

**MONITORING AND REPORTING PROGRAM
ORDER NO. R3-2007-0073**

**INDIVIDUAL CONDITIONAL WAIVER OF
WASTE DISCHARGE REQUIREMENTS**

FOR 1-00NTMP-066 SCR FOURWATERS NTMP

September 7, 2007

This Monitoring and Reporting Program Order No. R3-2007-0073 (MRP) is issued pursuant to Water Code sections 13267 and 13269. Failure to comply with this MRP may subject the Discharger to monetary civil liability in accordance with Water Code section 13268 and 13350. Monitoring shall begin at the onset of timber harvest operations and must comply with this MRP and any subsequent revisions. Monitoring shall continue until this MRP is rescinded.

SITE SPECIFIC MONITORING LOCATIONS

This MRP takes into account specific site conditions and mitigations to establish monitoring locations (see attached map, Attachment 3 Fourwaters Water Quality Monitoring Locations) that will provide functional monitoring information. The Discharger¹ is required to perform monitoring at these locations as described below in Section I – Implementation and Effectiveness Monitoring and Monitoring Frequency; Section II – Data Logging and Reporting; and Section III – Standard Provisions.

VISUAL MONITORING POINTS: The Discharger is required to conduct visual monitoring at the points listed below.

Visual monitoring points shall include the full length of roads, watercourse crossings, landings, skid trails, water diversions, watercourse confluences, known landslides, and all mitigation sites in the Non-Industrial Timber Management Plan (NTMP) area (as documented the CDF approved NTMP).

PHOTO-MONITORING POINTS: The Discharger is required to monitor Photo-monitoring points listed below (guidelines in Exhibit 1). Photo-monitoring points:

¹ "Discharger", "you", or "your" means the landowner and anyone working on behalf of the landowner in the conduct of timber harvest activities.

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Photo-point #1 (P1) – photo of the slide located between Crossings X4 and X5.

Photo-point #2 (P2) – photo of the culvert replacement located at Crossing X12.

Photo-point #3 (P3) – photo of the rock dip installation located at Crossing X12.

WATER COLUMN MONITORING POINTS: The Discharger is required to measure instream temperature and turbidity conditions at the following water column monitoring points:

Turbidity monitoring locations:

Turbidity monitoring point #1 (T1) – located within 25 feet upstream of the confluence of Newell and Peterson Creeks.

Turbidity monitoring point #2 (T2) – located within 25 feet downstream of the confluence of Newell and Petersen Creeks.

Turbidity monitoring point #3 (T3) – located within 25 feet downstream of the intersection of the eastern property boundary and Velma Creek.

Turbidity monitoring point #4 (T4) – located within 25 feet downstream of the confluence of Newell and Velma Creeks.

Turbidity monitoring point #5 (T5) – located within 25 feet downstream of crossing X16.

Temperature monitoring locations:

Temperature monitoring point #1 (T2) – located within 25 feet downstream of the confluence of Newell and Petersen Creeks.

Temperature monitoring point #2 (T4) – located within 25 feet downstream of the confluence of Newell and Velma Creeks.

Temperature monitoring point #3 (T5) – located within 25 feet downstream of crossing X16.

CDF FOREST PRACTICE RULES COMPLIANCE MONITORING: The Discharger is responsible for and is required to ensure timber harvest activities are conducted in accordance with the approved Non-Industrial Timber

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Management Plan (NTMP) and with all applicable sections of the Forest Practice Rules. This includes allowing site access for compliance inspections by California Department for Forestry and Fire Protection and Central Coast Regional Water Quality Control Board pursuant to 40 CFR Article 8, Section 4604.

ROAD INVENTORY PROGRAM: The Discharger is required to develop and implement a Roads Management Program (example attached in Exhibit 1, Big Creek Road Inventory Program) within the NTMP area. The road management program must be approved by the Water Board's Executive Officer prior to implementation.

FORENSIC MONITORING: The Discharger is required to conduct forensic monitoring as described in Section I below.

SECTION I – IMPLEMENTATION AND EFFECTIVENESS MONITORING AND MONITORING FREQUENCY

VISUAL MONITORING

VISUAL MONITORING POINTS: Visual monitoring points must include the full length of roads, watercourse crossings, landings, skid trails, water diversions, watercourse confluences, known landslides, and all mitigation sites (as documented in the CDF approved NTMP) in the plan area. Visual monitoring points must be at locations within the timber harvest plan area where timber harvest activities have the greatest risk of potential discharge (sites may be established by the Water Board's Executive Officer during or after the pre-harvest inspection).

VISUAL MONITORING FREQUENCY: The Discharger is required to monitor all visual monitoring points established by the Water Board's Executive Officer during or after the pre-harvest inspection for existing or potential sources of erosion. The Discharger is required to perform visual monitoring within 12 to 24 hours of storm events of two inches of rain or greater within a 24-hour period.

"Year One" – You are required to monitor a minimum of three times over each 12 months during **"Year One"** monitoring. "Year One" monitoring begins with the onset of timber harvest operations. "Year One" monitoring then continues during the entire length of time active timber harvest operations occur plus one year past the end of active timber harvest operations.

Monitoring Event One:

The Discharger is required to perform the first monitoring event within 12 to 24 hours of the first storm event that yields two inches of rain or greater within a 24-hour period.

Monitoring Events Two and Three:

The Discharger is required to perform the next two monitoring events within 12 to 24 hours of the next two storm events (one monitoring event each storm) that yield two inches of rain or greater within a 24-hour period and soil saturation after the start of the winter period on October 15.

Years 2-5 – In years two through five, following completion of timber harvest operations and a determination by the Water Board's Executive Officer that implemented management practices are functioning to protect water quality and beneficial uses (as documented by information contained in the annual report and post-harvest inspection conducted by Water Board staff), visual monitoring

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shall be implemented according to the Road Management Program developed by the Discharger and approved by the Water Board's Executive Officer (example attached in Exhibit 3, Big Creek Road Inventory Program).

It is your responsibility to schedule a post-harvest inspection with Water Board staff. You may call to schedule an inspection no sooner than 10 months after the timber harvest plan is complete.

Important Note: You may not begin Year Two monitoring until you are directed to do so in writing by the Water Board's Executive Officer.

If implemented management practices are not adequately protecting water quality and beneficial uses, as determined by the Water Board's Executive Officer, the Discharger is required to repeat "Year One" monitoring. In addition to supplementary monitoring, the Water Board's Executive Officer will determine additional management measure implementation required.

Summary of Visual Monitoring Frequency:

"Year One": minimum of three events
Year Two – Five: consistent with the Road Management Program developed by the Discharger and approved by the Water Board's Executive Officer.

PHOTO-MONITORING

PHOTO-MONITORING POINTS: Photo-monitoring points shall be at locations within the timber harvest plan area where timber harvest activities have the greatest risk of potential discharge (sites may be established by the Water Board's Executive Officer during or after the pre-harvest inspection). Photo-monitoring points must include **sites** up and down stream of each newly constructed or reconstructed Class I and Class II watercourse crossings and landings within a Class I or II Watercourse or Lake Protection Zone (WLPZ). Monitoring photos need to be of sufficient quality to record the effectiveness of the implemented management practice.

The Discharger must:

- i. Utilize the attached document titled "Standard Operation Procedure 5.2.3 - Photo Documentation Procedure" (including any subsequent revisions to SOP 5.2.3) as the protocol for all photo-monitoring (attached in Exhibit 3).
- ii. Utilize flagging, rebar, or another method of establishing the photo-monitoring point site locations.

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- iii. Utilize all photo-monitoring point locations until this Monitoring and Reporting Program is revised or rescinded.

PHOTO-MONITORING FREQUENCY: The Discharger is required to monitor all photo-monitoring points established by the Water Board's Executive Officer during or after the pre-harvest inspection.

"Year One" - You are required to photo-monitor according to the following four conditions during "Year One" monitoring.

- Prior to the onset of timber harvest operations as baseline monitoring. (One Photo Set)
- Following the first significant storm event (First Storm) (One Photo Set).
- Following completion of timber harvest activities (One Photo Set).
- Following a significant storm event during the month of April (April Storm) (One Photo Set). A significant storm event means any storm with two inches of rain or greater within a 24-hour period and soil saturation (i.e., soil saturation typically occurs after a minimum of four inches of precipitation after the start of the winter period on October 15).

