ATTACHMENT 1

Memorandum

DATE: March 1, 2024

TO: The Siskiyou County Board of Supervisors

FROM: Chelsea Murphy, CKM Environmental

SUBJECT: Klamath Dam Removal Project – Siskiyou County Environmental Health Water Quality Sampling Results for Heavy Metals

---

I. INTRODUCTION AND BACKGROUND

Drawdown of the three reservoirs along the Klamath River in Oregon and California as part of the Lower Klamath Dam Removal Project (Project) began in January 2024. Following the approved project planning and environmental documents, water from JC Boyle, Copco 1, and Iron Gate dams were released through spillway gates and adit tunnels, allowing for the controlled draining of the reservoirs. As noted in the approved environmental documents, including the Final Environmental Impact Statement (FEIS 2022), and Final Environmental Impact Report (FEIR 2020), as well as outlined in the Reservoir Area Management Plan (RAMP) (December 2022), no large-scale assisted sediment removal from the reservoir footprints is proposed as part of the project activities. The estimated amount of sediment that has accumulated in the project reservoirs is approximately 15.5 million cubic yards (4.3 million tons), with more than half of this volume accumulated in the Copco 1 reservoir (FEIS 2022). According to the KRRC project plans, "For a median water year, hydraulic modeling predicted that approximately half of the stored sediment would naturally erode and vacate the Reservoir Area (USBR, 2011b)" (RAMP 2022). The small-scale assisted sediment evacuation proposed at Iron Gate and Copco 1 reservoirs is focused on "high priority tributaries," with work only occurring between January 1 and March 15, 2024. The high priority tributaries identified by the Klamath River Renewal Corporation (KRRC) are Spencer Creek, Beaver Creek, Jenny Creek, Scotch Creek and Camp Creek.

With approvals from the regulatory agencies, the project plan for sediment transport is to allow the reservoirs to naturally release the accumulated sediments via drawdown, subsequent rain events, and erosion. As stated in the FEIS, 2022:

> *Drawdown would erode and mobilize sediments in the reservoirs primarily during the period of the drawdown… Interior and California DFG (2012) estimated that 36 to 57 percent of the accumulated sediment in the reservoirs would be mobilized, depending on hydrological conditions (i.e., flow magnitude and duration) during drawdown and dam removal. Additional erosion and mobilization of fine sediments could occur while the riverbed in the reservoir stabilizes in the following year but would likely be indistinguishable from the background sediment regime… The fine sediments in the reservoirs not eroded during drawdown and dam removal would consolidate on the terraces above the active channel. These areas would be stabilized through revegetation, engineered slope improvements, and other BMPs, as specified in the RAMP.*

> *Drawdown of the four reservoirs would release an estimated total of 1.5 to 2.4 million tons of sediment (table 3.1-3). The sediment mobilized from the reservoirs during drawdown is expected to be transported by the river to the ocean mostly as suspended sediment because most of it is predominantly fine-grained composition (silt and clay). Sand and coarser material (approximately 16 percent) would be transported more slowly, depending on the frequency and magnitude of flows and storage in the channel bed.*

The increased turbidity and sediment transport occurring during the drawdown phase of the dam removal project, and during precipitation/erosion events prior to vegetation establishment in the reservoirs, has resulted in public health concerns related to heavy metals and other undesirable water quality constituents. While KRRC is responsible for water quality sampling (both continuous monitoring and grab sampling), as part of the project's permit conditions (such as stated in the State of California 401 Water Quality Certificate from the State Water Quality Control Board [SWQCB]), the constituents monitored and analyzed by KRRC are for the protection of the aquatic environment. The purpose of KRRC's water quality monitoring is not to monitor the effects of the project on human health. Therefore, the Siskiyou County Board of Supervisors directed the Siskiyou County Environmental Health Division to collect water quality grab samples from the mainstem of the Klamath River for analysis of constituents that may be harmful to public health.

The purpose of this memorandum is to provide the public with information on the water quality samples taken by the County, and to give context and an analysis of the results regarding heavy metals.

