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August 23, 2018

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SOLICITATION OF APPLICABLE RELEVANT AND APPROPRIATE REQUIREMENTS, CONSIDERATION FOR LONG-TERM EFFECTIVENESS OF REMEDIES EVALUATED & IDENTIFICATION OF AGENCY DATA NEEDS FOR DECISION MAKING, FORMER GEORGIA-PACIFIC MILL SITE, FORT BRAGG, CALIFORNIA

Dear Ms. Miller,

Applicable Relevant and Appropriate Requirements

The Department of Toxic Substances Control (DTSC) as lead agency for the investigation and remediation of the former Georgia-Pacific Mill Site (Site) in Fort Bragg California is soliciting Applicable Relevant and Appropriate Requirements (ARARs)¹ for the Operable Unit E of the Georgia-Pacific Mill Site. DTSC is currently reviewing the draft Feasibility Study (FS) for the cleanup of Operable Unit E (OU-E). The FS describes remedial action objectives, ARARs, and a preliminary screening of potentially feasible options to address sediment and groundwater contamination concerns at OU-E.

¹ The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and its regulations (40 [Code of Federal Regulations] CFR 300 et seq., referred to as the NCP) provide an established, and generally accepted, framework for evaluating and remediating industrial sites. Under the NCP, remedial actions must attain (or justify the waiver of) any federal or more stringent state environmental standards and facility citing laws that are "applicable or relevant and appropriate." These regulatory requirements are known as ARARs. The ARARs are used to develop quantitative Remedial Action Objectives, determine the extent of site cleanup, and govern the implementation and operation of the selected alternatives.

Although some ARARs have been identified in the draft FS, DTSC is sending this solicitation letter to ensure that all ARARs which may potentially relate to eventual sediment and groundwater remedial action at the Site have been correctly identified in the FS. A table of the current ARARs is attached to this letter (Table 3-1 of the draft Feasibility Study). Federal, state, and local ARARs can be divided into the following categories:

Chemical-specific ARARs: Chemical-specific or ambient requirements include those laws and regulations that govern the release to the environment of materials possessing certain chemical or generally set health- or risk-based concentration limits, or discharge limitations for specific hazardous substances that may be found in, or discharged to, the ambient environment. If, in a specific situation, a chemical is subject to more than one discharge or exposure limit, the more stringent of the requirements should generally be applied.

Performance, design, or action-specific ARARs: Action-specific ARARs consist of requirements that define acceptable handling, treatment, and disposal procedures for hazardous substances. These ARARs generally set performance, design, or other similar action-specific controls or restrictions on particular kinds of activities related to management of hazardous substances or pollutants. These requirements are triggered by the particular remedial activities that are selected to accomplish the cleanup remedy.

Location-specific ARARs: Location-specific ARARs are those requirements that relate to the geographical or physical position of the site, rather than the nature of the contaminants or the proposed site remedial actions. These requirements may limit the type of remedial action that can be implemented and may impose additional constraints on the cleanup action.

A requirement may not meet the definition of an ARAR but may still be useful in determining whether to take action at a site or to what degree action is necessary. Some requirements are called to-be-considered (TBC) criteria. The TBC requirements are non-promulgated advisories or guidance issued by federal, state, or local government that are not legally binding, but may provide useful information or recommend procedures for remedial action.

Related to the identification of ARARs, DTSC seeks specific information on the application of ARARs for the different alternatives included in the FS. For example, what are the ARARs and how might they apply for alternatives that include excavation of contaminated sediment, but no loss of wetland area? Another example, what are the ARARs and how might they apply to sediment containment remedies, such as covers or dams, for sites located at or near the ocean?

Second, DTSC is also seeking information from your Agency on considerations related to long-term effectiveness of the remedies evaluated in the FS, as further described

below. Finally, the third purpose of this letter is to better understand your Agency data needs for decision-making related to the Site, as described in greater detail below.

