1 PROJECT/TASK ORGANIZATION

Mill Creek Council: provides guidance and public input for the Mill Creek project, determines projects focus, and makes critical decisions if any problems arise with either the project or the health of the creek.

Project Coordinator: responsible for creation of monitoring manual, instructions, data sheets, QAAP, program organization, volunteer recruitment, establishing training and data collection schedules and seeing that they are adhered to, recruiting agency specialists to assist the project, final data checks, analysis of results and report generation.

Lab Analyst: performs the more complex testing in the Clallam County Health Dept.

GIS Specialist: responsible for map generation, spatial data organization and assistance with generation of database.

Quality Control Analyst: utilizes a Hyrolab®to conduct duplicate testing which serves as a quality control, transfers data to data coordinator.

Volunteer data coordinator: checks completed data sheets, enters the results into the computer database, checks with hardcopy forms, and files the data sheets.

Volunteer captain/Teacher: brings all necessary testing equipment to site and disseminates it to team members, reviews all monitor sheets, returns all equipment to center and delivers data sheets to the data coordinator.

Volunteer monitor/Student: collects samples, performs testing, observes and gathers data according to the SOP's outlined in the monitoring instructions, and taking lab samples to lab.

PARTICIPANTS: ONRC - John Calhoun (ONRC Director), City of Forks - Rod Fleck (City Atty./Planner) Barbara Harrison (Project Coordinator), Miranda Wecker (ONRC Water Specialist), Teresa Alcock (GIS Specialist); City Utility Department - Dan Wahlgren; Quileute Tribe (Mel Moon - Director, Quileute Natural Resources, Kathy Krueger - Policy Analyst, Roger Lein - Fisheries Specialist); Jessica Baccus and Edward Chadd (Streamkeepers of Clallam County); Pacific Coast Salmon Coalition - Carl Chastain (Volunteer Coordinator);Quillayute Valley School District - Don Hall, Patty Vaughan, and Sherry Schaaf (Teachers); Local Landowners (including Department of Natural Resources, Green Crow, and Rayonier); and Local Sportsmen's Club.

2 PROBLEM DEFINITION / BACKGROUND

Mill Creek is located in Forks, WA. and flows through T28N, R13W, sections 14,15,16,17, and 18. Its headwaters begin at approximately 1280 feet in elevation and descend to about 120 feet at the point where it flows into the Bogachiel River. The river starts out in rural forested land and travels down through the Southwestern portion of Forks, flowing under route 101, around the airport, past two shake mills, two mobile home parks, and under Russell Road, before forming a wetland and meeting the Bogachiel. It is within the Hoh-Quillayute Watershed, USGS cataloging unit #17100101. It originates at approximately 47° 56 '30" N, 124° 20 '30" W, and enters the Bogachiel river at 47° 55 '42" N, 124° 25 '28" W. The creek is 8.55 miles long and the watershed occupies 1,935.82 acres.

The geologic history of Mill Creek, and the Olympic Peninsula in general, is based on the tectonic movements of the Juan de Fuca plate, directly East of the Juan de Fuca Ridge. The collision of the Juan de Fuca plate and the North American plate created an area of partial subduction, where some of the Juan de Fuca plate was sheared off and pushed up through intense faulting and folding. The resulting mountain range and coastal features were further molded by extensive glaciation periods which left broad deposits of sand and gravel along much of the bedrock, especially evident in the major river valleys. The mild, wet winters, relatively cools summers, frequent precipitation events, and resultant lush coniferous forests all combined to form the inceptisol soils currently present in Forks.

The Mill Creek watershed contains the following soil types: 27-Ilwaco silt loam, 15 to 35% slopes; 54-Queets silt loam; 56-Quillayute silt loam, 0 to 8 % slopes; and 66-Solduc very gravelly sandy loam, as described by the USDA Soil Survey of Clallam County. Both the Queets silt loam and the Quillayute silt loam have moderate permeability, slight water erosion hazards, and medium runoff. Both units 'primary use is woodland, but they are also used for homesites, grazing, and agriculture. In the case of grazing, agriculture, and forestry the main concern is wet, saturated soil that is easily compacted and reduces permeability. Ilwaco silt loam is a very well drained soil occurring in the foothills, formed in highly weathered sandstone and loess. It has moderate permeability, slow to medium runoff, and moderate hazard of water erosion. It is primarily used as woodland. Solduc very gravelly sandy loam is a very deep, somewhat excessively drained terrace soil. It is formed by glacial outwash that contains loess and volcanic ash. Its permeability is moderate to the substratum and rapid beyond that with a slight erosion hazard. It is used primarily for homesites and woodland, although its excessive drainage can lead to problems with septic tanks and road or house excavation.