Additionally, the Discharger shall photograph new or reconstructed Class I and Class II water crossings:

- Before construction begins, after construction is completed, and after the crossing structure is removed (if crossing is temporary).

You are required to conduct photo-monitoring within seven days of all of the following:

1. The first storm.
2. Completion of timber harvest activities.
3. April storm events. If no significant storm event occurs in the month of April, the Discharger must complete photo-monitoring by April 30 of the same year.

Years 2 and 5 - In years two and five, following completion of timber harvest operations and a determination by the Water Board's Executive Officer that implemented management practices are functioning to protect water quality and beneficial uses (as documented by information contained in the annual report and a post-harvest inspection conducted by Water Board staff), the Discharger must conduct the April storm photo-monitoring.

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It is your responsibility to schedule a post-harvest inspection with Water Board staff. You may call to schedule an inspection no sooner than 10 months after the timber harvest plan is complete.

Important Note: You may not begin Year Two monitoring until you are directed to do so in writing by the Water Board's Executive Officer.

If implemented management practices are not adequately protecting water quality and beneficial uses, as determined by the Water Board's Executive Officer, the Discharger must repeat "Year One" monitoring. In addition to supplementary monitoring, the Water Board's Executive Officer will determine additional management measure implementation required.

Summary of Photo-monitoring Frequency:

"Year One": 2 photo sets (minimum)
Year Two: 1 photo set
Year Five: 1 photo set

TEMPERATURE MONITORING

TEMPERATURE MONITORING POINTS: The Discharger is required to monitor temperature continuously as prescribed in the document Central Coast Regional Water Quality Control Board, Timber Harvest Program, Standard Operating Procedures for Continuous Temperature Monitoring (April 2006) (attached in Exhibit 3) during the months of May 1 through October 15. Monitoring sites will be established by the Water Board's Executive Officer during or after the pre-harvest inspection. Continuous water temperature monitoring is required.

If no Class I watercourse exists on the parcel where timber harvest activities occur, and there is water in the Class II during the months of May 1 through October 15, the Discharger is required to conduct temperature monitoring in the Class II watercourse.

TEMPERATURE MONITORING FREQUENCY: The Discharger is required to monitor all temperature monitoring points.

"Year One" - The Discharger is required to program data loggers to record point measurements every hour during the months of May 1 through October 15 at all established temperature monitoring points.

Years Two and Five - In years two and five, following completion of timber harvest operations and a determination by the Water Board's Executive Officer (as documented by information contained in the annual report and a post-harvest

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inspection conducted by Water Board staff) that implemented management practices are functioning to protect water quality and beneficial uses, the Discharger is required to program data loggers to record point measurements every hour during the months of May 1 through October 15 at all established temperature monitoring points.

It is your responsibility to schedule a post-harvest inspection with Water Board staff. You may call to schedule an inspection no sooner than 10 months after the timber harvest plan is complete.

Important Note: You may not begin Year Two monitoring until you are directed to do so in writing by the Water Board's Executive Officer.

If implemented management practices are not adequately protecting water quality and beneficial uses, as determined by the Water Board's Executive Officer, the Discharger shall **repeat "Year One" monitoring**. In addition to supplementary monitoring, the Water Board's Executive Officer will specify any additional required management measures.

Summary of Temperature Data Sets:

"Year One": 1 data set
Year Two: 1 data set
Year Five: 1 data set

TURBIDITY MONITORING

TURBIDITY MONITORING POINTS: The Discharger is required to monitor turbidity as prescribed for storm event-based turbidity monitoring and forensic monitoring consistent with the requirements in the document Central Coast Regional Water Quality Control Board, Timber Harvest Program, Standard Operating Procedures for Instream Turbidity Monitoring (October 2006) (attached in Exhibit 3). The Discharger is required to monitor all newly constructed or reconstructed Class I and II crossings within the timber harvest plan area in place after October 15 for turbidity (a hand held turbidimeter is acceptable for this purpose). The Discharger is required to measure turbidity approximately 25 feet upstream and downstream of all newly constructed or reconstructed Class I and II road crossings or combination of sites if there is close site proximity (sites may be established by the Water Board's Executive Officer during or after the pre-harvest inspection). The Water Board's Executive Officer may require turbidity monitoring if no newly constructed or reconstructed crossings exist within a proposed timber harvest plan and the plan has activity within a Class I or II WLPZ.

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TURBIDITY MONITORING FREQUENCY: The Discharger is required to monitor turbidity within 12 hours of a storm event which yields two inches or more of rain within a 24-hour period. If a qualifying storm terminates or two inches is reached between the hours of 3:00 pm (1500 hour) and 9:00 pm (2100 hour) you are required to conduct turbidity monitoring within 18 hours.

“Year One” You are required to monitor a minimum of three times over each 12 months during “Year One” monitoring.

Monitoring Event One:

The Discharger is required to perform the first monitoring event within 12 hours of the first storm event that yields two inches of rain or greater within a 24 hour period.

Monitoring Events Two and Three:

The Discharger is required to perform the next two monitoring events within 12 hours of the next two storm events (one monitoring event each storm) that include two inches of rain or greater within a 24 hour period and soil saturation after the start of the winter period on October 15.

Years 2-5 - In years two through five, following completion of timber harvest operations and a determination by the Water Board’s Executive Officer (as documented by information contained in the annual report and a post-harvest inspection conducted by Water Board staff) that implemented management practices are functioning to protect water quality and beneficial uses, the Discharger is required to conduct turbidity monitoring based on need as determined by forensic monitoring.

It is your responsibility to schedule a post-harvest inspection with Water Board staff. You may call to schedule an inspection no sooner than 10 months after the timber harvest plan is complete.

Important Note: You may not begin Year Two monitoring until you are directed to do so in writing by the Water Board’s Executive Officer.

If implemented management practices are not adequately protecting water quality and beneficial uses, as determined by the Water Board’s Executive Officer, the Discharger will be required to **repeat “Year One” monitoring**. In addition to supplementary monitoring, the Water Board’s Executive Officer will specify additional required management measures.

Summary of Turbidity Data Sets:

“Year One”: 1 data set (minimum of three events)
Year Two – Five: as needed based on forensic monitoring.

FORENSIC MONITORING

1. If at any time during implementation or effectiveness monitoring, the Discharger observes failed management measures and/or source of discharge, the Discharger is required to conduct forensic monitoring to identify the source. Management measure failure is defined as: 1) whenever an implemented management measure creates a condition of pollution, contamination, or condition of nuisance, as defined by CWC Section 13050, or 2) when lack of implementation of a necessary management measure creates a condition of pollution, contamination, or condition of nuisance, as defined by CWC Section 13050.
2. If management measures fail (this includes failure to implement appropriate management measures as determined by CDF and documented by CDF as a violation of the Forest Practice Rules) the Discharger is required to photo² document them and is required to implement management practices immediately to prevent discharge and impacts to water quality.
3. If timber activities cause a discharge (sediment, soil, other organic material, etc.) into waters of the State, the Discharger is required to measure in-stream turbidity (using grab samples) at the point of discharge into waters of the state. If there is a discharge into a Class III watercourse and water is no longer flowing, the Discharger is required to measure in-stream turbidity in the closest Class I or Class II watercourse downstream of the discharge.
4. If at any time during implementation or effectiveness monitoring, the Discharger observes a discharge (sediment, soil, other organic material, herbicides, pesticides, fluids from timber equipment (oil, hydraulic fluid, etc), etc.), the Discharger is required to notify the Water Board within 24 hours.
5. The Discharger is required to submit to the Water Board a written report, including photo documentation, water quality data, and the management measures or corrective actions and a description of their effectiveness within 10 working days. Upon review of the report, the Water Board's Executive Officer will determine completeness of the report and the need for additional actions necessary for the protection of water quality and beneficial uses.

FORENSIC MONITORING AREAS OF CONCERN: The following areas must be addressed during forensic monitoring if water diversion, feral pig activity, or trespass activity are causing or threatening to cause impacts to water quality.

² Monitoring photos need to be of sufficient quality to record the effectiveness of the implemented management practice.