Site Background

OU-E is one of five operable units on the site (see attached Figure 1-2) and consists of approximately 12 acres of man-made ponds and seasonal wetland areas and 45 terrestrial acres divided into eight areas of interest (AOIs) (see attached Figure 1-3). Aquatic areas evaluated in the FS include Ponds 1-4 (South Ponds), 6-8, and the North Pond. Ponds 5 and 9 were investigated and not contaminated; therefore, these ponds not evaluated in the FS. A Removal Action, completed in 2017, for OU-E soils meet unrestricted cleanup goals; therefore, soil is not included in the FS. OU-E groundwater contains barium and petroleum hydrocarbons. Groundwater remedies are evaluated in the FS.

Remedial Alternatives Evaluated for the Pond Sediments

The primary contaminants in pond sediment are dioxin and arsenic. The OU-E FS includes several alternatives to address the risks to a recreational visitor to the ponds. The draft OU-E FS includes a summary and comparison of Remedial Alternatives in Table 7-1 of the FS (attached). The remedial alternatives in the draft OU-E FS for aquatic sediments for the South Ponds (1-4), Ponds 6, 7, 8, and the North Pond include:

- No action;
- Institutional controls: land use restrictions, sediment management, and containment (for Ponds 6, 7, 8 and North Pond),
- Vegetative soil cover (dry) and institutional controls;
- Excavation and disposal;
- Vegetative sediment cover over contaminated sediment and institutional controls;
- For Pond 8 sediment only, in-situ stabilization sediment.

Remedial Alternatives Evaluated for the Groundwater

Table 7-1 of the FS contains a comparison of groundwater alternatives (attached). Groundwater in the Interim Remedial Measure (IRM) AOI and the West of IRM AOI contains fuel related constituents. Groundwater in the OU-E Lowlands AOI contains barium and petroleum hydrocarbons are present in IRM AOI and West of IRM AOI. The remedial alternatives for groundwater include;

- No action;
- Restricted use: land use controls (restricted use of groundwater) and long-term operations and management;
- Monitored natural attenuation and institutional controls (restricted use of groundwater);

- Enhanced aerobic bioremediation, monitored natural attenuation, and institutional controls;
- Enhanced anaerobic bioremediation, monitored natural attenuation, and institutional controls;

Long-Term Effectiveness of Remedial Action Alternative

DTSC must evaluate the long-term effectiveness of each remedial alternatives in the draft FS. DTSC is therefore interested in the possible impacts of sea level rise, earthquakes and tsunamis on the remedy alternatives evaluated (as described above) that involve leaving contaminated sediment in place. These remedies involve containment of sediment through use of the Mill Pond Dam, Beach Berm, covers, or in-situ stabilization at locations near the ocean. Failure of the containment structures could result in a release of contaminated pond sediment to the ocean.

Identification of Agency Data Needs for Decision-Making

It is our understanding that the ARARs applicable to your Agency and longer-term actions related to remedy implementation may require additional data for your decision-making process related to the Mill Site. The third purpose of this letter is to inquire about these data needs and timing so that we can work collaboratively with the Responsible Party and consultants to ensure that this data is available at the most opportune time for your Agency's decision-making.


For example, the Mill Pond Dam and Beach Berm are within the Coastal Zone; therefore, repairs and enhancements of these structures will require a Coastal Development Permit. DTSC would appreciate information related to the application of the Coastal Act and other Coastal Commission policy or guidance that might apply to the remedial alternatives for Ponds 6, 7, 8 and the North Pond that include containment of sediment.

DTSC has truly appreciated all of your Agency's work on this project, and looks forward to continuing working with you collaboratively in the future.

Ms. Tabatha Miller
August 23, 2018
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Please provide information requested in this letter to DTSC by September 24, 2018.
If your agency requires additional information regarding the alternatives evaluated in the FS or has questions regarding this request for information, please contact me at 510-540-3776 or Tom.Lanphar@dtsc.ca.gov.