Mill Creek is classified as a type 2 and type 3 water body - according to the DNR forest practices classification- with smaller type 4 and 5 tributaries entering it. Many of the areas that surround Mill Creek are listed under the critical areas ordinance. East of route 101 the land is cited for landslide and erosion hazards, and near the mouth of the Bogachiel, the area is a certified wetland. According to the city of Forks 'Critical Areas Ordinance, these are Class II Aquatic Habitat Conservation Areas and have particular buffer requirements. All uses on or adjacent to these areas require approved drainage, erosion control, and grading plans which adhere to the city's section 800 ordinance. Buffers are determined by measuring from the OHWM (ordinary high water mark) or if

unidentifiable, from the top of the bank.

For minor development the following buffers apply:
-Urban residential, commercial, and industrial zones = 25 feet
-Rural residential zones = 35 feet
-Agricultural-residential zones = 35 feet
-Forestry zones = 50 feet
For major development and land divisions the following buffers apply:
-*Type 2 waters = 150 feet or the 100-yr. flood plain, whichever is greater.
-*Type 3 waters = 100 feet or the 100-yr. flood plain, whichever is greater.
*These buffers may be decreased if the Review Authority approves a Habitat Management Plan determined to sufficiently mitigate any detrimental effects, or increased if the Authority deems it necessary to protect the habitat of federally or state listed endangered, threatened, or sensitive species.

The area surrounding Mill Creek is zoned as Urban Rural Land, Public Land, and Commercial Forest. Much of the creek is contained within the urban growth boundary of Forks. With the re-structuring of the Shoreline Management Act, the lower reaches of Mill Creek from 47° 55'58" N, 124° 24'39" W, to its mouth are now considered "shorelines" of the state and subject to the zoning specified in those regulations.

Because Mill Creek is a tributary of the Bogachiel River, which is classified as a DOE Class AA fresh water body, it is also considered a Class AA fresh water body. This represents the state's most stringent classification (extraordinary) and provides even more impetus to determine a monitoring protocol that provides Department of Ecology (DOE) quality data. This classification states that the water quality "shall markedly and uniformly exceed the requirements for all or substantially all uses." These characteristic uses include drinking, irrigation, swimming, fishing, fish habitat, wildlife habitat, navigation and commerce. The 303(d) listing of Grader Creek, just South of Mill Creek, exemplifies how thoroughly Washington waterways are monitored, and illustrates a possible scenario for Mill Creek if it is not periodically assessed. Mill Creek is included in Water Resource Inventory Area (WRIA) 20, which is listed as medium priority by at-risk stock significance as determined by the Washington Department of Fish and Wildlife (WDFW) Watershed Recovery Inventory Project.

According to WDFW and Quileute Tribe fish surveys, the following species inhabit Mill Creek: Steelhead, Cutthroat Trout (leftover from plantings), Chum, Chinook and Coho Salmon.

The city of Forks initiated the Mill Creek project because it was concerned about the prospect of more salmon listings and possible regulations levied against local watersheds. This is particularly important to the city because it owns a substantial amount of property on the creek that represents possible pollution concerns, namely the airport and two shake mills. Local landowners were concerned about the regulatory state of Mill Creek and wanted to have input into any newly proposed watershed plans and/or regulations. The tribes were also involved because of their established interest in salmonids and their habitat.

3 PROJECT/TASK DESCRIPTION

The initial discussions involved the director of the ONRC, the Forks City Planner/Attorney, the QVSD superintendent, and a water resources specialist at the ONRC. By the next meeting, members of the Quileute tribe, all landowners adjacent to the creek, school staff, and community members were invited to participate in the planning process. They raised additional concerns beyond regulatory control, namely the future of farming, water rights/access, and possible pollution problems.

One central objective encompassed all of these concerns: to strive for healthy fish habitat that would lead to more fish in Mill Creek, thereby signaling cleaner water and protecting the city from outside regulation. From this, they created a basic project design to address the coalition of interests generated by both public and private entities.

1. Enhance local control over managing Mill Creek Resources - create community based monitoring, regulations, and protocols to address new issues and problems as they arise.
2. To provide a unique educational opportunity for the QVSD by creating a continuous monitoring and testing regime that students can learn from and participate in. With properly created materials this project will incorporate the necessary learning requirements to make it a valuable educational experience while allowing the Mill Creek group to use student data in its assessment.
3. To determine the state of Mill Creek (both fish habitat and water quality) and the health of the fish populations.

