COUNTY OF HUMBOLDT EXTRACTION REVIEW TEAM (CHERT)

2022 POST-EXTRACTION REPORT

DISCUSSION DRAFT

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For the:

Humboldt County Board of Supervisors

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This report is being issued as a Discussion Draft.

Comments can be submitted during the 60-day public review period of
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to the Director of Humboldt County Planning and Building Department.

Comments received will be summarized with responses in Final Draft
which will be available by July 1, 2023

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INTRODUCTION

This report presents an overview of the Humboldt County gravel extraction for the 2022 mining season. Information on mining volumes, methods, and success of mine operators in meeting approved plans is reported herein. Representing Humboldt County, the County of Humboldt Extraction Review Team (CHERT) provided site-specific recommendations on extraction designs submitted by the operators and their consultants, as did agencies with regulatory and oversight responsibilities, including: 1) US Army Corps of Engineers (Corps), 2) National Marine Fisheries Service (NMFS), 3) California North Coast Regional Water Quality Control Board (NCRWQCB) and 4) California Department of Fish and Wildlife (CDFW). Recommendations were based on field reviews at each site, aerial photos, biological surveys, and topographic and hydrologic information provided by the operators as required by the US Army Corps of Engineers 2015 Letter of Permission (LOP 2015) and individual permits obtained by several operators. The LOP and associated documents are the primary federal instruments regulating gravel mining operations in Humboldt County. LOP 2015 can be accessed at: https://www.spn.usace.army.mil/Portals/68/docs/regulatory/LOP_2015-1.pdf. The NMFS Biological Opinion provides the basis for many of the LOP's standards and requirements; it can be accessed at: https://www.spn.usace.army.mil/Portals/68/docs/regulatory/Biological%20Opinions/HumboldtGravelLOPBO.pdf

The Humboldt County Board of Supervisors created CHERT (then under a different name) in 1992 to provide scientific oversight on Mad River gravel extraction, which had arrived at an impasse over environmental concerns (discussed below). In 1997, the scope of CHERT services was expanded to include most riverine extraction sites throughout Humboldt County. Additional details on CHERT's role have been presented in earlier post-extraction reports found, along with other County gravel mining documents, at: http://humboldtgov.org/252/Surface-Mining-Reclamation-Act-SMARA-Doc

Four CHERT members were initially appointed by the Humboldt County Board of Supervisors in 1992. The team was selected for having expertise in hydrology, fluvial geomorphology, and river ecology, knowledge and skills necessary for addressing how to manage river gravel mining so as to provide the necessary raw materials for society's needs while minimizing harmful effects on river morphology and habitat. Two of those same four original members continue to serve through the present, and three new members were appointed by the Humboldt County Board of Supervisors in January, 2023. The new members will be participating in all aspects of the CHERT program in 2023 in anticipation of the retirement of original CHERT members in the coming years.

Annual Gravel Mining Review Process

Pre-extraction Process: The pre-extraction mining review process begins with CHERT scheduling field visits (typically May-July each year) for those operations planning to mine gravel in a given year. Site visits involve walking sites to observe the river's responses to the previous season's mining and discussing possible mining methods for the upcoming season. All individuals on the field visits, including CHERT, agency staff, operators and their representatives, discuss observations and insights, and ultimately come to consensus on conceptual mining plans for that season. Field discussions are supported with aerial photos and possibly topographic surveys. As a follow-up to the pre-extraction site visits, CHERT synopsizes the consensus with text and markings on aerial photos and distributes this to all concerned.

Once conceptual plans are developed, the operators' agents prepare submittals aiming to conform to field discussions and consensus. The operators' submittals include air photos depicting the site and layout of mining areas, topographic and hydrologic information, and a narrative consistent with conceptual plans agreed to in the field. Occasionally, preliminary plans need revision, usually for logistical reasons, and a second field review may be needed.

