stabilization methods utilized.



Figure 5: Example of CGP NOT photograph documentation

<b>WDID # :</b>		<b>Project Name:</b>	
<b>QSP / Inspector:</b>			
<b>Final Stabilization Criteria</b>			
<p><i>(Pre-Construction Photo insert date/time stamped photo)</i></p>		<p><i>(Post-Construction Photo insert date/time stamped photo)</i></p>	
<b>Photo ID or # :</b>		<b>Direction:</b>	
<b>Photo ID or # :</b>		<b>Direction:</b>	
<b>SWPPP Map Sheet:</b>		<b>SWPPP Map Sheet:</b>	
<b>Description:</b>		<b>Description:</b>	



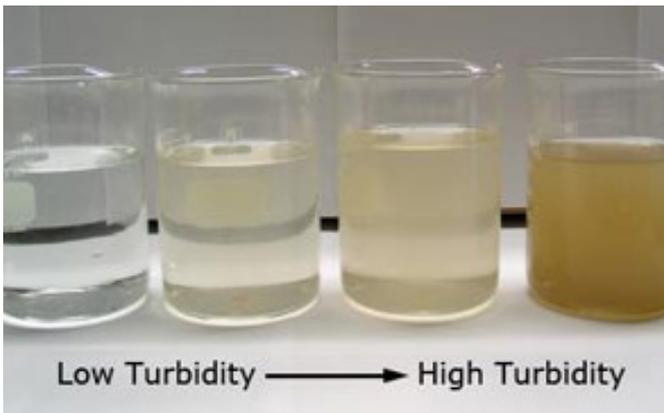
Pre-construction photos should be taken of the entire site with particular attention paid to areas that will be disturbed by construction activities. Existing vegetation and soil types should be photographed and documented before disturbing the site in any way. Accurately characterizing the existing vegetative cover and soil can be used to validate pre-construction inputs selected for RUSLE 2 Analysis or to justify final stabilization if the 70% final coverage method is used (*for additional information on final stabilization methods, see CGP Review 3.0*). Regardless of the method used for final stabilization, detailed pre-construction photographs are essential to help facilitate the NOT process.

Permittees should also take the opportunity to photograph site drainage and examine the site for any existing areas that may be prone to erosion issues. If any erosion-prone areas are found on site, these areas should be documented and photographed. These erosion-prone areas should then be addressed in the construction Stormwater Pollution Prevention Plan (SWPPP) where BMPs can be identified and implemented to eliminate or reduce the impacts of erosion.

### Documenting Unusual Circumstances

A water utility pipe was being installed along a normally un-vegetated road shoulder and pre-project photographs were taken just before construction started in the spring, which was before the transportation agency conducted annual weed abatement. These photos depicted lush growth of roadside weeds. The project was completed in the summer and the post-project photographs depicted the normal condition of the un-vegetated shoulder. This situation needed additional explanation in the NOT.

# SAMPLING GUIDELINES



To evaluate BMP effectiveness within a construction site, it is important to comply with the Risk and Linear Underground/Overhead Project (LUP) type specific monitoring requirements. As a reminder, pH and turbidity sampling results taken from within the interior (not at a discharge location or compliance point) do not have to be reported in SMARTS (*the requirement to submit sample results online is tripped when stormwater runoff leaves the property or enters a receiving water body*). A keyed map of sample locations is helpful for recordkeeping and consistency when collecting samples for BMP evaluation or for SMARTS submittal. Sampling locations will need to be re-evaluated should project conditions change as a result of events such as fire, landslides, or another construction project commencing adjacent or upstream from the project. The CGP also requires all permittees to conduct an assessment and monitor for pollutants that are not visually detectable for stormwater. Monitoring for non-visible pollutants is required at any construction site when the exposure of construction materials occurs and where a discharge can

cause or contribute to an exceedance of a water quality objective. The most effective way to avoid sampling and analysis requirements for non-visible pollutants is to avoid the exposure of construction materials to precipitation and stormwater runoff. The following sections provide guidelines and tips for effective turbidity and pH sampling.

## **Turbidity**

Turbidity is the cloudiness of water quantified by the degree to which light traveling through a water column is scattered by the suspended organic and inorganic particles it contains. The turbidity test is reported in Nephelometric Turbidity Unit (NTU). Low values indicate less turbid or clearer water while higher values indicate more turbid or cloudier water (Figure 6). Field turbidity meters can provide an accurate measure of turbidity when calibrated and used correctly. Different turbidity meters have different requirements for calibration intervals; consult the manufacturer's user guide for the particular meter you are using. Be sure that your meter has been correctly calibrated before entering the field.

Steps for taking field turbidity samples:

1. Use gloves to prevent contamination of the sample and minimize the likelihood of fingerprints on the vial (fingerprints on the vial can cause elevated readings). Stand downstream of the collection site and exercise caution not to suspend sediment before taking the sample.
2. Using a collection bottle (preferably largemouth) collect a sample and carefully place the cap on the collection bottle.



## pH

pH is a scale of acidity that ranges from 0 to 14. More acidic solutions have a lower pH while more basic or alkaline solutions have a higher pH. A pH value of 7.0 is neutral. The typical safe pH ranges for freshwater aquatic habitats are 6.5-8.5 pH Units. Areas where concrete work is being completed are of particular concern because concrete washout water can commonly have a pH around 12. If waters within aquatic habitats become too caustic or corrosive, fish gills, eyes, and reproduction can be harmed. Caustic water can also cause skin irritation or eye damage to concrete workers.

The most common method for measuring pH is with a pH meter. As with a turbidity meter, if you are using a pH meter be sure to calibrate the instrument according to the manufacturer's instructions before entering the field.

Steps for taking field pH samples using a pH meter:

1. Refer to the applicable manufacturer's directions regarding calibration and meter operation prior to entering the field.
2. Turn on the pH meter.
3. If the pH meter has a probe, it can be placed directly in the flow of stormwater. As discussed with turbidity sampling, a large-mouth bottle can also be used to capture a sample and obtain a pH reading.
4. Typically the probe will need to sit within the sample for 5-10 seconds before providing a final reading. Do not to remove or disturb the sample bottle while the probe is obtaining a reading
5. In a site log book, record:
  - a. Date/Time
  - b. Location
  - c. Reading
  - d. Notes
  - e. Name/Signature of Sampler

3. Gently invert the collection bottle several times but be careful to avoid creating air bubbles.
4. Inspect the sample vial to ensure surface is clean and free of scratches or material because anything that can obstruct the passage of light through the vial will bias the reading.
5. Fill the sample vial from the collection bottle.
6. Follow the operating instructions of the turbidity meter and line up the vial within the meter accordingly.
7. In a site log book, record:
  - a. Date/Time
  - b. Location
  - c. Reading
  - d. Notes
  - e. Name/Signature of Sampler
8. Clean the vial with distilled water and repeat steps 3-7 if you wish to take an average of several readings. This is an option, not a requirement.

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