Workplan for Development of Mill Creek Monitoring Project

Initial Watershed Inventory
Determine how to test and assess the health of Mill Creek.
Level 3 Monitoring (as defined by the Dept. of Ecology) will provide the basis for choosing water monitoring protocol and testing.
Implement inventory and assessment plan.
Decide how to proceed in accordance with the monitoring results.
-Continue monitoring to ensure that quality is maintained, enforcing current zoning and regulations
OR
-Devise and implement measures to improve creek habitat and water quality
-If the cause of water/habitat degradation is not established by the monitoring, then more focused and specific monitoring may be necessary to determine the cause before prescribing restoration measures.

4 DATA QUALITY OBJECTIVES FOR MEASUREMENT DATA

The monitoring results will be measured against the guidelines established in the 173-201a WAC – water quality standards for surface waters of the State of Washington by the Department of Ecology.

Water Quality standards according to the WA. State Class AA fresh water classification:

- For Dissolved oxygen: DO levels "shall exceed 9.5 mg/L."
- For total dissolved gas: "shall not exceed 110 percent of saturation at any point of sample collection."
- For fecal coliform organisms: these levels "shall both not exceed a geometric mean value of 50 colonies/100 ml and not have more than 10 percent of all samples obtained for calculating the geometric mean value exceeding 100/100mL."
- For temperature: "shall not exceed 16.0° C due to human activities. When natural conditions exceed 16.0° C no temperature increases will be allowed which will raise the receiving water temperature by greater than 0.3° C. Incremental temperature increases resulting from point source activities shall not, at any time, exceed $t=23/(T+5)$. Incremental temperature increases resulting from nonpoint source activities shall not exceed 2.8° C." ("t" = the max. permissible temperature increase measured at a mixing zone boundary; and "T" = represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.).
- For pH: "shall be within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.2 units."
- For turbidity: "shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU."
- For toxic, radioactive, or deleterious material: "concentrations shall be below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department."
- For aesthetics: "shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste."
- For N-Nitrate: the levels must be $\leq$ 10 mg/L or 10 ppm to prevent methemoglobinemia (blue baby syndrome).

**Keep in mind that regions with higher rainfall-such as the Western Olympic Peninsula-tend to have lower concentrations of nutrients and other dissolved ions.

Table 2 illustrates the precision, accuracy, ranges, and testing methods for each of the Mill Creek parameters. The expected ranges were determined by the Class AA water standards for Mill Creek.

Precision represents the degree of agreement among repeated measurements of the same parameter and provides information about the consistency of the data collection methods. Accuracy is a measure of confidence that describes how close a measurement is to its true value. Instrument sensitivity refers to the increment size measured by a particular instrument.

Table 2. Parameter Ranges & Testing Methods

Parameter	Method	Instrument Sensitivity	Measurement Range	Expected Range	Precision	Accuracy
pH	Orion pH meter instructions	0.1 pH	0 - 14	6.5 – 8.5	± .13	0.005
Temp	TFW protocols	1° C	- 10° - 110° C	1° C - 16°C	± 1° C	± 1° C
DO	SWRP Modified Winkler Titration, mg/L	0.2 mg/L DO	0.2 - 4 & 1 - 20	> 9.5 mg/L	± 2.0 mg/L	NA
Turbidity	Nephelometric, NTUs	0.05	0.00 - 1100	0.00 - 5	NA	±2%
Conductivity	Hach, µmhos/cm	0.1	0-199.9	40 - 90		±5%
Total Phosphorus	SWRP and Hach # s 8190 & 8048, mg/L P	0.05	0 - 2 A Photometric	0.02 - 0.04	±0.005	±0.05
Nitrates	Ion analyzer*	The Clallam County Department of Health will analyze these two tests.				
Fecal coliform	Membrane filtration*					

In the Mill Creek project s assessment, representativeness primarily depends upon the site locations and the presence of stream parameters common to Mill Creek. The number of replicates performed for each test will represent completeness. All tests, except fecal coliform and nitrate will include between 3-5 replicates.

Comparability is ensured by the use of standardized, agency accepted methods of collection, analysis, and documentation (agency accepted units of measurement for each parameter). Volunteers will have an operations manual for reference and vegetation keys for plant identification.

5 TRAINING REQUIREMENTS / CERTIFICATION

Before the actual training begins there will be a one hour orientation meeting to explain what the program is about, the site locations, the time commitment it would require, the monitoring schedule, and the basic data path / chain of custody (where they get equipment, who is responsible for it, how it's checked out and returned, how data is to be recorded, and entered into the database).