II. BASELINE INFORMATION

To gain a comprehensive understanding of the effects of the Project on the water quality of the Klamath River, it's important to compare any sampling results to pre-project, or baseline, conditions. Heavy metals are naturally occurring in many environments, including within the Klamath Basin (ODEQ 2019), and can only become toxic through accumulation in organisms (bioaccumulation, which is further explained in Section IV). Various water quality and sediment sampling has occurred within the Klamath River, below Iron Gate throughout the past 20+ years. The results of these sampling efforts provide baseline information on the naturally occurring and preexisting inorganic compounds (such as heavy metals) and organic compounds (such as volatile organic compounds [i.e., gasoline, pesticides] and synthetic organic chemicals [i.e., synthetic polymers]). Below are the results of previous sampling activities along the Klamath River.

a. Sediment Baseline Information

As part of the Project's environmental review and approval process, the potential for adverse ecological or human health effects from chemical contamination in Klamath Reservoir sediments was analyzed. The analysis primarily relied on information from a screening-level evaluation of sediments from JC Boyle, Copco 1, and Iron Gate reservoirs, which was conducted by CDM Smith in 2011 for the U.S. Department of Interior Klamath Dam Removal Water Quality Sub Team. The full report is available here: https://ifrmp.net/file/screening-level-evaluation-of-

contaminants-in-sediments-from-three-reservoirs-and-the-estuary-of-the-klamath-river-2009-2011/. The report evaluated the reservoir sediment and elutriate chemistry (a process for separating lighter particles from heavier ones using a vertically-directed stream of gas or liquid), laboratory bioassays, bioaccumulation studies, and tissue of fish. This process generated multiple lines of evidence that were compared to five relevant exposure pathways of biota and human receptors to identify potential adverse effects (CDM 2011). The report analyzed a total of 501 constituents including metals, PAHs, PCBs, pesticides/ herbicides, phthalates, VOCs, SVOCs, dioxins, furans, and polybrominated diphenyl ethers (PBDEs) (i.e., flame retardants) (CDM 2011). The analysis processed used by CDM Smith in 2011(the sediment evaluation framework [SEF] process) identified the chemicals of potential concern (COPC) listed with the rationale for these decisions for project reservoirs (tables 3.3-9 through 3.3-11), and concluded that:

- Sediment in the project reservoirs and the estuary do not have significant levels of contaminants compared to screening levels within the SEF and human health criteria and relatively few chemicals identified as COPCs (FEIS 2022).
- All metals identified by CDM (2011) as COPCs in sediment of the project reservoirs, estuary or both had concentrations similar to local background, were lower than 2018 screening levels, or could not be detected with methods employed.
- In some cases, values for dioxins, furans, and PCBs are slightly higher than background values reported by EPA for Region 9 (i.e., 2 to 5 ppt), Region 10 (i.e., 4 ppt), and for non-impacted lakes of the United States (i.e., 5.3 ppt) (FEIS 2022; EPA, 2010).
- Toxic equivalent (TEQ) values indicate the dioxins, furans, and PCBs present in the reservoir sediments have limited potential for adverse effects for either ecological or human receptors exposed to sediment (FEIS 2022).

In addition, the CDM 2011 report evaluates the potential adverse effects to freshwater biota, marine biota, terrestrial biota, and humans associated with chemical exposure under five exposure pathways (CDM 2011, page 7-3). These pathways are: 1. Short-term exposure to sediments flushed downstream, 2. Long-term exposure to exposed reservoir terrace and or riverbank deposits, 3. Long-term exposure to new river channels and riverbed deposits, 4. Long-term exposure to marine/nearshore deposits, and 5. Long-term exposure to reservoir sediments. For humans, the report identifies that humans may be exposed to potentially harmful chemicals from the reservoir sediments via pathways 2, 3, and 5. However, for pathways 2 and 3, the report indicates that while one or more chemicals are present in that exposure pathway, the levels of those chemicals are unlikely to cause adverse effects based on the lines of evidence. Only pathway 5 indicated that one or more chemicals present within the pathway are at levels with potential to cause minor or limited adverse effects based on the lines of evidence (CDM 2011, page 7-3).