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Water Diversion: The Discharger is required to monitor the water diversion point(s) for total daily water usage when water is being diverted. The Discharger is required to monitor the creek to ensure no more than 10% of the creek flow is diverted.

Feral Pig Activity: During any inspection, the Discharger is required to document all evidence of feral pig activity near watercourses that may be contributing discharges to waters of the state. The Discharger must address the feral pig activity according to forensic monitoring requirements described in 1 – 5 above.

Trespass Activity: During any inspection, the Discharger is required to document all evidence of trespass activity near watercourses that may be contributing discharges to waters of the state. The Discharger must address the trespass activity according to forensic monitoring requirements described in 1 – 5 above.

FORENSIC MONITORING FREQUENCY: The frequency of Forensic Monitoring is coincident with implementation and effectiveness monitoring, or at any time a failed management measure and/or discharge is reported or observed.

SECTION II - DATA LOGGING AND REPORTING

LOGBOOKS: The Discharger is required to maintain logbooks for recording all visual and water analysis data. Logbooks are required to include documentation of maintenance and repair of management practices. These logbooks must be available for inspection to the Water Board staff.

HEALTH AND SAFETY: The Discharger is responsible for ensuring that all monitoring is done in a safe manner. If any monitoring point is too dangerous to sample, then the Discharger is required to report this circumstance to the Water Board within 48 hours.

ROAD MANAGEMENT PROGRAM: The Discharger is required to develop and implement a Roads Management Program (example attached in Exhibit 3, Big Creek Road Inventory Program) within the NTMP area. Prior to implementation, the road management program must be approved by the Water Board's Executive Officer. After each storm event that triggers an inspection, the Discharger is required to perform a field inspection and prepare a field form as described in the protocol for the road management program. The Discharger is required to enter the data into a logbook (same as described in item a. above) and database or spreadsheet which tracks observations, work completed, and dates of last review. If the need for repair is immediate, the Discharger is required to promptly develop an appropriate treatment so that the Discharger can complete corrective action as soon as practical.

SEDIMENT RELEASE REPORTING: The Discharger is required to report to the Water Board within 48 hours whenever at least one cubic yard of soil is released to a waterway due to anthropogenic causes or at least five cubic yards of soil is released to a waterway due to natural causes, or when turbidity is noticeably greater downstream compared to upstream (of a crossing or the Plan area). The Discharger is required to submit a written report to the Water Board within 10 days of detection. The Discharger is required to investigate source areas of sediment. If sources are found, the Discharger will locate and document the source and size of the release. If sources related to timber harvest activities are found, the Discharger is required to immediately correct the source if possible, or schedule corrective action at an appropriate time given the site conditions.

VIOLATION REPORTING: The Discharger is required to report any violation of the Forest Practice Rules, to the Water Board within 48 hours. The Discharger is required to provide the report in writing to the Water Board within 10 working days of the violation. The written report must include photo documentation and water quality data (if discharge enters waters of the state) before and after remedial action. Upon review of the report, the Water Board's Executive Officer will determine completeness of the report and the need for additional actions

necessary for the protection of water quality and beneficial uses. The Discharger is required to complete any additional monitoring the Water Board's Executive Officer determines is necessary.

ANNUAL REPORTING: By November 15 of each year, the Discharger is required to submit an Annual Report to the Water Board using the template that can be downloaded from:

<http://www.waterboards.ca.gov/centralcoast/Facilities/TimberHarvest/index.htm>

Under "Monitoring and Reporting" click on "Annual Report Template." In addition to the reporting requirements already set forth in the MRP, the annual report must address each of the following³:

Annual Reports must include all of the following:

General

- ❖ The name and address of the person submitting the report as well as the day, month, and year in which the report is being submitted at the top of the first page.
- ❖ The subject line of the annual report must state the NTMP number, three-letter county code, plan name as it appears in the approved NTMP, NTO number, and specific units within the NTMP that have been enrolled under the General Waiver.
- ❖ Time period during which the data was collected.
- ❖ List Tier level and summarize the monitoring requirements.
- ❖ A status of active timber harvest operations including:
 - Day, month, and year the harvest opened and closed for the season.
 - Previous year activities (types of activities, locations, percent harvested, area of harvest, and extent of overall plan completion)
 - Planned activities including estimated month and year harvests activities must resume.
 - Estimated month and year harvesting will be completed.
 - Wet weather problems observed
 - Any other critical information
- ❖ A summary of all violations. If there were no violations, please state it as such.
- ❖ Detailed documentation of rainfall measurement procedures and locations or a reference to the page number in the NTMP where this is described.

³ Portions of these requirements and sections of the template may not apply to your specific MRP (e.g. If your MRP does not require temperature monitoring, the temperature monitoring requirements should be ignored).

- Describe the type of rain gauge(s) used. If applicable include the link to the Web site where data for the rain gauge may be viewed.
- ❖ With the first annual report, a copy of the road management program.
 - A summary of the road management program⁴ and actions implemented for the protection of water quality and beneficial uses.
 - ❖ Recommendations for improving the monitoring and reporting program.

Water Quality Monitoring (if required)

- ❖ A summary of the water quality monitoring performed during the previous year. Any monitoring described in the summary must also include an electronic submittal of the data.
- ❖ A detailed map with the following specifications:
 - In color (if possible).
 - Title stating: "Water Quality Monitoring Locations for NTMP No. XXXX"
 - All monitoring locations and routes clearly marked with unique site identification tags.
 - A Key or Legend identifying all monitoring locations and routes.
 - North Arrow.
 - Scale

Visual Monitoring

- ❖ *A summary of all visual monitoring activities performed during the previous year.*
 - Summary must include dates and times visual monitoring occurred and any corrective actions taken during inspections.
 - Attach inspection forms or copies of logbook pages detailing inspections.

Photo-monitoring (if required)

- ❖ Submittal of all data and photos in electronic format.

⁴ Big Creek's Road Inventory Program may be used as a model.

Turbidity Monitoring (if required)

- ❖ All data submitted electronic format compatible with Excel.
- ❖ Make and model of turbidimeter being used.
 - Copy of the manufacture's protocol / recommendation for proper use of the turbidimeter.
- ❖ A summary of all turbidity monitoring activities performed during the previous year.
- ❖ Completed Field Data Sheet with data from all monitoring events. (if more than four events, there is no need to complete top section on additional pages)

Continuous Temperature Monitoring (if required)

- ❖ All data submitted electronically in Excel format.
- ❖ Make and model of the data loggers being used at each monitoring location.
 - Copy of the manufacture's protocol / recommendation for proper use of the loggers.
- ❖ Calibration check form for each data logger.
- ❖ Description of any modifications or adjustments made based on the calibration checks and field observations.

SECTION III - STANDARD PROVISIONS

1. The Water Board shall be allowed:
 - a. Entry upon premises where timber harvest activities occur;
 - b. Access to copy any records that must be kept under the conditions of these requirements;
 - c. To inspect any timber harvest activity, equipment (including monitoring and control equipment), practices, or operations regulated or required under these requirements; and,
 - d. To photograph, sample, and monitor for the purpose of showing timber harvest requirements compliance.
2. The Discharger is required to maintain records of all monitoring information and results. Records must be maintained for a minimum of three years after the MRP is rescinded. This period may be extended during the course of any unresolved litigation or when requested by the Water Board.
3. Any person signing a report must make the following certification:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

The Water Board's Executive Officer may modify or rescind this Monitoring and Reporting Program at any time, or may modify or rescind the monitoring and reporting program as to a specific Discharger. Any such modification or rescission must comply with California Water Code section 13269 or 13267.

Roger W. Briggs, Executive Officer

Date

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Exhibits:

Exhibit 1

Big Creek Road Inventory Program

Standard Operating Procedure 5.2.3 Photo Documentation Procedure

Standard Operating Procedures Continuous Temperature Monitoring

Standard Operating Procedures Instream Turbidity Monitoring

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Exhibit 1

Big Creek Road Inventory Program

Standard Operating Procedure 5.2.3
Photo Documentation Procedure

Standard Operating Procedures
Continuous Temperature Monitoring

Standard Operating Procedures
Instream Turbidity Monitoring

BIG CREEK ROAD INVENTORY PROGRAM (BCRIP)
PROTOCOL FOR CONDUCTING COMPANY ROAD
INVENTORIES & MAINTENANCE

Purpose

Big Creek Lumber Company owns and controls over 11,000 acres of forestlands on which there are over 60 miles of permanent, temporary, surfaced, and un-surfaced roads. Maintenance of these roads requires frequent monitoring and treatment.