How will the training be provided? Who, When, Where, What equipment and manuals will be provided, and what will they learn?

-Who: Training can be provided by a combination of people; we can have SWRP, Salmonweb, or DOE people come to Forks. We can also utilize local scientists at the DNR, Clallam County, Conservation District or university level.

-What: Volunteers will be provided with all necessary water testing kits and equipment. In addition, the group will be trained in stages, so there are enough materials for everyone to use them during the training. Volunteers will be given a procedures manual documenting data collection, storage, and analysis protocol.

-Where: Training sessions will be held at the ONRC and in the field as necessary. The training will last approximately 2 days including field work and lab analysis. Macroinvertebrate collection will require an additional training session prior to the annual collection time.

Day 1 – Calibration of Equipment
Preparing for Fieldwork
Grab samples
Day 2 – Habitat Evaluation and mapping techniques
Lab analysis of samples – microbiology

-What they will learn: Volunteers will be trained in the established sampling and analysis protocols established for Mill Creek. In addition, they will learn about wildlife, fish, vegetation identification and mapping, riparian ecology, and the general health of their watershed.

How will volunteer performance be monitored?

-Specific data forms that ensure certain methods were undertaken by the data that they produce and the units data are reported in.

-Checks by group captain that all forms are completed before entry into ONRC database.

-Supervisory trained personnel attending all student volunteer collections and a schedule of equipment checks to ensure that all chemicals and equipment functions properly.

-Periodic checks by trained personnel on the data collection and analysis performed by volunteer groups.

6 DOCUMENTATION AND RECORDS

All Mill Creek data sheets must be completed at the time of collection or analysis if done at an offsite location, such as a lab. Each sheet will contain basic identifying information: site location and corresponding code #, date, time, and data collectors 'names. The site identification, date, time, and data collector's name will be documented onsite before samples are taken. In addition, previous test results, method used, instructions, weather conditions, and space for any necessary calculations will be included on the data sheets. Any occurrences that may skew test results should be noted on data sheet with author's initial next to the explanation. Copies of all data sheets are presented in Appendix A.

Each volunteer group will have a captain. The captain will be responsible for distributing all data sheets and equipment to the group members, checking that all data sheets are completed, collecting and accounting for all equipment and data sheets, returning all equipment and completed data sheets to the ONRC. A separate "grab sample team" will collect and transport water samples for analysis at the Clallam County Dept of Health. Data should be screened for outliers by both the data gatherer and the team captain before leaving the site, so that a new sample can be taken if necessary. Protocol for equipment take out is listed in Appendix B. Data will be stored electronically in a relational database, and any spatial data will be stored in GIS format.

All data will be made publicly accessible by posting on a website linked to the ONRC, the City of Forks, and the QVSD websites. There will two separate databases, one for level 3 data and one for level 1 and 2 data.

A roster of all trained volunteers, teachers and their respective classes will be generated and stored at the ONRC. Included in this roster will be the names, phone numbers and addresses of all volunteers. A separate roster of all those involved in coordinating the program, training, and offering technical, scientific assistance will also be maintained at the ONRC. Contacts for these individuals will be provided upon request.

All landowner contracts for entry onto their land will also be stored at the ONRC or the city of Forks. The landowner will also receive a copy. The contracts will specify where volunteers are to park, how they are to access the site, the number of people allowed at one time, the time of day appropriate, and the approximate sampling dates. These will be tailored to the landowner's wishes and may be terminated at any time by the landowner. A sample copy of the contract is in Appendix C.

Any data and/or other pertinent correspondence received from outside agencies will be filed at the ONRC.
Receipts for equipment and other financial records associated with the monitoring program, including any funding received, can also be stored at the ONRC.
Hard copies of all data sheets will be stored at the ONRC.
All data will be backed-up and archived.

7 SAMPLING PROCESS DESIGN

Mill Creek data collection sites will be chosen according to an established set of site criteria. The sites must be both physically and legally accessible by volunteers, and representative of the creek for each of the lower, middle, and upper sections of the river. The site should have water in it throughout the year, representative enough so that all of the necessary tests can be performed, and it should be downstream of any tributaries, drains, or bridges. There may be sites placed below possible pollution inputs with reference sites above the possible source. Reference sites will be chosen based on their similarity to the downstream sites and will be located at least the distance of a stream reach above the possible pollution source. Similarity between sites will be assessed by comparison of channel gradient, width, substrate, valley shape, channel size, pool to riffle ratio, and adjacent land uses. Other than the land use being tested, there should be no significant differences in land use between the reference and its downstream site. Sites will be identified by a site name, Universal Transverse Mercator coordinates (UTM's), latitude and longitude coordinates, and a designated site code. A map of the Mill Creek watershed and its designated stream reaches is included in Appendix C.