As directed in the Project's SWQCB's 401 Water Quality Certificate, KRRC was required to collect and analyze sediment samples from the Klamath Riverbed prior to the dam decommissioning. Seventeen organic and inorganic compounds (including heavy metals such as lead, aluminum, and arsenic) are listed as the minimum parameters for analysis. KRRC conducted Klamath River sediment sampling in October 2023 at four locations: 1. Klamath River

upstream of Copco No. 1 Reservoir and downstream of Shovel Creek, 2. Klamath River downstream of Copco No. 2 Powerhouse, no farther downstream than the Daggett Road bridge crossing of the Klamath River, 3. Klamath River at or near USGS gage no. 11516530 (below Iron Gate), and 4. Klamath River at or near USGS gage no. 11523000 (Orleans) (KRRC 2022; California Water Quality Monitoring Plan). The results are outlined in Table 1.

Table 1. RES Klamath River Sediment Sampling Results Pre-Drawdown

Sample Location	Sample Date	Analyte	Result	Units
Downstream Shovel Creek	10/18/2023	Arsenic	2.2	mg/kg
		Lead	1.4	mg/kg
		Copper	6.6	mg/kg
		Nickel	5.8	mg/kg
		Iron	6700	mg/kg
		Aluminum	4500	mg/kg
		Cyanide	ND	mg/kg
		Mercury	0.39	mg/kg
		Ethyl benzenes	ND	µg/kg
		Total xylenes	ND	µg/kg
		Dieldrin	ND	µg/kg
		DDT	ND	µg/kg
		DDD	ND	µg/kg
		TCDD	ND	pg/g
		DDE	ND	µg/kg
		PECDF	ND	pg/g
Klamath River at Daggett Bridge	10/18/2023	Arsenic	1.5	mg/kg
		Lead	1.8	mg/kg
		Copper	9.2	mg/kg
		Nickel	7.5	mg/kg
		Iron	8500	mg/kg
		Aluminum	8800	mg/kg
		Cyanide	ND	mg/kg
		Mercury	ND	mg/kg
		Ethyl benzenes	ND	µg/kg
		Total xylenes	ND	µg/kg
		Dieldrin	ND	µg/kg
		DDT	ND	µg/kg
		DDD	ND	µg/kg
		TCDD	ND	pg/g
		DDE	ND	µg/kg
		PECDF	0.825 J	pg/g
Klamath River below Iron Gate	10/18/2023	Arsenic	1.5	mg/kg

Sample Location	Sample Date	Analyte	Result	Units
		Lead	2.2	mg/kg
		Copper	10	mg/kg
		Nickel	9.5	mg/kg
		Iron	12000	mg/kg
		Aluminum	9300	mg/kg
		Cyanide	ND	mg/kg
		Mercury	ND	mg/kg
		Ethyl benzenes	ND	µg/kg
		Total xylenes	ND	µg/kg
		Dieldrin	ND	µg/kg
		DDT	ND	µg/kg
		DDD	ND	µg/kg
		TCDD	ND	pg/g
		DDE	ND	µg/kg
		PECDF	ND	pg/g
Klamath River at USGS Orleans Gage	10/19/2023	Arsenic	2.8	mg/kg
		Lead	3.3	mg/kg
		Copper	42	mg/kg
		Nickel	66	mg/kg
		Iron	20000	mg/kg
		Aluminum	18000	mg/kg
		Cyanide	ND	mg/kg
		Mercury	ND	mg/kg
		Ethyl benzenes	ND	µg/kg
		Total xylenes	ND	µg/kg
		Dieldrin	ND	µg/kg
		DDT	ND	µg/kg
		DDD	ND	µg/kg
		TCDD	ND	pg/g
		DDE	ND	µg/kg
		PECDF	ND	pg/g

ND: Not Detected – meaning that the constituent was in concentrations below the laboratory detection limit.
J: The constituent is above the laboratory detection limit, but below the limit of quantification.

These results provide background information on the pre-project contaminant levels in the Klamath River sediments. Per the SWQCB 401 Certification, KRRC is required to conduct sediment sampling after the dam removal is complete, at the four locations for the same constituents to evaluate the impacts of the Project on river sediments.

b. Water Quality Baseline Information

Memorandum

Pre-project water quality conditions are reported on in both the FEIS and the FEIR, including baseline information on inorganic and organic contaminants within the water column. Water quality samples have been reoccurring along the Klamath River under the California Surface Water Ambient Monitoring Program (SWAMP). SWAMP is a California State Water Resources Control Board (SWRCB) program that has a mission to provide resource managers, decision makers, and the public with timely, high-quality information to evaluate the condition of all waters throughout California. You can find more information on SWAMP and the state, regional, and specific monitoring programs here: https://www.waterboards.ca.gov/water_issues/programs/swamp/. The FEIR reports that (FEIR 202, page 3-38):