When all issues have been resolved, CHERT issues a written recommendation. Once all parties accept a final version of the mining plan, and it is approved by the Corps, NMFS, NCRWQCB and CDFW, mining can begin provided all agency permits have been obtained. Additional field reviews may be done while mining is taking place due to unexpected circumstances that might require alteration to an approved plan.

Post-extraction process: After mining is completed and before significant river rises, post-extraction field reviews are conducted in late summer or fall. Most often post-extraction field visits are completed before high water. Unfortunately, sometimes not all sites can be visited because of high flows, but this is rare.

A goal is to visit all sites to observe the post-extraction conditions and effect any remediation, if needed, before the rivers rise with fall rainfall. On relatively rare occasions, post-extraction field and/or office reviews reveal problems with extraction implementation, most often with failing to meet approved extraction designs. Often, a problem can be resolved by re-grading within an extraction area. A worst-case-scenario may involve replacing mined gravel onto the river bar if significant over-extraction has occurred. This has occurred only three times in the three decades of the CHERT program.

Post-extraction surveys and aerial photography are required to be done following completion of extraction. Each operator compiles a post-extraction submittal, including pre- and post-extraction topographic data, volume calculations, aerial photographs, and other pertinent data. These data are required to be submitted to CHERT, CDFW, Corps, and NMFS by December 15 each year and provide a primary information source, along with field observations, for post-extraction reports.

Guiding Principles: CHERT develops recommendations based on two primary goals: 1) minimizing potential cumulative effects by ensuring that reach-scale mining volumes do not exceed sustainable levels, and 2) ensuring that site-specific methods of extraction (skimming, trenching, etc.) are appropriate for protecting local habitat. The concept of 'sustained yield' gravel extraction requires that gravel extraction volumes not exceed mean annual recruitment (an estimate of the long-term average annual supply of gravel to a specific reach of a river). At present, only the Mad River has had sufficient data analysis for estimating sustained yield, and annual mining volumes limits are determined each Spring using a formula developed by the NMFS based on the previous winter's stormflows. Because it is a much larger river system relative to annual mining volumes, it is assumed that the Eel River (and tributaries) has gravel extraction volumes below mean annual recruitment.

Ensuring that annual mined gravel volumes are less than mean annual recruitment is an important management criterion for avoiding excessive channel bed degradation and habitat damage. Site-specific measures are also recommended by CHERT to reduce both cumulative and localized potential mining effects on riparian and aquatic habitat. These may include, for example, ensuring that skim floor elevations are sufficiently high to maintain low flow channel confinement so that small rises in river stage do not inundate skimmed surfaces too readily.

With time, experience on the rivers, and interaction with regulatory agencies, mine operators, and other stakeholders, the measures taken to protect river habitat and to improve program functioning are continually being refined. This feedback process, termed 'adaptive management', helps ensure that gravel mining and management improves resource protection, the quality of information provided by mine operators, and program efficiency. Problems occasionally arise, however, when either the river's response to previous mining results in undesirable river habitat conditions, or an operator deviated from an approved mining plan. Any such problems are described in the performance issues section of this report.

In addition to annually recurring activities (e.g., mining site reviews, extraction recommendations, annual post-extraction report preparation), CHERT occasionally participates in other activities. For example, CHERT prepared a technical analysis of Mad River physical channel conditions, riparian vegetation, and fish habitat in 2009 to support physical and biological assessments required for renewal of federal and state permits. Such analyses occur when requested by the County, the operators, or other stakeholders and with direction from the Humboldt County Board of Supervisors. CHERT also provides comments on drafts of various other documents, such as the Corps' updated letters of permission (LOP), NMFS biological opinions, etc.

Humboldt County Instream Gravel Extraction Sites and Extraction Terminology

Table 1 describes the geographic breakdown of Humboldt County mining reaches. CHERT classifies extraction techniques into twelve descriptive categories in Table 2.