Sampling schedule

There will be an initial watershed inventory, which will be updated annually. This will be followed by quarterly sampling during the months of October, January, April, and August. After establishing baseline data, this quarterly sampling schedule may be altered by removing the October sampling event.

Some parameters may be monitored more or less frequently depending on the data requirements or the identification of possible problems. Data collection normally will be conducted in groups of two; except the macroinvertebrate collection, where three collectors are recommended.

The designated sampling time will be the middle two weeks of an identified sampling month. Sampling will occur between sunrise and 3 p.m. on the chosen sampling day. Volunteers will be asked to note any recent significant precipitation events when conducting their sampling. When possible, each subsequent data collection should occur at the same time each collection month. For instance, if a group sampled on the third Wednesday of April, their August sampling time should occur at the same time. If a volunteer is unable to participate in the sampling, they need to contact their program coordinator to arrange a substitute. A list of potential substitutes, (volunteers willing to serve on an on-call basis or those who do not want to commit to a regular schedule but are willing to fill in occasionally) and their phone numbers will be kept with the volunteer roster for such cases.

What parameters are sampled at each site?

The initial watershed inventory covers the entire watershed and is performed before the scheduled data collection begins. This will occur in the late summer before the October sampling window and will be updated annually with any human or nature induced alterations of the watershed. It is

prepared through the gathering of historical, background data and existing biological data relevant to an extensive watershed description. This inventory procedure incorporates climatic, biologic, geologic, soils, hydrologic, economic, demographic, and land use information.

Macroinvertebrate sampling will occur annually in the last week of August and the first week of September. Nitrates will be tested once a year during the August sampling event. All other chemical and biological sampling will occur quarterly in October, January, April, and August. The parameters sampled at each site will include pH, DO (Dissolved Oxygen), % DO, Turbidity, Reactive Phosphorus, Temperature, and Habitat. The sampling will follow the order prescribed below.

1. Creation of Stream Reach Map (see procedure descriptions in Appendix A). The two methods of creating the stream reach map are adapted from the Streamkeeper's version of the "Stream Reach Map" procedures, pp. 68 – 72. Our area will be a 100′ x __′.
2. Wade to center of creek and collect water samples for the chemical tests before entering the stream for any other test. Be careful to collect water upstream of where you entered the creek. Move upstream a few feet and take the temperature reading. Perform basic chemistry tests (DO, Temp, pH, Alkalinity, Turbidity, and Conductivity). The advanced chemistry tests (Reactive Phosphorus, Nitrate, and Fecal Coliform) will be conducted in a lab.
3. Perform the remainder of the stream reach survey and habitat assessment, which includes the measurement of depth, width, and calculation of flow.

8 SAMPLING METHODS REQUIREMENTS

The Mill Creek SOP's (Standard Operating Procedures), located in Appendix A, contain detailed sampling instructions for each parameter. Table 3 summarizes some of the key components of this information.

Table 3. Mill Creek Standard Operating Procedures

Matrix	Parameter	Sampling Equipment	Sample Holding Container	Method Sample Preservative	Maximum Holding Time
Water	pH	ATI Orion pH meter & electrode	Glass sampling bottle	None	Analyze within 2 hrs
Water	Temperature	Armored Thermometer	None	None	Analyze Immediately
Water	Dissolved Oxygen	Hach Kit No. 1469-00, (Model OX-2P)	None	None	Analyze Immediately
Water	Turbidity	LaMotte Portable Turbidity Meter	Glass sampling bottle	Complete Darkness, Cool - 4° C	24 hours
Matrix	**Parameter**	**Sampling Equipment**	**Sample Holding Container**	**Method Sample Preservative**	**Maximum Holding Time**
Water	Conductivity	ATI Orion Conductivity Meter	Glass sampling bottle	Cool - 4° C	28 days
Water	Reactive Phosphorus	Hach DR/700 Colorimeter	Glass sampling bottle	After Method 8190 has been completed, then Cool - 4° C	28 days
Water	Nitrate Nitrogen	County Ion Analyzer	Sterile collection bottles*	Cool 4° C, H_2SO_4 to pH < 2	48 hours
Water	Fecal Coliform	Membrane Filtration Unit	Sterile collection bottles*	Cool - 4° C	6 hours
Substrate	Macroinvertebrates	Surber sampler	Plastic screw-top vial	70-90% ethanol alcohol	6 weeks

***Provided by Clallam County Dept. of Health.**
Specific methods and equipment were chosen in order to comply with DOE accepted protocols. Those parameters being stored for only the short transit back to the lab will be collected in sterile Whirl-pak® bags.