> *Data collected under the California Surface Water Ambient Monitoring Program (SWAMP) for the period 2001−2005 indicate that at eight monitoring sites from the Oregon-California state line to Turwar, the majority of inorganic constituents (i.e., arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc) detected in the Hydroelectric Reach, Middle Klamath River, and Lower Klamath River were in compliance with water quality objectives. Aluminum concentrations ranged from 50.7 to 99.2 ug/L, so all samples were less than California primary drinking water standards31 (1,000 ug/L), but some samples were slightly elevated above USEPA freshwater aquatic life standards (87 ug/L) along with USEPA and California secondary drinking water standards32 (50 ug/L) (North Coast Regional Board 2008)… The results of water quality studies during 2002 and 2003 at four USGS gage stations downstream of Iron Gate Dam indicate that, with the exception of nickel, magnesium, and calcium, the concentration of trace elements decreased as water flowed downstream, most likely because of binding to other particles and settling out of the water column (Flint et al. 2005) (see Appendix C for more detail).*

Water quality sample results from the SWAMP outlined in the *Summary Report for the North Coast Region (Regional Water Quality Control Board 1) for Years 2000 – 2006*, include information on baseline trace metals within the Klamath River Watershed Management Area (WMA). The most applicable hydrologic area (HA) within the WMA is the Middle Klamath River HA, which encompasses the area along the Klamath River from below Iron Gate Reservoir to Seiad Valley. Four locations were sampled 72 times over the six-year reporting period and included grab samples for the analysis of conventional water quality constituents (CON), trace metals concentrations (MET), pesticides and pesticide residues (PEST), and PCBs (PCB). For trace metals, the results were compared with multiple criteria based on the Basin Plan, California and USEPA guidelines for drinking water, the California Toxics Rule (CTR), and the USEPA recommended criteria for freshwater aquatic life protection. The results were the following (RWQCB 2008):

- *Arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver and zinc concentrations were all in compliance with every objective at the time of sampling.*

- *Aluminum concentrations potentially exceeded USEPA's continuous concentration for freshwater aquatic life protection (87 ug/L) on 23 of 59 site visits (39% exceedance rate), exceeded USEPA's secondary MCL for drinking water (50 ug/L) on 37 site visits (63% exceedance rate), and exceeded DHS's secondary MCL for drinking water (200 ug/L) on*

five site visits (8% exceedance rate). Aluminum concentrations ranged from 26.30 to 280.00 ug/L.

As required by the Project's SWQCB's 401 Water Quality Certificate, and as outlined in the Water Quality Monitoring and Management Plan for the project, KRRC is conducting monthly water quality sampling at 9 locations along the Klamath River. Both continuous monitoring, collected every 15 minutes for conventional water quality constituents (such as pH, dissolved oxygen, and turbidity), as well as grab samples for nutrients and two heavy metals – aluminum and methylmercury – is being collected by Resource Environmental Solutions (RES). Sampling efforts began in 2023, to collect baseline water quality data along the Klamath and will continue throughout the Project. As an example, Table 2 outlines the grab sample results from sampling efforts conducted in January 2023 at relevant Klamath River locations.

Table 2. RES Water Quality Grab Samples along Klamath River – January 2023

Sample Location	Sample Date	Analyte	Result	Units
Klamath River near Klamath, USGS Gage #11530500	1/17/2023	Total Nitrogen	0.274	mg N/L
		Nitrate	0.202	mg N/L
		Nitrite	<0.001	mg N/L
		Ammonia	<0.015	mg N/L
		Total Phosphorus	0.078	mg P/L
		Particulate Organic Phosphorus	<0.018	mg/L
		Orthophosphate	0.012	mg P/L
		Particulate Organic Carbon	<0.185	mg/L
		Dissolved Organic Carbon	1.76	mg/L
		Turbidity	44.2	NTU
		Suspended Sediment Concentration	93	mg/L
		Methylmercury	0.049	ng/L
		Settleable Solids	33.3	mg/L
		Particulate Aluminum	2.68	mg/L
		Dissolved Aluminum	0.069	mg/L
		Total Nitrogen	0.28	mg N/L