Table 1. Description of river reaches used to sort and report extraction data.

Approximate Length (miles)	River Reaches
7	**Mad River:** The Mad River Reach extends approximately seven miles downstream from the Blue Lake Fish Hatchery to just below the Highway 299 Bridge near Arcata.
6	**Lower Eel River:** The Lower Eel River Reach extends approximately six miles downstream from the mouth of the Van Duzen River to near Fernbridge.
5	**Lower Van Duzen River:** The Lower Van Duzen River Reach extends upstream approximately five miles from the mouth of the Van Duzen River.
26	**Middle Reach of Eel River:** The Middle Reach of the Eel River extends upstream from Scotia (River Mile 20) for approximately 26 miles to River Mile 46.
17	**South Fork Eel River:** The South Fork Reach extends from Garberville (River Mile 33) upstream to Cooks Valley near the Mendocino County line (River Mile 50).
15	**Trinity River Reach:** The Trinity River Reach extends downstream about 15 miles from near Willow Creek into the Hoopa Valley.
	Isolated Sites: Five Humboldt County extraction sites are more or less isolated from the reaches described above. These are the *Satterlee Bar* on the main stem of the Eel River at Fort Seward, the *PL Bar* on the Van Duzen River, the *Branstetter Bar* on Bear River, the *Charles Bar* on Larabee Creek, and the *Cook Bar* on the North Fork of the Mattole River. Located in Trinity County, Dinsmore Bar on the Van Duzen River, operated by Mercer Fraser Co., is not part of the CHERT program but their volumes are included in this report.

Table 2. CHERT extraction methodology terminology and descriptions.

Narrow Shoreline Skim	A skim with one edge close to the low flow channel at or above the 35% flow elevation with a width no greater than 1/3 that of the unvegetated bar surface.
Wide Shoreline Skim	Same as above but wider.
Narrow Offset Skim	A skim that has a substantial vertical or horizontal offset from the low flow channel and a width no greater than 1/3 that of the unvegetated bar surface.
Wide Offset Skim	Same as above, but wider. Some may refer to this as a 'horseshoe' skim.
Dry Trench	A relatively long, linear shallow skim that remains above the water table at the time of excavation. When located in a secondary channel that normally dries up during the low flow season, it may be called an overflow channel skim.
Wet Trench	A trench sufficiently deep to intersect the water table at the time of excavation, designed for high water to flow through the trench.
Alcove	An excavation designed to simulate naturally occurring shoreline pools, typically located on the backside of meanders, that can provide deep, cool water during summer months and/or winter high velocity refuge.
Dry Alcove	Same as above, but to a depth above the water table at the time of excavation.
Fish Access Channel	A channel excavation that may include pools and incorporate large wood designed to temporarily improve fish migration access.
Riparian Enhancement Extraction (REE, formerly wetland pit)	A closed or open-sided pit excavated down to moist gravel on floodplain surfaces too dry to support beneficial riparian plants, such as willows, cottonwoods and alders. Unlike earlier versions that sustained year-round

	ponded water, designs are now shallower so that they go dry for some period each year to prevent non-native bullfrogs from successfully reproducing. It is hoped that these pits may create conditions favorable for native amphibians and beneficial riparian plants.

2022 EXTRACTION SUMMARIES

River Reach Extraction Volumes

In 2022, CHERT reviewed 40 extraction areas (some multiple times) distributed among 13 mining sites in Humboldt County (many sites had more than one extraction area). Appendix A provides historical gravel extraction volumes from the beginning of the CHERT program in 1992 (Mad River) and the expansion in 1997 (Eel River, Trinity River, and isolated sites added). As shown in Table 3, the total volume of gravel approved for extraction in 2022 was 465,081 cubic yards (cy). The total volume actually extracted was 361,597 cy, or about 78% of that approved for extraction. We note that gravel extraction of up to 20,000 cy annually done by Blue Lake Rancheria from the Mad River is not included in this report as the Rancheria of not part of the CHERT program.