This document has been drafted to provide the standard operating procedures for conducting and recording road inventories and for the use of the inventory to direct appropriate treatments. This protocol has been drafted so as to guide road inventories consistent with Big Creek goals & objectives and with the certification of Big Creek's lands with the Forest Stewardship Council (FSC).

Process of Road Inventory

Big Creek conducts road inventories on varying intervals, depending upon (1) the designated use of the road, (2) the intensity and duration of precipitation received, (3) the hydrologic activity of the stream system in the area, (4) the susceptibility of the road and appurtenant crossings to failure or damage, and (5) the interval of time since that portion of road was used.

On properties where there has been recent activity or road use, especially if road drainage was altered or improved, review of the roads is conducted more frequently. For each portion of road, Big Creek has designated a standard interval of 2 inches of rain per storm event as the cue to send out maintenance crews. The 2" standard interval is subject to change based on the relationship between the five factors listed above.

When indicated by the interval period, or when deemed necessary otherwise, an individual or group of persons will review the portion of road. Road inventory may be conducted on foot, by pickup, or (especially in wet periods) by ATV or other light-tracking vehicle. While conducting the inventory, the person or persons will do handwork, where necessary, to clear and improve drainage structures and culverts.

Each instance a portion of road is inventoried, a form is filled out recording the observations of the person (see Appendix B, Road Inventory Form). This form allows the person to record the location, date, problem, and proposed solution. This form is then submitted to the Chief Forester of Operations (CFO).

After the road inventory form is completed, it is entered into the roads inventory database (a spreadsheet which tracks observations, work completed, and dates of last review for a portion of road).

If the need for repair or maintenance is immediate, the road reviewer will immediately notify the Chief Forester of Operations so that an appropriate treatment may be planned and initiated. All road inventory forms submitted to the CFO are reviewed, and potentially urgent problems are further analyzed to determine if immediate treatment is necessary. When immediate treatment is prescribed, the project is listed with indication of urgency on a dry erase board posted in the Big Creek Forestry Office. As soon as resources are available to conduct the treatment operations, the necessary equipment, materials, and personnel are dispatched to the site.

After the site is treated, the CFO or the CFO's designee will review the site to determine the success of the treatment. This site, at an interval dependent upon the treatment, will be reviewed over time to evaluate success of treatment and to determine if follow-up treatment is necessary.

For sites that do not require immediate treatment, the records for that site will not be further reviewed until the biennial summary of roads is prepared (May 1 and November 1 of every year). At these times corresponding to the approximate end and beginning, respectively, of the winter period, the latest records for each property are reviewed and responsibility for appropriate treatments are delegated. Subsequent evaluation of the treatment's success is conducted, and follow-up treatment prescribed, if necessary.

ELEMENTS OF THE FIVE FACTORS THAT DETERMINE INSPECTION TRIGGERS FOR THE BCRIP:

Watershed:

- Threatened and Impaired
- 303 (D) Listed Stream Segments
- Sub-division/home proximity to project area
- Orographic effect:
 - South county vs. North county
 - Project elevation, low vs. high in the watershed
 - Road conditions outside of project area that contribute or receive flow
 - Watercourse classifications for project area

Porosity:

- Fast vs. slow
- Soil type - sandstone/shale/granite
- High vs. low rock content
- Ground saturation point/springs begin to flow at higher rates

Topography:

- Steep/flat/undulating
- Indication of instabilities/ tipped trees/earth fractures/slides
- Proximity to San Andreas Fault

Vegetative Cover Type:

- Brush/oak woodland/conifer
- General vegetative cover

General Elements Associated with Infrastructure:

- Age of road:
 - Older vs. newer road/existing leaf cover/general vegetation cover
- History:
 - Legacy problems/old humboldt crossings
 - Who designed and implemented the existing road/crossings
 - Past performance and condition of general infrastructure
- Location of road:
 - Ridge top/steep ground/proximity to watercourse/roads on unstable areas
- Road surfacing:
 - Rocked/ based/seeded/straw mulched/slash packed/un-surfaced
- Road Standard:
 - Insloped/outloped/crowned/re-contoured:
 - Spittler outslope of new roads
 - Full bench road cut/balanced cut and fill/fill
 - Through cuts/long run of through cut
 - Berms on outside edge of road
 - Seasonal/all winter road
- Type of drainage and crossings:
 - Waterbars/rolling dips/bridges/culverts/rocked fords
 - Current condition of erosion control structures/How much do you think they can handle
- Trespass
 - 4WD/motorcycles/mountain bikes/horses/foot traffic
- Watercourse crossing location and frequency
- Gopher holes
- Pig wallows/rooting
- PG&E access road
- EHR rating in THP

Weather:

- Interval of time since the last rain event
- Type of rain year/El nino/are storms holding more rain
- Jet stream status
 - High pressure or low pressure

Wind direction:

- South East - Strong high pressure
- South - Storm medium pressure
- Southwest - Storm low pressure
- East/Southeast - Strong extreme low pressure
- West - Clearing

Check the barometer

Soaking, low intensity, rain vs. hard, high intensity, rain

General weather patterns

Trigger Assessment Tools:

Weather radio

Barometer

Local contacts:

- Forest landowners

Local news forecasts

Tell tail locations:

- Creek mouths open to the ocean

- General overland flow

- Bridge crossings of major rivets/streams/creeks throughout the county

- Etc...

State wide contacts

- Other foresters and forestry companies

California News:

- Moving uphill vs. downhill

Weather web sites (rainfall, stream flow, satellite imagery, forecasts, flood warnings, etc...):

<http://www.wrh.noaa.gov/mtr/>

<http://www.goes.noaa.gov/>

http://water.usgs.gov/cgi-bin/waterwatch?map_type=real&state=ca

<http://cdec.water.ca.gov/misc/realStations.html>

http://www.weather.com/maps/maptype/satelliteworld/pacificoceansatellite_large_animated.html?

<http://www.wrh.noaa.gov/mtr/gettext.php?pil=RR5&sid=RSA>

<http://www.surflife.com/home/index.cfm>

<http://weather.cnn.com/weather/forecast.jsp?locCode=SRU>

OWNERSHIP:

NAME(S):

DATE:

LOCATION:	
PROBLEM:	
CODES	
SOLUTION:	
CODES	
LOCATION:	
PROBLEM:	
CODES	
SOLUTION:	
CODES	

PROBLEM	
Cut-Bank Failure	1
Fill-Slope Failure	2
Water Bar Failure	3
Fill Failure	4
Drainage Problem	5
Cracks/Settling	6
Plugged Culvert	7
Wash-Out	8
Slide Debris/Flow	9
Trees Blocking Road	10

SOLUTION	
Replace	A
Reconstruct	B
Drain	C
Resurface	D
Remove	E
Cover	F
Mechanical	M
Hand Work	H
Temporary	T
Permanent	P

Standard Operating Procedure 5.2.3

Photo Documentation Procedure

Introduction:

Photographs provide a qualitative, and potentially semi-quantitative, record of conditions in a watershed or on a water body. Photographs can be used to document general conditions on a reach of a stream during a stream walk, pollution events or other impacts, assess resource conditions over time, or can be used to document temporal progress for restoration efforts or other projects designed to benefit water quality. Photographic technology is available to anyone and it does not require a large degree of training or expensive equipment. Photos can be used in reports, presentations, or uploaded onto a computer website or GIS program. This approach is useful in providing a visual portrait of water resources to those who may never have the opportunity to actually visit a monitoring site.