Memorandum

Sample Location	Sample Date	Analyte	Result	Units
Klamath River at Orleans, USGS Gage #11523000	1/17/2023	Nitrate	0.211	mg N/L
		Nitrite	<0.001	mg N/L
		Ammonia	<0.015	mg N/L
		Total Phosphorus	0.057	mg P/L
		Particulate Organic Phosphorus	<0.018	mg/L
		Orthophosphate	0.015	mg P/L
		Particulate Organic Carbon	<0.185	mg/L
		Dissolved Organic Carbon	1.86	mg/L
		Turbidity	14.9	NTU
		Suspended Sediment Concentration	178	mg/L
		Methylmercury	0.033	ng/L
		Settleable Solids	42.7	mg/L
		Particulate Aluminum	0.903	mg/L
		Dissolved Aluminum	0.0493	mg/L
Klamath River below Seiad Valley, USGS Gage #11520500	1/17/2023	Total Nitrogen	0.854	mg N/L
		Nitrate	0.475	mg N/L
		Nitrite	0.002	mg N/L
		Ammonia	0.029	mg N/L
		Total Phosphorus	0.108	mg P/L
		Particulate Organic Phosphorus	0.0206	mg/L
		Orthophosphate	0.05	mg P/L
		Particulate Organic Carbon	<0.185	mg/L
		Dissolved Organic Carbon	4.23	mg/L
		Turbidity	12.6	NTU
		Suspended Sediment Concentration	136	mg/L

Memorandum

Sample Location	Sample Date	Analyte	Result	Units
		Methylmercury	0.058	ng/L
		Settleable Solids	18.4	mg/L
		Particulate Aluminum	0.853	mg/L
		Dissolved Aluminum	0.0831	mg/L
Klamath River below Iron Gate Dam, CA (11516530)	1/17/2023	Total nitrogen	1.33	mg N/L
		Nitrate	0.692	mg N/L
		Nitrite	0.014	mg N/L
		Ammonia	0.136	mg N/L
		Total phosphorus	0.107	mg P/L
		Particulate organic phosphorus	<0.018	mg/L
		Orthophosphate	0.069	mg P/L
		Particulate organic carbon	<0.185	mg/L
		Dissolved organic carbon	4.42	mg/L
		Turbidity	5.87	NTU
		Suspended sediment concentration	9	mg/L
		Methylmercury	0.04	ng/L
		Settleable solids	1.9	mg/L
		Particulate aluminum	0.295	mg/L
		Dissolved aluminum	0.209	mg/L

III. COUNTY SAMPLING METHODOLOGY AND RESULTS

As directed by the Siskiyou County Board of Supervisors, the Siskiyou County Environmental Health Division collected water quality grab samples at six locations along the Klamath River (Figure 1). Samples were collected on January 31 and February 5, 2024, for analysis of organic and inorganic constituents. The laboratory results are included in Appendix A. Table 3 compares the heavy metal concentrations from the County's sampling efforts to the Environmental Project Agency's (EPAs) drinking water standards.