9 SAMPLING HANDLING AND CUSTODY REQUIREMENTS

Data Labeling
Each sample container will be pre-labeled before taking it into the field. Once at the site, all identifying data on the label should be filled out before the sample is taken.

Data Responsibility
In the field, each individual is responsible for the samples they take and process, as well as the completion of the data sheets, and the transfer of these materials to their team captain/teacher. After receiving the data sheets, the team captain becomes responsible for their transfer to the data coordinator, whose office will be located at the ONRC. Creek samples due for laboratory testing will be brought to the lab by a designated member of the monitoring team. Once at the lab, the samples become the responsibility of the lab analyst, who tests samples, disposes of waste, and records the results. The analysis results will be delivered to the data coordinator, who then enters the data in the computer database. The data coordinator is responsible for checking the computer database against the hardcopy data sheets to ensure that the data was entered correctly. Finally, all hardcopy data sheets will be filed according to site and date, and stored for three years.

Once testing of the samples is complete, they are to be properly disposed of according to the SOP's defined in Appendix A. The only samples stored after their analysis will be the macroinvertebrate samples. Initially they will be used to establish a reference collection. Once that has been completed, the following samples will be stored for 3 years as an accuracy check. They will be stored in glass vials labeled with the date, site code, and sampler name.

Data Tracking
Sample labels will contain all the necessary information to identify the date, site, time, and person who collected them. This label information will allow tracking of the sample until its transfer to the ONRC or the lab for analysis. The data entry person at the ONRC will file and store these sheets for three years.

10 ANALYTICAL METHODS REQUIREMENTS

In the Mill Creek Project, pH, reactive phosphorus, and conductivity are measured using protocols from Hach's *Water Analysis Handbook*. The protocols for dissolved oxygen, temperature, turbidity, and come from a combination of Hach's *Water Analysis Handbook* and the Student Watershed Research Project's, *A Manual of Field and Lab Procedures*. The protocols for testing N-nitrate and Fecal Coliforms are derived from the state requirements of county DOH labs.

11 QUALITY CONTROL REQUIREMENTS

Training

All volunteer monitors will be trained according to the procedure outlined in the Training Requirements/Certification section. Both volunteer and student monitors will perform preliminary sample collecting and analysis before they begin actual monitoring. Their ability will be tested by performing a synthetic sample analysis before they go into the field, followed by an assessment by supervisory personnel to determine if their results fall within the acceptable ranges. Technical assistance will be provided in the field and classroom.

Training will also incorporate safety issues and site accessibility. Volunteers will receive training on evaluating and minimizing potential risks, both physical and legal, see Appendix E.

Equipment Quality Controls

When removing equipment and sampling supplies for use, all items will be checked to ensure that nothing has broken or spilled. All electronic equipment/meters will be tested to ensure that they are in working order. When testing in the field with battery operated equipment, an extra set of batteries will be included as part of the field equipment. Before leaving for the field, the team captain will be responsible for going over the field equipment checklist and obtaining all the necessary material. Each parameter tested will have its own set of instructions, data sheets, and equipment checklists to guarantee that all necessary equipment is both taken to and returned from the field.

Field Procedures Quality Controls

The first quarterly data collection will be a pilot run of the Mill Creek protocols and methodologies. The purpose is to determine any problems or inconsistencies in the SOP's and the proper ranges that should be used in those tests that have both high and low range methods.

Each monitoring location will be clearly described by map, photographs, and written directions. Orange forestry stakes will designate the site boundaries. They will display the site name, site code, and latitude, longitude coordinates. All of the descriptive site information listed above will be

contained in a "Site Description Sheet," see Appendix C. Each site will have its own sheet, which comprises a part of each volunteer group's field equipment.

Once at the site, the volunteer captain will dispense the equipment and assign tasks accordingly. Volunteers will take at least 3 sample replicates for each of the parameters sampled. Volunteers will double-check their data sheets before turning them into their team captains, who will, in turn, re-check the data sheets. The data sheets are checked according to the following criteria: completion, legibility, and that the answers fall within a realistic range.

Analysis Quality Controls
The Mill Creek Program will coordinate with Quileute Natural Resources for the provision of a hydrolab operator. This person will perform duplicate sample testing and will provide quality control analysis for the chemical water quality tests. The site for these duplicates will be rotated among the Mill Creek sites to reduce any bias.