Equipment:

Use the same camera to the extent possible for each photo throughout the duration of the project. Either 35 mm color or digital color cameras are recommended, accompanied by a telephoto lens. If you must change cameras during the program, replace the original camera with a similar one comparable in terms of media (digital vs. 35 mm) and other characteristics. A complete equipment list is suggested as follows:

Required:

- Camera and backup camera
- Folder with copies of previous photos (do not carry original photos in the field)
- Topographic and/or road map
- Aerial photos if available
- Compass
- Timepiece
- Extra film or digital disk capacity (whichever is applicable)
- Extra batteries for camera (if applicable)
- Photo-log data sheets or, alternatively, a bound notebook dedicated to the project.
- Yellow photo sign form and black marker, or, alternatively, a small black board and chalk

Optional:

- GPS unit
- Stadia rod (for scale on landscape shots)
- Ruler (for scale on close up views of streams and vegetation)

Some safety concerns that may be encountered during the survey include, but are not limited to:

- Inclement weather
- Flood conditions, fast flowing water, or very cold water
- Poisonous plants (e.g.: poison oak)
- Dangerous insects and animals (e.g.: bees, rattlesnakes, range animals such as cattle, etc.)
- Harmful or hazardous trash (e.g.: broken glass, hypodermic needles, human feces)

We recommend that the volunteer coordinator or leader discuss the potential hazards with all volunteers prior to any fieldwork.

General Instructions:

From the inception of any photo documentation project until it is completed, always take each photo from the same position (photo point), and at the same bearing and vertical angle at that photo point. Photo point positions should be thoroughly documented, including photographs taken of the photo point. Refer to copies of previous photos when arriving at the photo point. Try to maintain a level (horizontal) camera view unless the terrain is sloped. (If the photo can not be horizontal due to the slope, then record the angle for that photo.) When photo points are first being selected, consider the type of project (meadow or stream restoration, vegetation management for fire control, ambient or event monitoring as part of a stream walk, etc.) and refer to the guidance listed on *Suggestions for Photo Points by Type of Project*.

When taking photographs, try to include landscape features that are unlikely to change over several years (buildings, other structures, and landscape features such as peaks, rock outcrops, large trees, etc.) so that repeat photos will be easy to position. Lighting is, of course, a key ingredient so give consideration to the angle of light, cloud cover, background, shadows, and contrasts. Close view photographs taken from the north (i.e., facing south) will minimize shadows. Medium and long view photos are best shot with the sun at the photographer's back. Some artistic expression is encouraged as some photos may be used on websites and in slide shows (early morning and late evening shots may be useful for this purpose). Seasonal changes can be used to advantage as foliage, stream flow, cloud cover, and site access fluctuate. It is often important to include a ruler, stadia rod, person, farm animal, or automobile in photos to convey the scale of the image. Of particular concern is the angle from which the photo is taken. Oftentimes an overhead or elevated shot from a bridge, cliff, peak, tree, etc. will be instrumental in conveying the full dimensions of the project. Of most importance overall, however, is being aware of the goal(s) of the project and capturing images that clearly demonstrate progress towards achieving those goal(s). Again, reference to *Suggestions for Photo Points by Type of Project* may be helpful.

If possible, try to include a black board or yellow photo sign in the view, marked at a minimum with the location, subject, time and date of the photograph. A blank photo sign form is included in this document.

- marker post) then have an alternate method (map, aerial photo, copy of an original photograph of the photo-point, etc).
2. Select an existing structure or landmark (mailbox, telephone pole, benchmark, large rock, etc.), identify its latitude and longitude, and choose (and record for future use) the permanent position of the photographer relative to that landmark. Alternatively, choose the procedure described in *Monitoring California's Annual Rangeland Vegetation* (UC/DANR Leaflet 21486, Dec. 1990). This procedure involves placing a permanently marked steel fence post to establish the position of the photographer.
 3. For restoration, fuel reduction, and BMP projects, photograph the photo-points and carry copies of those photographs on subsequent field visits.

Determining the Compass Bearing:

1. Select and record the permanent magnetic bearing of the photo center view. You can also record the true compass bearing (corrected for declination) but do not substitute this for the magnetic bearing. Include a prominent landmark in a set position within the view. If possible, have an assistant stand at a fixed distance from both the photographer and the center of the view, holding a stadia rod if available, within the view of the camera; preferably position the stadia rod on one established, consistent side of the view for each photo (right or left side).
2. Alternatively, use the procedure described in *Monitoring California's Annual Rangeland Vegetation* (UC/DANR Leaflet 21486, Dec. 1990). This procedure involves placing a permanently marked steel fence post to establish the position of the focal point (photo center).
3. When performing ambient or event photo monitoring, and when a compass is not available, then refer to a map and record the approximate bearing as north, south, east or west.

Suggestions for Photo Points by Type of Project:

Ambient or Event Monitoring, Including Photography Associated with Narrative Visual Assessments:

1. When first beginning an ambient monitoring program take representative long and/or medium view photos of stream reaches and segments of shoreline being monitored. Show the positions of these photos on a map, preferably on the stream/shore walk form. Subjects to be photographed include a representative view of the stream or shore condition at the beginning and ending positions of the segment being monitored, storm drain outfalls, confluence of tributaries, structures (e.g., bridges, dams, pipelines, etc.).
2. If possible, take a close view photograph of the substrate (streambed), algae, or submerged aquatic vegetation.

4. Long view and medium view of streambed changes (thalweg, gravel, meanders, etc.)
5. Medium and close views of structures, plantings, etc. intended to induce these changes.
6. Optional: Use a tape set perpendicular across the stream channel at fixed points and include this tape in your photos described in 3 and 4 above. For specific procedures refer to Harrelson, Cheryl C., C.L. Rawlins, and John P. Potyondy, *Stream Channel Reference Sites: An Illustrated Guide to Field Techniques*, United States Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, General Technical Report RM-245.

Vegetation Management for Fire Prevention ("fuel reduction"):

1. Aerial view (satellite or airplane photography) if available.
2. In the absence of an aerial view, a landscape; long view showing all or representative sections of the project (bluff, bridge, etc.)
3. Long view (wide angle if possible) showing the project area or areas. Preferably these long views should be from an elevated vantage point.
4. Medium view photos showing examples of vegetation changes, and plantings if included in the project. It is recommended that a person (preferably holding a stadia rod) be included in the view for scale
5. To the extent possible include medium and long view photos that include adjacent stream channels.

Stream-Sediment Load or Erosion Monitoring:

1. Long views from bridge or other elevated position.
2. Medium views of bars and banks, with a person (preferably holding a stadia rod) in view for scale.
3. Close views of streambed with ruler or other common object in the view for scale.
4. Time series: Photograph during the dry season (low flow) once per year or after a significant flood event when streambed is visible. The flood events may be episodic in the south and seasonal in the north.

PHOTO- LOG FORM

Project:

Location:

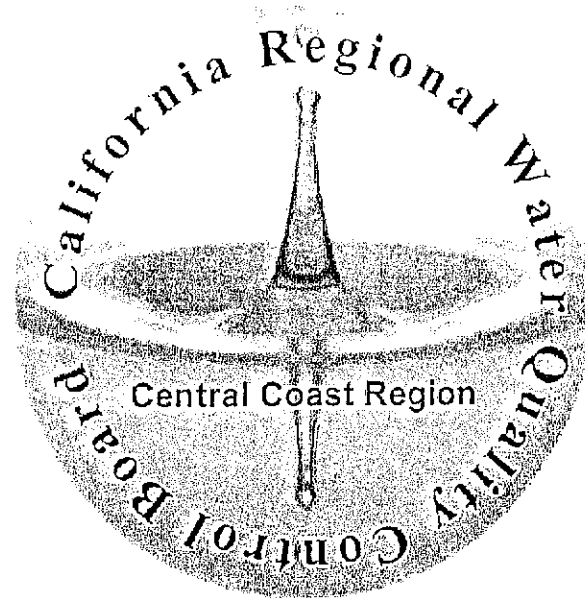
Date:

Photographer:

Team members:

Photo #	Time	Photo Point ID	Photo Pt. Description & Location	Bearing to Subject	Subject Description

General Notes or Comments (weather, cloud cover, time of sunrise and sunset, other pertinent information):



Timber Harvest Program
Standard Operating Procedures
Continuous Temperature Monitoring

April 2006

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Purpose

This document provides standard operating procedures for continuous temperature monitoring on forest streams pursuant to the General Conditional Waiver of Waste Discharge Requirements – Timber Harvest Activities in the Central Coast Region (General Waiver). These procedures, when followed correctly, will support the collection of continuous temperature data. The data will be used for trend analysis and to determine compliance with Monitoring and Reporting Program R3-2005-0066.