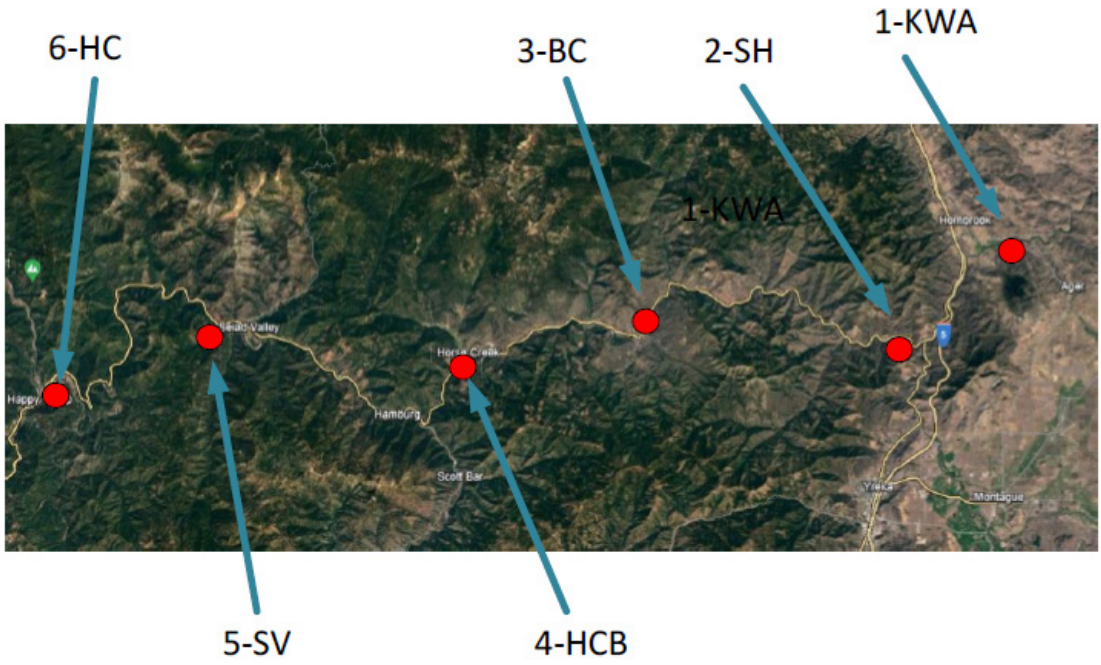

Figure 1. Klamath River Sample Locations, January & February 2024

Memorandum

Table 3. County Water Quality Sampling Results (January & February 2024)

Sample Location	Sample Date	Analyte	County Results	Primary Drinking Water Standard MCL	Secondary Standard - MCL	CA Beneficial Use Standard MCL	Units
1 - KWA	1/31/2023	Mercury	0.000212	0.002	-	0.002	mg/L
		Aluminum	50.1	-	0.05 to 0.2	1.0	mg/L
		Iron	46.9	-	0.3	-	mg/L
		Arsenic	0.0222	0.01	-	0.01	mg/L
		Cadmium	0.000345	0.005	-	0.005	mg/L
		Chromium	0.0437	0.1	-	0.05	mg/L
		Copper	0.0617	1.3	-	-	mg/L
		Lead	0.0214	0.015	-	-	mg/L
		Nickle	0.0348	-	-	0.1	mg/L
		Silver	0.00049	-	0.1	-	mg/L
		Zinc	0.0914	-	5	-	mg/L
2 - SH	1/31/2023	Mercury	0.000252	0.002	-	0.002	mg/L
		Aluminum	57.4	-	0.05 to 0.2	1.0	mg/L
		Iron	53.6	-	0.3	-	mg/L
		Arsenic	0.025	0.01	-	0.01	mg/L
		Cadmium	0.00025	0.005	-	0.005	mg/L
		Chromium	0.0646	0.1	-	0.05	mg/L
		Copper	0.0671	1.3	-	-	mg/L
		Lead	0.0239	0.015	-	-	mg/L
		Nickle	0.0377	-	-	0.1	mg/L
		Silver	0.000552	-	0.1	-	mg/L
		Zinc	0.1	-	5	-	mg/L
		Mercury	0.000227	0.002	-	0.002	mg/L

Memorandum

Sample Location	Sample Date	Analyte	County Results	Primary Drinking Water Standard MCL	Secondary Standard - MCL	CA Beneficial Use Standard MCL	Units
3 - BC	1/31/2023	Aluminum	47.2	-	0.05 to 0.2	1.0	mg/L
		Iron	44.8	-	0.3	-	mg/L
		Arsenic	0.0238	0.01	-	0.01	mg/L
		Cadmium	0.000339	0.005	-	0.005	mg/L
		Chromium	0.0478	0.1	-	0.05	mg/L
		Copper	0.0636	1.3	-	-	mg/L
		Lead	0.0224	0.015	-	-	mg/L
		Nickle	0.0375	-	-	0.1	mg/L
		Silver	0.000523	-	0.1	-	mg/L
		Zinc	0.0946	-	5	-	mg/L
4-HCB	1/31/2023	Mercury	0.000205	0.002	-	0.002	mg/L
		Aluminum	48.1	-	0.05 to 0.2	1.0	mg/L
		Iron	45.5	-	0.3	-	mg/L
		Arsenic	0.0237	0.01	-	0.01	mg/L
		Cadmium	0.00036	0.005	-	0.005	mg/L
		Chromium	0.0488	0.1	-	0.05	mg/L
		Copper	0.0648	1.3	-	-	mg/L
		Lead	0.0225	0.015	-	-	mg/L
		Nickle	0.0386	-	-	0.1	mg/L
		Silver	0.000533	-	0.1	-	mg/L
		Zinc	0.0937	-	5	-	mg/L
5-SD	1/31/2023	Mercury	ND	0.002	-	0.002	mg/L
		Aluminum	23.5	-	0.05 to 0.2	1.0	mg/L
		Iron	22.9	-	0.3	-	mg/L