12 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE REQUIREMENTS; CALIBRATIONS AND FREQUENCY; INSPECTIONS AND ACCEPTANCE REQUIREMENTS FOR SUPPLIES

Project staff will generate an inventory of equipment and monitoring supplies that are not considered permanent, either because of their limited shelf life or their disposable nature. This list will contain the dates received and the suggested renewal/re-order dates for each item. The lab analyst or the project coordinator will check this list and the related supplies quarterly, 2 weeks prior to the sampling window. This inventory will be kept with the supplies in a locked storage area, accessible only to project staff and team captains.

Expiration dates of all chemicals and reagents used in testing will be checked prior to each use. Any necessary calibrations of equipment and meters will be performed according to the manufacturer's instructions. A log recording equipment checks and calibrations will be stored with the equipment and updated after each service. It will include the person's name, date and equipment checked and/or calibrated.

13 DATA ACQUISITION REQUIREMENTS

To establish the base layer for the Mill Creek maps, the Mill Creek GIS coordinator received the majority of data from the Department of Natural Resources, Olympic Region. They provided data layers for Township 28 N, Range 13 W in the form of 1994 Digital Orthophoto, Digital Elevation Model, Transportation, Hydrography, POCA (Public Land Survey System (PLSS) section lines), PLS PT (major PLSS survey points), Soils, RIU (Resource Inventory Units), FIUMAIN, FIUTREE (associated inventory data tables), LULC (Land Use/Land Cover data tables), and MPL (Major Public Lands). The Clallam County Assessor also provided data in the

form of data tables for legal description of ownership parcels (1998) and various Assessor maps (1984). The program coordinator obtained Plat maps covering the City of Forks from the Clallam County Assessor's Office and a Western Clallam County Zoning map from the Clallam County Department of Community Development.

The Washington state Department of Ecology provided the 173-201a WAC water quality standards for surface waters of the state of WA. DOE staff also provided a copy of the Washington State Water Quality Assessment 305 (b) report. Staff at the Washington Department of Fish & Wildlife verbally gave information regarding a stream restoration project, channel restoration, and juvenile fish monitoring on Mill Creek. The WDFW information provided some evidence of exactly which fish species inhabited Mill Creek. Department of Natural Resources staff provided some data on fish counts and water quality, but because of equipment problems and the methods used to gather the data it was not incorporated into the Mill Creek project. A contact at the Quileute tribe sent all their data on Mill Creek spawner surveys. Once again, this data served as an indicator of the fish species that inhabit Mill Creek. Aerial photographs covering the entire Mill Creek area were ordered from the DNR mapping center. Robert Coon, ONRC Education Coordinator, provided a DNR thinning map that displayed the best access routes to the Mill Creek headwaters. USGS 7.5" topographic maps were used to identify the boundaries of the Mill Creek Watershed. The city of Forks provided high flow data from the gauges on Mill Creek and maps of their Critical Areas Ordinance locations. Several people at the WDFW, DNR, and DOE gave brief interviews on their departments 'activities, or lack thereof, involving Mill Creek. The Army Corp of Engineers provided oral testimony that they had not initiated any projects on Mill Creek. The Natural Resource Conservation Service located in Port Angeles provided the 1987 Soil Survey for Clallam County.

In the private sector, Rayonier provided aerial photo coverage to give an idea of the historical coverage and offered advice with some of the GIS decisions. Green Crow of Port Angeles provided some color aerial photos and 1998 temperature data for Mill Creek, obtained by using HOBO monitoring according to TFW guidelines.

14 DATA MANAGEMENT

Field data sheets are reviewed and checked by the sampler before transfer to the team captain. The team captain also reviews and checks data before its transfer to the data coordinator. Field samples are also checked for label completion before leaving the site and these will be transferred to lab by a second person in the volunteer team. This person is identified before the sampling begins and is responsible for the samples until they are signed for by the lab analyst. The lab analyst is then responsible for testing, disposing of, recording, and transferring the sample analysis data to the data coordinator. Once the data coordinator has the data, it is his responsibility to record the data, check the computer entered data with the hardcopy, and then file the hardcopy data sheets.

Each data sheet will be checked by the initial sampler, the sample tester, the volunteer captain or lab

analyst, and finally the data coordinator. Forms will be checked to ensure that they have been filled out completely and correctly, with any omissions or problems identified and explained. They will be checked for accuracy by determining if the answers fall within an acceptable range. This is done before the sample leaves the testing site, so that any outliers may be discarded and another test can be run.