Monitoring Season

Monitoring shall begin at the onset of timber harvest operations (i.e. tree falling, yarding, and / or roadwork, etc.) and shall be consistent with the Monitoring and Reporting Program (MRP), any conditions set forth within the waiver or waste discharge requirements, and the procedures outlined in this document. Monitoring shall continue as specified in the MRP until it is revised or rescinded.

Continuous Temperature Monitoring occurs for the five and a half month period starting May 1 and ending October 15, at all temperature monitoring locations established in the MRP. If a site becomes dry at any point during the monitoring season, the logger shall be relocated further downstream where monitoring can continue. Relocation of the logger must be documented.

If timber harvest operations commence during the period of October 16 through April 30, temperature monitoring shall begin the subsequent May 1. If timber harvest operations commence during the period of May 1 through October 15, temperature monitoring shall begin and continue the day operations begin until October 15 of that same year. Temperature monitoring shall then continue in the subsequent years as prescribed in the MRP.

Calibration Checks

Calibration checks shall be conducted on the data loggers at three separate times during the monitoring season: 1) prior to logger deployment 2) at mid-season data collection 3) at the end of the monitoring season. Calibration check One shall be conducted as described for the two bath tests (below). Calibration checks Two and Three will be conducted against a stream temperature thermometer¹ reading in the field, as described in the mid-season data collection and logger calibration section. Calibration checks are used to document logger performance and accuracy. This provides assurance of the quality of data being collected and reported. Calibration events Two and Three shall occur shortly after sampling results have been downloaded and backed up. Always download data according to the manufacture's instructions. Results of the calibrations must be documented on the calibration check form,² the form must be kept with your logbook.

The following bath tests shall be conducted at least once per year, prior to deployment of your logger for the monitoring season, to determine its accuracy. Each logger shall be assigned a unique temperature logger ID number. The calibration check form shall include fields to record the calibration check results for each data logger. The loggers, utilized for continuous temperature monitoring must be specified for full submersion, outdoor freshwater stream temperature monitoring. The logger must also be designed to withstand the environmental conditions it will be subjected to over the full duration of the monitoring season.

¹ All references to a thermometer in this document call for the use of a Certified Reference Thermometer or one certified by the National Institute of Standards and Technology that is designed for total immersion.

² Available at the Water Board's website or upon request to Water Board staff.

Data Logger Ice Bath

This test will allow you to determine the accuracy of your data logger at its lower range.

Place crushed ice in an insulated container that is large enough to hold the loggers that you are testing. It is important to crush the ice to maintain as consistent and uniform a temperature as possible. Fill the container with water to just below the level of the ice and stir the mixture around. Submerge the loggers that you are testing. Place the entire container in a refrigerator to minimize temperature gradients. Allow enough time for the logger to acclimate; at least ten minutes. The ice will melt slowly, so the actual temperature should settle around 0°C if the ice bath was prepared correctly. Place a thermometer in the bath to confirm the temperature against your logger's reading. Allow the logger to collect at least five readings before removing it from the bath. Check the reading of your logger to confirm that the five readings are within the acceptable accuracy range reported by the manufacturer at 0°C. Record the calibration check on your calibration check form.

Room Temperature Bath

This test will allow you to determine the accuracy of your data logger at its higher range.

Fill an insulated container that is large enough to hold the loggers that you are testing with water. Place the open container in a room overnight that has constant air temperature at the higher end of the loggers temperature range. Submerge the loggers that you are testing. Allow enough time for the logger to acclimate; at least ten minutes. Place a thermometer in the bath to confirm the temperature against your logger's reading. Allow the logger to collect at least five readings before removing it from the bath. Check the reading of your logger to confirm that the five readings are within the acceptable accuracy range reported by the manufacturer at the upper end of the loggers temperature range. Record the calibration check on your calibration check form.

Note: Water used to make the ice and fill the containers for the bath tests may be tap water or bottled water. Salt water may not be used.

Deployment Procedure

All loggers must be deployed at the temperature monitoring locations identified in your MRP. Only those loggers that pass the calibration check requirements may be programmed for deployment. Prior to deployment, follow the manufacture's instructions for programming the logger for a delayed start and set the logger to record point measurements every hour. All loggers and other monitoring equipment should be kept clean, stored in protective cases during transportation, and protected from extreme temperatures. Prior to programming the temperature logger, both the computer clock and the watch used to record deployment times shall be synchronized. You must also confirm that the date and time modes of the logger are functioning properly.

During the deployment process, all field data including station number, station name, temperature logger ID numbers, and calibration results must be recorded. All monitoring stations must have a unique site identification number and / or name. A sketch and description of the logger locations that notes a landmark reference point, such as a unique rock, log, root, or tree should also be recorded. In addition, a picture of the water temperate logger location including a landmark should be taken to help relocate the logger in the future.

The most important aspect of logger deployment is to find a location in the stream that is safe to get to and where representative stream temperature data may be obtained during lower flows. The logger should be placed to avoid direct sunlight. In small streams, loggers should be installed as close to the thalweg³ as possible and six inches off the stream bottom. In large streams, areas of potential temperature stratification (resulting from eddies, groundwater, and tributaries) need to be avoided. In addition, placing the logger in a 2 -2 ½ foot deep location downstream or alongside a landmark rock or streambed feature improves the chance of it staying submerged during its deployment period and being located for retrieval.

When placing the logger at the sampling point, you must find a method to secure the logger in place for the duration of the monitoring season. Secure a waterproof business card to the logger in a manner that will not inhibit the collection of data. This provides an opportunity for the logger (and the data) to be returned in the event the logger is lost. If the logger will be placed in an area subject to vandalism, you must make accommodations to prevent vandalism. Most manufactures sell products that can camouflage the logger without disrupting its data collection.

Mid-season Data Collection and Logger Calibration

For the safety of the data, data logger manufactures recommend that a logger never be deployed for longer than a three-month period. Mid-season data collection and logger calibration will decrease the chances of losing a full season of temperature data for any one monitoring point. Mid-season data collection and logger calibration shall occur within the last two weeks in July or first two weeks in August. This mid-season check can either be conducted in the field or the loggers may be taken back to the lab for data collection and analysis. Loggers removed from the field to perform the mid-season calibration check must be returned to their monitoring station within four days.

Upon inspection of the site, look for signs of physical disruption of channel conditions; inspect the logger for fouling, corrosion, or damage; perform a battery or power check; clean or service the sensor as needed; and calibrate the logger as described below.⁴

To conduct the mid-season data collection and logger calibration you must begin by checking the stream temperature with a thermometer. Place the thermometer next to the

³ The line defining the lowest points along the length of a riverbed or valley.

⁴ This inspection regime must be repeated when the logger is removed from the field at the end of the monitoring season.

data loggers long enough for it to acclimate and then take the temperature reading. Record the thermometer's temperature reading on the calibration check form. After recording the temperature readings from the thermometer in the stream, remove the data loggers from the stream and download the data either onto a laptop in the field or on your computer in the lab. Check the reading of your logger to confirm that the reading is within the acceptable accuracy range presented by the manufacturer. Any loggers not reading within an acceptable range, found to be damaged, missing, or destroyed, must be replaced immediately with a logger that meets the specifications per these procedures. Spare loggers should be kept on hand for this purpose. Document all findings from the mid-season data collection and logger calibration on the calibration check form.

Reporting Requirements

By November 15 of each year, you must submit an Annual Report to the Central Coast Water Board per the requirements in your MRP. When reporting the temperature data you must include:

- ❖ A summary of the water quality monitoring performed during the previous year.
- ❖ A detailed map with all monitoring locations clearly marked with unique site identification tags.⁵
- ❖ All data submitted electronically in excel format.
- ❖ Make and model of the data loggers being used at each monitoring location.
 - Copy of the manufacture's protocol / recommendation for proper use of the loggers.
- ❖ Calibration check form for each data logger.
- ❖ Description of any modifications or adjustments made based on the calibration checks and field observations.

⁵ The map needs to be submitted once unless monitoring station locations are modified. In the future a map with unique monitoring site tags shall be submitted with the Timber Harvest Information Form and Fact Sheet.