Sample Location	Sample Date	Analyte	County Results	Primary Drinking Water Standard MCL	Secondary Standard - MCL	CA Beneficial Use Standard MCL	Units
		Arsenic	0.0078	0.01	-	0.01	mg/L
		Cadmium	ND	0.005	-	0.005	mg/L
		Chromium	0.0151	0.1	-	0.05	mg/L
		Copper	0.0264	1.3	-	-	mg/L
		Lead	0.00742	0.015	-	-	mg/L
		Nickle	0.0195	-	-	0.1	mg/L
		Silver	0.000126	-	0.1	-	mg/L
		Zinc	0.0409	-	5	-	mg/L
		Mercury	ND	0.002	-	0.002	mg/L
		Aluminum	30.3	-	0.05 to 0.2	1.0	mg/L
		Iron	29.1	-	0.3	-	mg/L
		Arsenic	0.0318	0.01	-	0.01	mg/L
		Cadmium	ND	0.005	-	0.005	mg/L
6-HC	1/31/2023	Chromium	0.0318	0.1	-	0.05	mg/L
		Copper	0.0411	1.3	-	-	mg/L
		Lead	0.0133	0.015	-	-	mg/L
		Nickle	0.0292	-	-	0.1	mg/L
		Silver	0.000307	-	0.1	-	mg/L
		Zinc	0.0587	-	5	-	mg/L

Levels of arsenic and lead exceeded the EPA's primary drinking water standard at 4 of the 6 sample locations (locations 1-4). These levels are also higher than the pre-project, or baseline sampling results (Section II). Levels of aluminum and iron at all 6 sample locations exceeded the EPA's secondary drinking water standard. While the Klamath River pre-project water quality samples indicate elevated levels of aluminum above the secondary standard, the County's sample results show much higher aluminum levels than the baseline. For example, the RES grab sample collected in January 2023 just below Iron Gate contained aluminum at 0.209 mg/L, while

the County's grab sample from 1-KWA in January 2024 (below Iron Gate, but further downstream of the RES sample) contained aluminum at 50.1 mg/L. The primary drinking water standards are legally enforceable standards that apply to public drinking water systems and protect public health by limiting the levels of contaminants in drinking water. The secondary drinking water standards are non-enforceable guidelines that regulate contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (i.e., taste, odor, or color) in drinking water.

The SWQCB and RWQCB's in California, under Water Code section 13241 are responsible for establishing water quality objectives which, in the Regional Water Board's judgment, are necessary for the reasonable protection of the beneficial uses and for the prevention of nuisance (North Coast RWQCB 2018). Beneficial uses in the Middle Klamath River HA are many and varied and include agricultural supply, industrial service supply, water contact recreation, non-contact water recreation, commercial and sport fishing, amongst others. The North Coast RWQCB has set water quality objectives for beneficial uses of inland surface waters, which include the Klamath River. For chemical constituents, waters shall not contain concentrations of chemical constituents in amounts that cause nuisance or adversely affect beneficial uses (North Coast RWQCB 2018). In no case shall waters designated for use as domestic or municipal supply contain concentrations of chemical constituents more than the following maximum contaminant level (MCL) and secondary maximum contaminant level (SMCL) provisions specified in title 22 of the California Code of Regulations (North Coast RWQCB 2018). The results of the County's January 2023 sampling effort show that arsenic exceeds the beneficial use threshold at 4 of the 6 sample locations, while aluminum is exceeded at all six sites. In addition, the chromium levels at 2-SH are slightly elevated above the beneficial use standard, as is the nickel levels at 5-SD.