Examples of all data sheets and checklists are presented Appendix A. The hardcopy data will be entered into a Microsoft Access relational database on a Microsoft NT 4.0 server at the Olympic Natural Resources Center in Forks, WA. Only the assigned data entry personnel, the program coordinator, and the GIS coordinator will have access to the NT server. No volunteer data entry personnel will be admitted without the supervision of the GIS coordinator or the program coordinator. The program files will be safeguarded by the computer's location in a locked facility and the use of a password once access is gained. Once the data has been entered and posted to the Mill Creek websites, it will be accessible to the public. The websites will be linked to the ONRC websites, the City of Forks websites, and the QVSD websites. The raw data will be available for anyone to download and manipulate, but on the websites they will be presented in a read-only format.

The data produced by the Mill Creek monitoring project may be used for compliance purposes by the city of Forks.

15 ASSESSMENTS AND RESPONSE ACTIONS

The first monitoring session will be used as pilot run of the methodologies and protocols used in the Mill Creek Program. Any sampling or testing procedures that provide erratic results or can be streamlined to improve efficiency or ease for the monitors will be reviewed, and altered if necessary.

Program staff and visiting experts will conduct field visits to gauge monitor performance. Any monitors providing inconsistent or unusable data will be offered the choice of re-training or resigning from the program. Volunteer refresher courses will be offered once a year, or if enough interest is generated in a specific area, special training courses can be scheduled at the earliest possible date.

After each quarterly monitoring session, the program coordinator will review all the data collected for Mill Creek and determine if any monitoring irregularities or problems exist. If they do, the program coordinator can follow the chain of custody for that suspect data and determine the cause of the problem. When determining the cause of a problem, one can ultimately go back to the initial sampler to ask if the protocols were followed exactly. Or, if there is a consistent, repetitive error, the equipment calibration will be checked, along with the viability of any chemicals that were used in the sample analysis.

The original monitoring plan will be evaluated by DOE personnel and a technical specialist assisting

with the program. Field and laboratory activities may be reviewed by state agency specialists as requested.

16 REPORTS

All data will be incorporated into quarterly reports generated after the sampling and testing has been completed. The program coordinator will generate these reports using the Microsoft 97 Access database program and present them to the volunteer monitors two weeks after the completion of the quarterly sampling window. Included in these reports will be any concerns regarding the overall operation of the program and any specific problems that may have arisen. This meeting will also represent a time where monitors can offer suggestions or raise questions about the program itself. In addition to quarterly meetings, the Mill Creek websites will be updated quarterly with all the raw data, test results, and reports from the monitoring program.

17 DATA REVIEW, VALIDATION AND VERIFICATION REQUIREMENTS & METHODS

Data is reviewed several times in the course of its journey from initial analysis to the filing of the data sheets. It is first reviewed by the person conducting the analysis, then the team captain reviews the data sheet, calculations, and test results to ascertain if they fall within the acceptable ranges. After being transferred to the data coordinator, the data then become that person's responsibility. He/She reviews the sheets and enter the data, after which he/she checks the hardcopy data sheet with the computer entries in the database. After the data entry has been completed and the data sheets filed, the program coordinator then reviews the results and calculates accuracy, precision, and completeness values. Replicate and duplicate sample results are then compared with volunteer data and any discrepancies are noted.

Any concerns or problems regarding the stream health will be brought to the attention of the Mill Creek council and a course of action will be decided upon at that time. This decision will be based on a vote by the Mill Creek group after hearing the report and recommendations of the program coordinator. Such an action may include more specific testing, bringing in outside specialists, or initiating some type of restoration activity.

18 RECONCILIATION WITH DATA QUALITY OBJECTIVES

The results will be compared against the water quality standards according to the Washington State Class AA fresh water classification to ensure the Mill Creek meets or exceeds those standards. If the results demonstrate that a particular parameter does not meet those standards, further testing will be performed and the issue will be brought before the Mill Creek council for a decision.

Immediately following each sampling event, project staff will perform calculations and determinations for precision, accuracy, and completeness. The procedures for determining accuracy, precision, and completeness are based on the EPA methods described in *The Volunteer Monitor's Guide To Quality Assurance Project Plans*, pp. 17-20 (see Appendix D). These tests will also apply to the duplicate samples sent to professional labs for analysis and will provide a measure of accuracy.

If data quality indicators do not meet the project's specification, the data may be discarded and the tests re-run. The project coordinator will try to determine the cause and apply appropriate corrective measures. These causes could include equipment failure, calibration error, or declining reagent effectiveness, and would initiate alterations in the maintenance and inspection procedures. If the problem is attributed to sampler error, then the instruction sheets will be checked over and re-training will occur. Any data problems and subsequent procedural changes will be documented with the original data sheet.