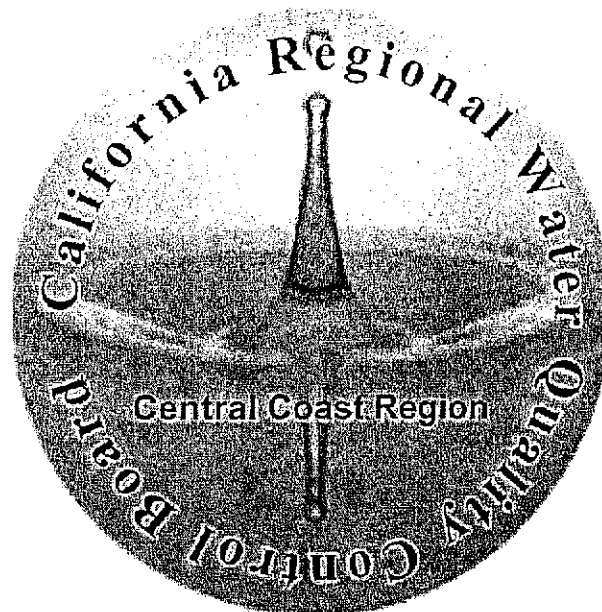
Literature Consulted

Quick Accuracy Check Copyright © 1996-2004 Onset Computer Corporation
<http://www.onsetcomp.com/Support/HS_Support/5317_acc_test.html>

Schuett-Hames D., A.E. Pleus, E. Rashin, and J. Matthews. 1999. *TFW Monitoring Program method manual for the Stream Temperature Survey*. Prepared for the Washington State Department of Natural Resources under the Timber Fish and Wildlife Agreement, Olympia, WA. TFW-AM9-999005. DNR # 107. June

Wagner Richard J., Harold C. Mattraw, George F. Ritz, and Brett A. Smith. 2000. *Guidelines and Standard Procedures for Continuous Water-Quality Monitors: Site Selection, Field Operation, Calibration, Record Computation, and Reporting*. U.S. Geological Survey, Water-Resources Investigations Report 00-4252. Reston, Virginia.

Ward, William J. *Continuous Temperature Sampling Protocols for the Environmental Monitoring and Trends Section*. 2003. Washington State Department of Ecology. Olympia, WA. Publication No. 03-03-052. December.



Timber Harvest Program

Standard Operating Procedures for Instream Turbidity Monitoring

October 2006

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Purpose

This document provides standard operating procedures for instream turbidity monitoring on forest streams pursuant to the General Conditional Waiver of Waste Discharge Requirements – Timber Harvest Activities in the Central Coast Region (General Waiver). These procedures, when followed correctly, will support the collection of turbidity grab samples or insitu probe measurement data. The data will be used for trend analysis and to determine compliance with Monitoring and Reporting Program R3-2005-0066.

Throughout this document "the discharger" means the landowner and anyone working on behalf of the landowner in the conduct of timber harvest activities including monitoring.

Timing: Monitoring Season

Monitoring shall begin at the onset of timber harvest operations (i.e. tree falling, yarding, and / or roadwork, etc.) and shall be consistent with the Monitoring and Reporting Program (MRP), any conditions set forth within the General Waiver or Waste Discharge Requirements, and the procedures outlined in this document. The turbidity monitoring season begins on or after October 15 as specified in the MRP. You are required to conduct forensic monitoring throughout the entire year as necessary. Monitoring shall continue as specified in the MRP until it is revised or rescinded.

Monitoring Triggers: Rainfall Information

Monitoring events¹ are triggered by rainfall events as prescribed in the MRP and as necessary according to forensic monitoring requirements.

The discharger shall document when and where rainfall data was obtained for each monitoring event on the Timber Harvest Turbidity Monitoring Field Data Sheet (Data Sheet). The Data Sheet may be downloaded from the website at: http://www.waterboards.ca.gov/centralcoast/Facilities/Timber_Harvest/index.htm and then click on "turbidity." Hard copies of the data sheet are available upon request.

Rain gauges used shall represent precipitation at the harvest site as closely as possible. Compare rain gauge readings at the site to published gauges whenever possible.

Locations: Monitoring Sites

Turbidity sampling shall occur at monitoring locations specified in the MRP or identified during forensic monitoring. Identify the monitoring locations for each harvest at the top of the Data Sheet and include the latitude and longitude of the location in North American Datum of 1983 (NAD83) (i.e. decimal degree format dd.ddddd). Latitude and longitude are available at the www.topozone.com website.

Equipment: Turbidimeter / Turbidity Probe

The MRP specifies that a handheld turbidimeter is acceptable for the purposes of measuring instream turbidity. A handheld turbidimeter is either field equipment, equipped with a probe that takes direct turbidity readings from the watercourse, or bench top laboratory equipment that takes a turbidity reading from a sample

¹ A monitoring event is defined as all the turbidity samples or readings taken during the same storm event.

already collected from the monitoring location. Some models of the bench top style turbidimeter are designed to be taken into the field.

Whether a bench top turbidimeter or probe is used, the equipment must report turbidity levels in Nephelometric Turbidity Units (NTUs) and be able to read within a scale of at least 0 – 1,000. Each piece of equipment must be assigned a unique equipment identification number.

Calibration and Accuracy Checks

Turbidity equipment (probe or bench top turbidimeter) must be calibrated within twenty-four hours prior to each sampling event using standard reference materials and following the manufactures instructions. Calibration must include at least two calibration points that are intended to bracket the expected conditions in the field. Calibration data must be recorded on the data sheet and include the equipment identification number, date and time, result prior to calibration, value of calibration standard, and result following calibration.

An accuracy check must be performed on the turbidity equipment within 24 hours following each sampling event. Accuracy check must include the same calibration points and certified reference materials as were used in the pre sampling calibration. If the readings are not within 5% of the standard value for any of the ranges, the probe or bench top turbidimeter must be recalibrated. Accuracy check data must be recorded on the data sheet and include equipment identification number, date and time, accuracy check result, and value of calibration standard.

Field Collection Procedures

Take turbidity reading with the probe or collect the grab sample away from the stream bank in the main current in a location that best represents the water column. An optimal location would be in a relatively straight reach that is well mixed, with uniform hydraulics, and away from turbulence. Never sample stagnant water.

When wading² to the site try not to disturb bottom sediment. Be careful not to take a turbidity reading or collect water that has sediment from bottom disturbance. Mark the site with flagging, photo-documentation, or other method to ensure that subsequent sampling occurs at the same location.

Probe

The discharger must take a turbidity reading using a probe that has been cleaned according to the manufacture's specifications or collect the sample using a clean sample container.

² A small clean container, such as a bucket, attached to a long handle may be used to collect a sample from a stream if direct access to the bank is difficult or dangerous.

If using a probe, identify a sampling location and place the probe in the stream at least 2.0 cm below the water surface but not more than 4.0 cm below the surface. Allow the probe measurement to stabilize (see manufacturer's instructions) and record the result on the field data sheet.

Grab samples

The sample container must be a plastic, wide mouthed, bottle with a screw top lid. Analyze the samples immediately. If samples will be placed in storage prior to analysis, they must be stored in amber laboratory bottles at 4° C for a time period not to exceed twenty four hours.

All bottles must be cleaned prior to each use according to the following specifications, 1) Wash each sample container with a brush and phosphate-free detergent, 2) Rinse three times with cold tap water.

Prior to sample collection label the bottle with the name of the sampler, location, and the date/time the sample was taken. Identify the sampling location and stand facing upstream. Rinse sample container three times with ambient water before filling with sample. To collect the sample, lower the lip of the bottle **below the surface of the water** and towards the current. Collect the sample with a "scooping" motion to sample the full water column instead of just one spot. (see Attachment 1, Collecting a Turbidity Grab Sample) Promptly³, pour out excess water to leave at least a 1-inch air space so the sample can be re-suspended (by inverting the sample container several times) prior to analysis.

Stage Measurements

At each monitoring location establish a staging location where the substrate is relatively stable. During each sampling event measure stream stage with a yard stick, staff gauge, or staff plate for comparison to future measurements.

Sample Analysis

Perform the sample analysis per the manufacturer's recommendation for the turbidimeter. If performing analysis with a bench top turbidimeter, conduct analysis on three separate sub-samples⁴ from the same bottle and record the median⁵ on the Data Sheet. Always re-suspend the sample by gently inverting the sample bottle several times (do not shake as air bubbles can interfere with your readings) before transferring to sub sample vials to prevent a misrepresentative reading due to settling.

