

Volume II:

**SAMPLING AND ANALYSIS PLAN FOR THE
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
OF THE UPLANDS ENVIRONMENT
AT THE FORMER RAYONIER PULP MILL SITE**

Prepared for

Rayonier

Jacksonville, Florida

Prepared by

integral
consulting inc.

1500 112th Avenue NE, Suite 101
Bellevue, Washington 98004

and

FOSTER  WHEELER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

12100 NE 195th Street
Bothell, WA 98011

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ACRONYMS AND ABBREVIATIONS

°C	degrees Celsius
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
BAF	bioaccumulation factor
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CLP	Contract Laboratory Program
cm/sec	centimeter per second
COPC	contaminant of potential concern
DOT	U.S. Department of Transportation
DQO	Data Quality Objective
E&E	Ecology and Environment, Inc.
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EDTA	ethylene diaminetetraacetic acid
Eh	redox potential
EPA	U.S. Environmental Protection Agency
EPH	extractable petroleum hydrocarbon
ESI	Expanded Site Inspection
FCR	Field Change Request
FOL	Field Operations Lead
Foster Wheeler	Foster Wheeler Environmental Corporation Environmental
FR	
FSP	Field Sampling Program
GPS	Global Positioning System
GRO	gasoline range organics
HASP	Health and Safety Plan
HDPE	high density polyethylene
IDL	instrument detection limit
IEUBK	integrated exposure uptake biokenetic
Integral	Integral Consulting, Inc.
L/min	liter per minute
LNAPL	light nonaqueous phase liquid
mg/kg	milligram per kilogram
MTCA	Model Toxics Control Act
mV	megavolt
MW	monitoring well
oz.	ounce
PAH	polynuclear aromatic hydrocarbon

PCB	polychlorinated biphenyl
PCP	pentachlorophenol
PID	photoionization detector
PVC	polyvinyl chloride
PZ	piezometer
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
Rayonier	Rayonier, Inc.
RCRA	Resource Conservation and Recovery Act
redox	reduction/oxidation
RI	Remedial Investigation
SAP	Sampling and Analysis Plan
SIM	selected ion
SMS	sediment management standards
SMT	Site Management Team
SOP	Standard Operating Procedure
SQL	sample quantitation limit
SSL	spent sulfite liquor
SVOC	semivolatile organic compound
TCDD	tetrachlorodibenzo-p-dioxin
TDS	total dissolved solid
TEF	total equivalency factor
TEQ	toxic equivalent concentration
TOC	total organic carbon
TPH	total petroleum hydrocarbon
Tribe	The Lower Elwha Klallam Tribe
TSS	Total Suspended Solid
TSS	total suspended solid
TVS	total volatile solids
USCS	Unified Soil Classification System
UST	underground storage tank
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbon
WAC	Washington Administrative Code
WRD	Water Resources Department

GLOSSARY

Accuracy— The agreement between a reported result and the true value.

Analyte— That which is identified and quantified in the process of analyzing the sample.

Assessment— The evaluation process used to measure the performance or compliance of sampling and analysis activities.

Calibration— The determination of the relationship between instrument response and

Conceptual Site Model (CSM)— Information on the contamination, fate and transport, and receptors potentially present at a site. The model is used as a tool in risk assessment to describe relationships between chemical contaminants and potentially exposed receptor organisms. The conceptual site model includes known and suspected sources of contamination, types of contaminants, affected media, known and potential routes of migration, and known or potential human and ecological receptors.

Congener— In the context of dioxins or furans, structures with the same degree (number) of chlorine atoms. For example 1,2,3,4,7,8-hexachloro dibenzo dioxin and 1,2,3,6,7,8-hexachloro dibenzo dioxin, are congeners.

Control Limit(s)— A value or range of values against which results of QC sample analyses are compared in order to determine whether the performance of a system or method is acceptable. Control limits are typically statistically derived. When QC results exceed established control limits, appropriate corrective action should be taken to adjust the performance of the system or method.

Corrective Action— Measures taken to remove, adjust, remedy, or counteract a malfunction or error so that a standard or required condition is subsequently met.

Data Quality Objectives (DQOs)— DQOs are qualitative and quantitative statements that define the appropriate type and quality of data needed to support the objective of a given project.

Dioxin— A generic term, often used to describe a group of 210 structurally related halogenated aromatic hydrocarbons. These compounds are distributed between two classes, the polychlorinated dibenzodioxins and the polychlorinated dibenzofurans.

Feasibility Study (FS)— An investigation or study that provides identification and evaluation of site cleanup alternatives. It stems from the Remedial Investigation (RI) process and is followed by the cleanup action plan. The FS evaluates site information and associated technology data to enable the selection of a cleanup action plan.

Field Blank—A simulated sample (usually consisting of laboratory pure water) that is taken through all phases of sample collection and analysis. Results of field blank analyses are used to assess the positive contribution from sample collection and analysis procedures to the final result.

Graphite Furnace Atomic Absorption Spectroscopy (GFAA)—A technique for metals analysis in which a sample is atomized in a graphite tube in a furnace, and the resulting vapor placed in a beam of radiation containing excited molecules of the element to be measured. Attenuation of the transmitted radiation is a measure of the concentration of that element in the sample.