Sincerely,



Tom Lanphar
Senior Environmental Scientist
Department of Toxic Substances Control

Enclosures: Figures 1-3, draft FS
Table 3-1, draft FS
Table 7-1, draft FS








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Legend

-  SITE BOUNDARY
 AOI BOUNDARY
 OU-E BOUNDARY
 OU-A BOUNDARY
 APPROXIMATE CENTRAL COASTAL TRAIL PROPERTY (CITY OF FORT BRAGG)
 PONDS
 AREA OF CONCERN BOUNDARY

AREAS OF CONCERN:

- ☐ A OUE LOWLAND
☐ B SOUTHERN PONDS
☐ C POND 5
☐ D POND 6
☐ E POND 7
☐ F NORTH POND

- (G)** POND 8
- (H)** POND 9

ACRONYMS:

ACRONYMS.
AOI - AREA OF INTEREST
OU - OPERABLE UNIT

Kennedy/Jenks Consultants

Former Georgia-Pacific Wood Products Facility
Fort Bragg, California

OU-E Area of Interest Map and Associated Features

1665018*18
Figure 1-3

Standard, Requirement, Criteria, Limitation	Citation	Description	Type of ARARs
Federal			
Clean Air Act	42 USC 7401-7642	Emission standards from stationary and mobile sources	Chemical
Clean Water Act	33 USCA 1251-1376 40 CFR 100-149	Regulations requiring development and implementation of a storm water pollution prevention plan	Action
National Archaeological and Historical Preservation Action	16 USC 469 36 CFR 65	Provides requirements if significant scientific/cultural/historical artifacts are found	TBC
Occupational Health and Safety	29 CFR 1910.120	Establishes requirements for health and safety training	Action
Regional Screening Levels	USEPA Region 9, 2015	Risk-based concentrations that are intended to assist risk assessors and others in initial screening-level evaluations of environmental measurements.	TBC
Resource Conservation and Recovery Act (RCRA)	42 USC 6901 et. seq. 40 CFR 258	Establishes criteria for generation, management, and disposal of non-hazardous solid waste	Chemical/ Action
	42 USC 6901 et. seq. 40 CFR 261	Establishes criteria to determine whether solid waste exhibits characteristics that makes it a regulated hazardous waste	Chemical/ Action
	42 USC 6901 et. seq. 40 CFR 263	Standards applicable to transporters of hazardous waste	Chemical/ Action
Risk Assessment Guidance for Superfund; Ecological Risk Assessment Guidance for Superfund; Ecological Soil Screening Levels	USEPA, 1989, 1997, 2010	Guidance and framework to assess human and ecological risks	TBC
Toxic Substances Control Act	40 CFR 761.60, 761.61, 761.75	Regulations that determine the appropriate characterization, cleanup, and disposal requirements for PCBs	Chemical/ Action
State and Local			
Ambient Air Quality Standards	HSC 39000-44071 MCAQMD Regulations 1-5	Establishes standards for emissions of chemical vapors and dust	Chemical
California Coastal Act	Public Resources Code Division 20	Establishes permitting requirements and conditions for any "development" which remedial activities qualify as.	Location/ Action
California Environmental Quality Act	PRC Division 13	Mandates environmental impact review of projects approved by governmental agencies	Action
California Hazardous Substances Account Act	HSC 25300-25395.15	Establishes site mitigation and cost recovery programs	Action
California Hazardous Waste Control	HSC 5100-25250.26	Establishes hazardous waste control measures	Action
California Human Health Screening Levels (CHHSLs)	CalEPA, 2010	Risk-based concentrations for human receptors that are intended to assist risk assessors and others in initial screening-level evaluations of environmental measurements.	TBC
City of Fort Bragg Grading Permit Requirements and Procedures	Title 18, Chapter 18.60 et. seq.	Establishes requirements for excavation and grading.	Location/ Action
Cover, grading, and alternative design requirements	27 CCR 21090(a)(1) through (3) and (b)(1)	Establishes criteria for cover and grading. Alternative cover designs are also acceptable.	Action
Discharges of Hazardous Waste to Land	Title 23, California Code of Regulations, Division 3, Chapter 15	Applies to discharge of waste	Action
Emission Standard	MCAQMD Regulation 1 Chapters 1, 2 and 4.	Establishes emission standards and permitting requirements for equipment and dust.	Action
Identification and listing of hazardous waste	HSC 25100 et. seq. 22 CCR 66261	Establishes criteria for characterization and classification of remediation waste.	TBC
Manifest System, Record-Keeping, Reporting and Transportation of Hazardous Waste	22 CCR Chapter 13	Governs transportation of hazardous materials	Action
Occupational Health and Safety	8 CCR GISO 5192	Establishes worker health and safety requirements	Action
Porter-Cologne Water Quality Control Act	California Water Code, Section 13000	Establishes policy for preservation and enhancement of the beneficial uses of the waters of the state	SWRCB