³ This must be done immediately after collecting the sample. Waiting to pour out excess water can create an unrepresentative sample as some material may have already settled.

⁴ If using bench top turbidimeter, all vials for subsamples must be cleaned to manufacturer's recommendations.

⁵ Constituting the middle value in the distribution.

Data Sheet

All sections of the field data sheet must be completed for each monitoring event.

Identify the Timber Harvest Plan (THP) or Nonindustrial Timber Management Plan (NTMP) number, Plan Name, and monitoring year. For NTMPs identify the unit or notice of timber operations (NTO) number.

Identify the monitoring sites with a unique site identification (ID). This ID needs to correlate to the monitoring maps in the MRP. Provide the latitude and longitude of each site in decimal degree format (e.g. 35.345600N 122.678900W).

Identify the type of turbidimeter or probe.

Provide data from pre sampling calibration prior to each monitoring event, including the equipment identification number, date and time, result prior to calibration, value of calibration standard, and result following calibration. Record the name of the person who conducted the calibration.

Provide data from accuracy checks following each monitoring event, including the equipment identification number, date and time, accuracy check result, and value of the standard. Record the name of the person who conducted the accuracy check.

Provide the date and time each sample was taken and the date and time the sample was analyzed. Record the stage height and note any additional information such as problems at the site or any other observations.

Note the rain gauge location reading and time; amount and duration of rainfall; and current weather.

Estimate whether the stream is on the rising or falling limb of the hydrograph.

Reporting Requirements

By November 15 of each year, the discharger must submit an Annual Report to the Central Coast Water Board per the requirements in the MRP and the following:

- ❖ A summary of the water quality monitoring performed during the previous year. Any monitoring described in the summary must also include the data submitted in an electronic format compatible with Excel.
- ❖ A detailed map⁶ meeting the following specifications:
 - In color (if possible).
 - Title stating: "Water Quality Monitoring Locations for THP No. XXXX"
 - All monitoring locations and routes clearly marked with unique site identification tags.
 - A Key or Legend identifying all monitoring locations and routes.
 - North Arrow.
 - Scale.
- ❖ Completed Field Data Sheets with data from all monitoring events.

⁶ The map needs to be submitted only once unless monitoring station locations are modified. In the future a map with unique monitoring site tags shall be submitted with the Timber Harvest Information Form and Fact Sheet.

Literature Consulted

Anderson, Chauncey W. "Chapter A6 Field Measurements Version 2.1 – 6.7 Turbidity" National Field Manual for the Collection of Water-Quality Data United States Geological Survey. September 2005.

Eaton, Andrew D. Clesceri, Lenore S. Greenberg, Arnold E. eds. "2130 Turbidity" Standard Methods for the Examination of Water and Wastewater Washington D.C., 1995 p. 2-8 – 2-11

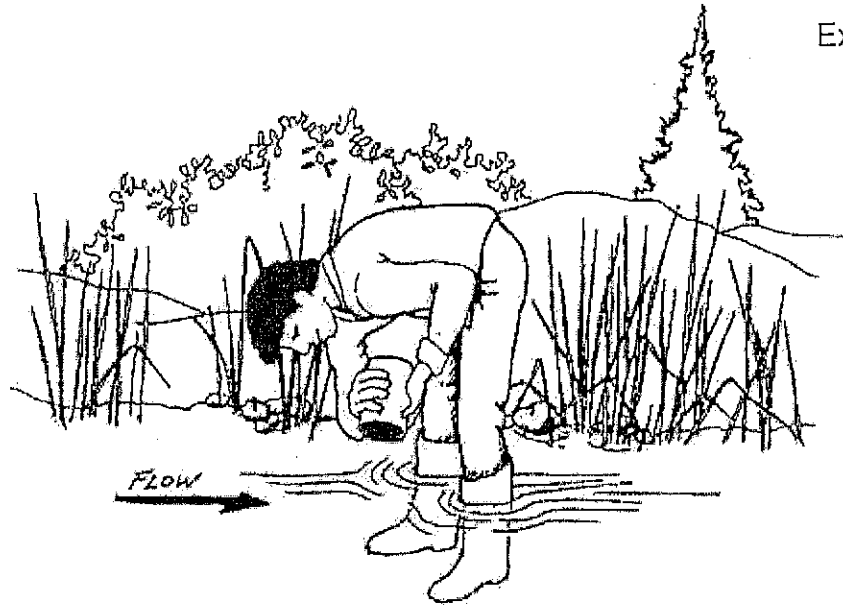
Ice, Dr. George. Dent, Liz. Walsh, Jenny. Hafele, Rick. Wilkinson, Dave. Brodziak, Lana. Caton, Larry. Hunt, Travis. Hammond, Ellen. Measeles, Paul. et all. "Chapter 11 and Appendix E" Oregon Plan for Salmon and Watersheds Water Quality Monitoring Technical Guidebook Version 2.0 July 1999

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<<http://www.dictionary.com>>

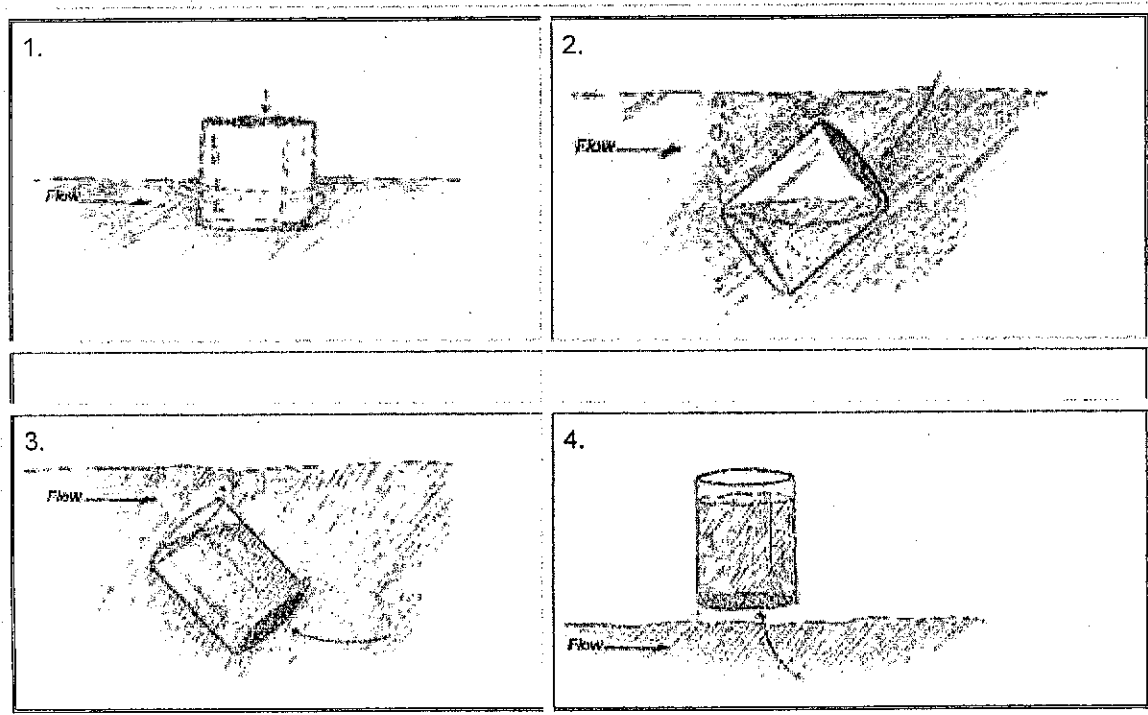
United States Environmental Protection Agency Office of Water. "Chapter 5.5 Water Quality Conditions – Turbidity" Volunteer Stream Monitoring: A Methods Manual EPA 841-B-97-003. November 1997

White, Adona. Water Resource Control Engineer. North Coast Regional Water Quality Control Board. Interview, Review, Edits. 21 Sept. 2006

Document1



Getting into position to take a turbidity grab sample.



Taking a water sample.

Turn the bottle into the current and scoop in an upstream direction.

Sketches taken from USEPA "Quality Assurance, Quality Control, and Quality Assessment Measures. Figures 5.2 and 5.3" Volunteer Stream Monitoring: A Methods Manual <http://www.epa.gov/volunteer/stream/vms50.html>