IV. EFFECTS TO PUBLIC HEALTH

Heavy metals suspended in the water column can pose health risks to humans through various pathways of exposure (i.e., bioavailability). These metals, including lead, cadmium, mercury, arsenic, and others, are naturally occurring elements within the Klamath River Basin, but are also introduced into the river through human activities such as the dam removal project. Understanding the bioavailability of heavy metals in water is crucial for assessing their potential ecological and human health impacts. Bioavailability refers to the portion of a substance, in this case, heavy metals, that are available for biological uptake and subsequent physiological effects or reactions in organisms. In the context of heavy metals suspended in water, bioavailability is influenced by various factors including the chemical form of the metal, its speciation, concentration, physical and chemical properties of the water, as well as the presence of other substances that may interact with the metal.

Understanding the recent water quality results, and how the elevated levels of arsenic, lead, aluminum and iron can be bioavailable to humans, is crucial for assessing the public safety and health implications of the Klamath River during drawdown and as sediments are released from the reservoirs. In the case of heavy metal concentrations suspended in the Klamath River water, the bioavailability of these analytes to humans may occur through dermal contact (i.e., swimming

in the river, fly fishing, etc.), and ingestion (i.e., drinking the water directly out of the Klamath River). The heavy metal analytes that have exceeded the primary and secondary EPA standards, and those which have exceeded the California Beneficial Use Standards may cause deleterious health effects if consumed. Therefore, it is not safe to consume the Klamath River surface water. In addition, at this time, it is advisable to stay out of the Klamath River.

V. CONCULSIONS & NEXT STEPS

While there are baseline concentrations of heavy metals within the Klamath River system (both in the sediments and water column) the County's sample results indicate that there are higher than baseline concentrations of arsenic, lead, and aluminum. In addition, the levels of arsenic, aluminum, chromium, and nickel are elevated above the RWQCB North Coast's beneficial use standards. An additional water quality sampling report and associated County sample results focusing on volatile organic compounds (VOCs) will follow this heavy metals report, and will be published on the County website. The County will continue to monitor the water quality of the river on a quarterly basis and release the results to the public. The County is also in conversation with various regulatory agencies to encourage additional water quality and sediment sampling.

VI. REFERENCES

California Water Board (2020). Final Environmental Impact Report (FEIR) for the Lower Klamath Project License Surrender. https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/lower_klamath_ferc14803_eir.html.

California Water Board (2020). Water Quality Certificate for Federal Permit or License; Klamath River Renewal Corporation Lower Klamath Project License Surrender. April 2020. https://www.waterboards.ca.gov/waterrights/water_issues/programs/water_quality_cert/docs/401_cert/lkp_wqc.pdf.

California Water Quality Control Board, North Coast Regional Water Quality Control Board (RWQCB) (2008). Summary Report for the North Coast Region [RWQCB-1] for years 2000-2006. Surface Water Ambient Monitoring Program. https://www.waterboards.ca.gov/northcoast/.

CA RWQCB North Coast (2018). Water Quality Control Plan for the North Coast Region. June 2018. https://www.waterboards.ca.gov/northcoast/water_issues/programs/basin_plan/basin_plan_documents/.

CDM (2011). Screening-level evaluation of contaminants in sediments from three reservoirs and the estuary of the Klamath River, 2009–2011. Prepared with assistance from Stillwater Sciences. Prepared for U.S. Department of Interior, Klamath Dam Removal Water Quality Sub Team, Klamath River Secretarial Determination. September 2011. https://kbifrm.psmfc.org/wp-content/uploads/2017/01/CDM_2011_0119_Screening-Level-Evaluation-of-Contaminants-in-Sediments.pdf.

Memorandum

Klamath River Renewal Corporation (KRRC) (2022). Reservoir Area Management Plan (RAMP). December 2022. https://klamathrenewal.org/wp-content/uploads/2022/12/20221202-5208_RAMP-Dec-2022-FERC-14803.pdf.

KRRC (2022) Water Quality Monitoring and Management Plan. December 2022. https://klamathrenewal.org/wp-content/uploads/2022/12/20221202-5208_WQMMP-Dec-2022-FERC-14803.pdf.

Oregon Department of Environmental Quality (ODEQ) (2019). Klamath Toxics Basin Summary. October 2019. https://www.oregon.gov/deq/FilterDocs/KlamathToxicsSummary.pdf.

United States Environmental Protection Agency (EPA) (2024). Drinking Water Regulations and Contaminants. https://www.epa.gov/sdwa/drinking-water-regulations-and-contaminants.