Guideline—A recommended practice that is non-mandatory.

Health and Safety Plan (HASP)—A plan to help ensure worker health and safety while conducting investigations at the former Rayonier Mill Site. It includes sections on protective clothing, decontamination, emergency medical information, and information on potential contaminants.

Management Plan—This is a cumulative document of various plans, including the conceptual site model (CSM), sampling and analysis plan (SAP), Health and Safety Plan (HASP), and quality assurance project plan (QAPP).

Matrix Spike—A QC sample that is created by adding known amounts of analytes of interest to an actual sample, usually prior to extraction or digestion. The matrix spike is analyzed using the normal analytical procedures. The result is then corrected for the analyte concentration determined in the unspiked sample, and expressed as a percent recovery. This provides an indication of the sample matrix effect on the recovery of target analytes.

Matrix—The sample material in which the analytes of interest are found (e.g., water, sediment, tissue).

Method Blank—A QC sample intended to determine the response at zero concentration of analyte and assess the positive contribution from sample analysis procedures to the final result. A clean matrix (generally water) known to be free of target analytes that is processed through the analytical procedure in the same manner as associated samples.

Method Detection Limit (MDL)—The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero; determined from analysis of a sample in a given matrix containing the element.

Method—A body of procedures and techniques for performing an activity that is systematically presented in the order in which they are to be executed.

Normalize—Perform a data calculation in order to express results in terms of a reference parameter or characteristic.

Precision—The statistical agreement among independent measurements determined from repeated applications of a method under specified conditions. Usually expressed as relative percent difference, relative standard deviation, or coefficient of variation.

Qualified Data—Data to which data qualifiers have been assigned. Data qualifiers provide an indication that a performance specification in the qualified sample or an associated QC sample was not met, or that a special condition existed during the analysis of the sample.

Quality Assurance (QA)—An integrated system of management activities involving planning, implementation, assessment, reporting, and quality improvement to ensure that a process, item, or service is of the type and quality needed and expected by the customer.

Quality Assurance Project Plan (QAPP)—A formal planning document describing the necessary QA, QC, and other technical activities that must be implemented to ensure that the results of the work performed will satisfy the stated performance criteria.

Quality Control (QC)—The routine application of procedures for obtaining prescribed standards of performance in the monitoring and measurement process. QC is an element of QA. QC sampling and auditing/assessment are common QC activities.

Quantification—The process of calculating the value of an analyte in a particular sample.

Receptor—An organism or medium that receives exposure to a toxic or harmful substance.

Recovery—The percentage difference between two measurements, before and after spiking, relative to the concentration spiked, or the percentage difference between a measured value and a true value, as in the case of a reference material or check standard.

Relative Percent Difference—Difference of two measurements x_1 and x_2 divided by the mean of the measurements, multiplied by 100.

Remedial Investigation (RI)—Any action that provides information on the extent and magnitude of contamination at a site. The purpose of the remedial investigation/feasibility study is to collect and develop sufficient site information enabling the selection of a cleanup action. This includes characterization of the site, risk assessment, and feasibility study.

Risk Assessment (RA)—The process by which the form, nature, extent, and characteristics of a risk are estimated. Types include human health risk assessments (impact to people) and ecological risk assessments (impact to plants and animals).

Risk—The probability of harm, including short-term and long-term effects, to human health, the ecology of the economic system, or the quality of human life.

Sampling and Analysis Plan (SAP)—A plan that includes information on sampling frequency, sampling locations, sampling procedures, chain of custody, acceptance criteria, analytical methods, and data quality management.

Semivolatile organic compounds (SVOCs)—Organic compounds with moderate or low vapor pressures that can be extracted from samples using organic solvents.

Site Health and Safety Plan (SHSP)—A plan to help ensure worker health and safety while conducting investigations at the site. It includes sections on protective clothing, decontamination, emergency medical information, and information on potential contaminants.

Spike—The addition of a known amount of a substance to a sample or a blank.

Standard—A substance or material, the properties of which are believed to be known with sufficient accuracy to permit its use to evaluate the same property of a sample. In chemical measurements, standard often describes a solution of analytes used to calibrate an instrument.

Target Analytes—(or **Target Compounds**)—One or more elements or compounds that are intended to be determined by an analytical procedure (often in contrast to tentatively identified compounds).

Tentatively Identified Compounds—Compounds not considered to be primarily target analytes, but which are tentatively determined during analysis. Typically associated control limits or QC are not available for these compounds, hence the tentative identification.

Toxic Equivalent Concentration (TEQ)—A calculated concentration used to represent the toxicity of a dioxin sample so that it may be easily compared with another dioxin sample containing a different combination of some of the 210 compounds in the dioxin family. The process is to assign each member of the dioxin family a value weighted to the toxicity of the most toxic member of the group, 2,3,7,8-TCDD. This compound has a value of 1, while all others are some fraction of 1.

Validation—Confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled. It can refer to a process whereby environmental data are determined by an independent entity to be complete

and final (i.e., subject to no further change), and to have their value for the intended use described by both qualitative and quantitative statements.

Volatile Organic Compounds (VOCs)—Organic compounds with high vapor pressures that tend to evaporate readily from a sample.

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