Table 3-1: Applicable or Relevant and Appropriate Requirements (ARARs) and "To be Considered" (TBC) Factors

Standard, Requirement, Criteria, Limitation	Citation	Description	Type of ARARs
Relevant Policies for the Protection and Conservation of Fish and Wildlife	California Fish and Game Code Section 2014	Requires conservation of natural resources and prevention of the willful or negligent destruction of birds, mammals, fish, reptiles, or amphibia.	Location/ Action
	California Fish and Game Code Section 1600	Establishes protection and conservation of the fish and wildlife resources.	Location/ Action
Remedial Action Plan Policy	EO-95-007-PP	Guidance and framework to develop a remedial action plan	TBC
Requirements for Substances Deleterious to Fish and Wildlife	California Fish and Game Code Section 5650	Makes it unlawful to deposit into, permit to pass into, or place where it can pass into the waters of the state certain specified pollutants.	Chemical/ Action
Site Investigation and Remediation Order	Docket No. HSA-RAO 06-07-150	Establishes requirements for investigation and site remediation	Action
State PCB Requirements	22 CCR 66261.113	Establishes standards to disposal of PCBs	Chemical/ Action
State Water Resources Control Board (SWRCB) Resolution No. 68-16	SWRCB, 1968	Establishes policy for the regulation of discharges to waters of the state.	TBC
SWRCB Resolution No. 92-49	SWRCB, 1996 California Water Code Section 13304	Establishes policies and procedures for investigation and cleanup and abatement of discharges.	TBC
Stockpiling Requirements of Contaminated Soil	HSC 25123.3(a)(20)	Establishes standards for stockpiling of non-RCRA contaminated soil	Location/ Action
Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities; Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities	DTSC, 1996 CalEPA, 2015	Guidance and framework to assess human and ecological risks	TBC
Title 22, California Hazardous Waste Control Act of 1972	22 CCR 66260.1 et seq.	Establishes criteria for determining waste classification for the purposes of transportation and disposal of wastes	Chemical/ Action
	22 CCR 66262.1 et seq.	Establishes standards applicable to generators of hazardous waste	Action
	22 CCR Chapter 18	Identifies hazardous waste restricted from land disposal unless specific treatment standards are met	Chemical/ Action
Title 27, Division 2 of the California Code of Regulations	27 CCR 20005 et seq.	Regulation of solid waste	Chemical/ Action
Water Quality Control Plan for the North Coast Region	NCRWQCB, May 2011	Beneficial uses, water quality objectives, and implementation plans	Chemical/ Action

Notes:

ARAR - Applicable or Relevant and Appropriate Requirements
 CalEPA - California Environmental Protection Agency
 CCR - California Code of Regulation
 CFR - Code of Federal Regulation
 CHHSLs - California Human Health Screening Levels
 DTSC - Department of Toxic Substances Control
 GISO - General Industry Safety Order
 HSC - Health and Safety Code
 MCAQMD - Mendocino County Air Quality Management District

NCRWQCB - North Coast Regional Water Quality Control Board
 PCB - polychlorinated biphenyl
 PRC - Public Resource Code
 RCRA - Resource Conservation and Recovery Act
 SWRCB - State Water Resources Control Board
 TBC - to be considered
 USC - United States Code
 USCA - United States Code Annotated
 USEPA - United States Environmental Protection Agency

References:

DTSC. 1996. *Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities*. State of California Environmental Protection Agency, Office of Scientific Affairs. August.
 CalEPA. 2015. *Public Health Goals for Drinking Water*. Office of Environmental Health Hazard Assessment. Available online at: <http://www.oehha.ca.gov/water/phg/index.html>. February.
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 NCRWQCB. *Water Quality Plan for the North Coast Region*. Available online at: http://www.waterboards.ca.gov/northcoast/water_issues/programs/basin_plan/083105-bp/basin_plan.pdf. May.
 SWRCB. 1968. *Resolution No. 68-16, Statement of Policy with Respect to Maintaining High Quality of Waters in California*. Available online at: http://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/1968/rs68_016.pdf. October 28.
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 USEPA. 1989. *Risk Assessment Guidance for Superfund*. Office of Emergency and Remedial Response. EPA/540/1-89/002. Available online at: <http://www.epa.gov/oswer/riskassessment/ragsa/>. December.
 USEPA. 1997. *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments*. Office of Emergency and Remedial Response. EPA 540-R-97-006. Available online at: <http://www.epa.gov/oswer/riskassessment/ecorisk/ecorisk.htm>. June.
 USEPA. 2010. *Ecological Soil Screening Levels*. Available online at: <http://www.epa.gov/ecotox/ecoss/index.html>. October.
 USEPA. Region 9. 2015. *Regional Screening Levels (Formerly PRGs)*. Available online at: <http://www.epa.gov/region9/superfund/prg/>. June.

Feasibility Study – Operable Unit E

Former Georgia-Pacific Wood Products Facility, Fort Bragg, California

WFOV/CAC-Road/KJ-Project/Site/Investigation/PA/2016/06/01/16_OPR/FortBragg/06-Report/06-01/EFSP/2016/Tables/CURRENT/Tables 3-1 through 3-1, 2017.

Table 7-1: Comparison of Remedial Alternatives

Media	AOC	Risk Summary	Alternative	Description	Threshold (Yes or No) Criteria		Balancing (Low, Moderate, or High) Criteria				
					Overall Protection of Human Health and the Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume Through Treatment	Short Term Effectiveness	Implementability	Cost
Aquatic Sediment	Ponds 1-4 (Southern Ponds)	Arsenic and dioxin TEQ are the primary risk drivers in Pond 1-4 sediment. Risks evaluated in the BHHRA indicate ELCR of 8E-06 for sediments 0-0.5 feet in depth and 7E-06 for sediments 0-2 feet in depth.	No Action	Site remains as is; provide no additional control or action to protect human health or the environment from affected sediment.	No	No	Low	Low	High	High	\$0
			Institutional Controls	Restrict future land use via deed restriction and implement risk management plan for soil/sediment based on COIs and associated risks.	Yes	Yes	Moderate	Low	High	High	\$143,000
			Vegetative Soil Cover and Institutional Controls	Provide an upland vegetative cover to cover each individual pond. Eliminate exposure pathways through vegetative containment, and implementation of a deed restriction and risk management plan for soil/sediment based on COIs and associated risks.	Yes	Yes	Moderate	Low	High	Moderate	\$4,616,226
			Excavation and Disposal	Eliminate exposure pathways through soil excavation and disposal offsite at a permitted landfill.	Yes	Yes	High	High	Low	Moderate	\$2,516,640
			Vegetative Sediment Cover and Institutional Controls	Provide a vegetative wetland cover to cover each individual pond. Eliminate exposure pathways through vegetative containment, and implementation of a deed restriction and risk management plan for soil/sediment based on COIs and associated risks.	Yes	Yes	Moderate	Low	High	Moderate	\$2,471,340
	Pond 7	Arsenic and dioxin TEQ are the primary risk drivers in Pond 7 sediment. Risks evaluated in the BHHRA indicate ELCR of 2E-05.	No Action	Site remains as is; provide no additional control or action to protect human health or the environment from affected sediment. Existing beach berm would continue to provide sediment containment.	No	No	Low	Low	High	High	\$0
			Institutional Controls	Restrict future land use via deed restriction and implement risk management plan for soil/sediment based on COIs and associated risks. Beach berm repairs provide improved sediment containment.	Yes	Yes	Moderate	Low	High	High	\$161,000
			Vegetative Soil Cover and Institutional Controls	Provide an upland vegetative cover to cover the pond. Eliminate exposure pathways through vegetative containment, and implementation of a deed restriction and risk management plan for soil/sediment based on COIs and associated risks. Beach berm repairs provide improved sediment containment.	Yes	Yes	Moderate	Low	High	Moderate	\$610,020
			Excavation and Disposal	Eliminate exposure pathways through soil excavation and disposal offsite at a permitted landfill. Beach berm repairs provide improved sediment containment.	Yes	Yes	High	High	Low	Moderate	\$525,720
			Vegetative Sediment Cover and Institutional Controls	Provide a vegetative wetland cover to cover the pond. Eliminate exposure pathways through vegetative containment, and implementation of a deed restriction and risk management plan for soil/sediment based on COIs and associated risks. Beach berm repairs provide improved sediment containment.	Yes	Yes	Moderate	Low	High	Moderate	\$481,020

Table 7-1: Comparison of Remedial Alternatives

Media	AOC	Risk Summary	Alternative	Description	Threshold (Yes or No) Criteria		Balancing (Low, Moderate, or High) Criteria				
					Overall Protection of Human Health and the Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume Through Treatment	Short Term Effectiveness	Implementability	Cost
Aquatic Sediment (cont.)	North Pond and Pond 6	Arsenic and dioxin TEQ are the primary risk drivers in Pond 6 sediment, while arsenic was the primary risk contributor in North Pond sediment. Risks evaluated in the BHHRA indicate ELCR of 2E10-6.	No Action	Site remains as is; provide no additional control or action to protect human health or the environment from affected sediment. Existing beach berm would continue to provide sediment containment.	No	No	Low	Low	High	High	\$0
			Institutional Controls	Restrict future land use via deed restriction and implement risk management plan for soil/sediment based on COIs and associated risks. Beach berm repairs provide improved sediment containment.	Yes	Yes	Moderate	Low	High	High	\$162,000
			Vegetative Soil Cover and Institutional Controls	Provide an upland vegetative cover to cover the pond. Eliminate exposure pathways through vegetative containment, and implementation of a deed restriction and risk management plan for soil/sediment based on COIs and associated risks. Beach berm repairs provide improved sediment containment.	Yes	Yes	Moderate	Low	High	Moderate	\$647,880
			Excavation and Disposal	Eliminate exposure pathways through soil excavation and disposal offsite at a permitted landfill.	Yes	Yes	High	High	Low	Moderate	\$1,071,480
			Vegetative Sediment Cover and Institutional Controls	Provide a vegetative wetland cover to cover the pond. Eliminate exposure pathways through vegetative containment, and implementation of a deed restriction and risk management plan for soil/sediment based on COIs and associated risks.	Yes	Yes	Moderate	Low	High	Moderate	\$564,780
	Pond 8	Dioxin TEQ is the primary risk drivers in sediment. Risks evaluated in the BHHRA indicate ELCRs are 2E-6 cumulative with the primary contributors of 1E-6 for dioxin and 1E-6 for arsenic. Arsenic concentrations are at background.	No Action	Site remains as is; provide no additional control or action to protect human health or the environment from affected sediment. Mill Pond Dam continues to provide sediment containment.	No	No	Low	Low	High	High	\$0
			Institutional Controls	Restrict future land use via deed restriction and implement risk management plan for soil/sediment based on COIs and associated risks. Dam repairs provide improved sediment containment.	Yes	Yes	High	Moderate	High	High	\$2,847,870
			In-Situ Soil Mixing and Institutional Controls	Proposes to treat sediment in place through stabilization by the addition of binders and Portland cement to restrict exposure of potential receptors to affected media, and would limit potential direct contact with affected sediment, or infiltration of water. Dam repairs provide improved sediment containment.	Yes	Yes	High	Moderate	Low	Low	\$18,913,400
			Excavation and Disposal	Eliminate exposure pathways through excavation and disposal offsite at a permitted landfill. Dam repairs provide improved sediment containment.	Yes	Yes	High	High	Low	Moderate	\$30,549,000
			Vegetative Sediment Cover and Institutional Controls	Provide a vegetative wetland cover to cover the pond. Eliminate exposure pathways through vegetative containment, and implementation of a deed restriction and risk management plan for soil/sediment based on COIs and associated risks. Dam repairs provide improved sediment containment.	Yes	Yes	Low	Moderate	High	Low	\$12,513,000
			Vegetated Soil Cover and Institutional Controls	Alternative proposes to provide a vegetative cover to cover the pond to restrict exposure of potential receptors to affected media, and would limit potential direct contact with affected sediment, or infiltration of water. Dam repairs provide improved sediment containment.	Yes	Yes	Moderate	Low	High	Low	\$13,447,100

Media	AOC	Risk Summary	Alternative	Description	Threshold (Yes or No) Criteria		Balancing (Low, Moderate, or High) Criteria				
					Overall Protection of Human Health and the Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume Through Treatment	Short Term Effectiveness	Implementability	Cost
Groundwater	IRM and West of IRM TPHd and Lowland Barium	Fuel-related constituents (TPHd) and Barium are the residual COCs. Concentrations of Barium show downward trends near the WQO, which is also the MCL. Concentrations of TPHd show downward trends near the WQO, which is based on the taste and odor threshold.	No Action	Site remains as is; provide no additional control or action to protect human health or the environment from affected groundwater.	No	No	Low	Moderate	High	High	\$0
			Restricted Use	A deed restriction on the AOC, prohibiting the use of groundwater to eliminate exposure to COIs.	Yes	Yes	Moderate	Moderate	High	High	\$65,000
			Monitored Natural Attenuation and Institutional Controls	Periodic sampling of groundwater to evaluate natural biological and chemical remediation of COIs with contingency for potential future remedial actions, and restrict future groundwater use by establishing a deed restriction prohibiting use of onsite groundwater.	Yes	Yes	Moderate	Moderate	High	High	\$73,000
	IRM and West of IRM TPHd and Lowland Barium	Fuel-related constituents (TPHd) and Barium are the residual COCs. Concentrations of Barium show downward trends near the WQO, which is also the MCL. Concentrations of TPHd show downward trends near the WQO, which is based on the taste and odor threshold.	Enhanced Aerobic Bioremediation, MNA, and Institutional Controls	Injection of calcium peroxide solution for treatment of contaminants followed by periodic groundwater sampling to confirm that WQOs will be reached within a reasonable timeframe. Periodic sampling of groundwater to evaluate natural biological and chemical remediation of COIs with contingency for potential future remedial actions, and restrict future groundwater use by establishing a deed restriction prohibiting use of onsite groundwater. Only effective for petroleum related compounds.	Yes	Yes	High	High	Moderate	Moderate	\$211,000
			Enhanced Anaerobic Bioremediation, MNA, and Institutional Controls	Anaerobic bio-oxidation of COIs followed by treatment through natural attenuation mechanisms. Periodic sampling of groundwater to evaluate natural biological and chemical remediation of COIs with contingency for potential future remedial actions, and restrict future groundwater use by establishing a deed restriction prohibiting use of onsite groundwater. Only effective for petroleum related compounds.	Yes	Yes	High	High	Moderate	Moderate	\$201,100

Recommended alternatives are outlined with bold lines.

Green shading indicates that the screening criteria is met or has a high ranking in preference

Yellow shading indicates that the screening criteria is likely met or has a moderate ranking in preference.

Red shading indicates that the screening criteria may not be met or has a low ranking in preference.

Acronyms:

AOC - area of concern

AQI - area of interest

ARARs - Applicable or Relevant and Appropriate Requirements

B(a)P - benzo(a)pyrene

bgs - below ground surface

BHHRA - Baseline Human Health and Ecological Risk Assessment - Operable Unit E (ARCADIS, 2015)

COI - chemical of interest

cy = cubic yard

dioxin - polychlorinated dibenzo-p-dioxin (in case of TEQ, 2,3,7,8-tetrachlorodibenzo-p-dioxin [2,3,7,8-TCDD] in particular)

ELCR - excess lifetime cancer risk

ERA - ecological risk assessment

IRM - interim remedial measure

NCP - National Oil and Hazardous Substances Pollution Contingency Plan

PAH - polycyclic aromatic hydrocarbon

PRA - presumptive remedy area

sf - square feet

TEQ - toxic equivalent

TPHd - total petroleum hydrocarbons as diesel

WQO - Water Quality Objective

Reference:

ARCADIS. 2015. Baseline Human Health and Ecological Risk Assessment – Operable Unit E, Former Georgia-Pacific Wood Products Facility, Fort Bragg, California. Prepared for Georgia-Pacific LLC. August.

Feasibility Study – Operable Unit E

Former Georgia-Pacific Wood Products Facility, Fort Bragg, California

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