Table 3. Humboldt County 2022 gravel extraction summary by river reach.

River Reach	No. of mined sites	No. of mined areas	Approved Volume (cu. yd.)	Extracted Volume (cu. yd.)	Percent of Approved Volume	Extracted Area (acres)
Lower Mad River	8	18	68,376	68,671	100%	17.8
Lower Eel River	2	13	234,947	162,234	69%	29.9
Middle Eel River	0	0	n/a	n/a	n/a	n/a
Van Duzen River	2	8	122,958	119,082	97%	16.6
South Fork Eel River	1	1	38,800	11,610	29%	1.1
Trinity River	0	0	n/a	n/a	n/a	n/a
Isolated Sites	0	0	n/a	n/a	n/a	n/a
Humboldt County Total =	**13**	**40**	**465,081**	**361,597**	**78%**	**65**

Tables 4-8 list site-specific 2022 extraction information for each extraction area grouped by river reach. Sites are listed from downstream to upstream in each table. No gravel extraction was proposed for the Trinity River, Middle Eel River or isolated sites in 2022.

Table 4. Mad River gravel extractions in the 2022 extraction season. Red font indicates extraction exceeding 10% above (or 110% of) that approved. The volumes listed in this table do not include gravel extracted by the Blue Lake Rancheria.

Operator	Site	Area No.	Method	Approved Volume (cu. yds.)	Extracted Volume (cu. yds.)	Percent of Approved Volume	Extracted Area (acres)
Eureka Ready Mix	O'Neill Bar	1	wide shoreline skim	4,200	4,225	101%	2.5
Eureka Ready Mix	Johnson-Spini Bar	1	wide shoreline skim	9,130	8,165	89%	3.1
Mercer Fraser Co.	Essex Bar	1	wide shoreline skim	1,130	861	76%	0.4
Garth Sundberg, Inc.	Simpson Bar	A	REE	2,592	2,550	98%	0.9
Eureka Ready Mix	Christie Bar	A	REE	12,390	11,975	97%	1.3
Eureka Ready Mix	Christie Bar	C	narrow skim	1,080	1,030	95%	1.2
Eureka Ready Mix	Christie Bar	D	narrow skim	5,272	5,225	99%	2.3
GLJ Construction	Blue Lake Bar	A	trench	3,012	3,315	110%	0.5
GLJ Construction	Blue Lake Bar	B	narrow skim	989	0	0%	0.0
GLJ Construction	Blue Lake Bar	C1	REE	338	961	284%	0.1
GLJ Construction	Blue Lake Bar	C2	REE	604	400	66%	0.9
GLJ Construction	Blue Lake Bar	C3	REE	2,286	2,497	109%	0.2
GLJ Construction	Blue Lake Bar	D	REE	4,530	5,755	127%	0.4
Eureka Ready Mix	Emmerson Bar	A	alcove	5,954	5,850	98%	0.5
Eureka Ready Mix	Emmerson Bar	B	narrow skim	1,030	995	97%	0.6
Mad River Sand and Gravel	Guynup Bar	1	narrow skim	9,420	10,056	107%	2.0
Mad River Sand and Gravel	Guynup Bar	2	narrow skim	3,170	3,971	125%	0.8
Mad River Sand and Gravel	Guynup Bar	3	REE	1,249	840	67%	0.1
River Reach Totals =		**18**	---	**68,376**	**68,671**	**100%**	**17.8**

Table 5. Lower Eel River gravel extractions in the 2022 extraction season. Red font indicates extraction exceeding 10% above (or 110% of) that approved.

Operator	Site	Area No.	Method	Approved Volume (cu. yds.)	Extracted Volume (cu. yds.)	Percent of Approved Volume	Extracted Area (acres)
Eureka Ready Mix	Singley Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
County of Humboldt	Worswick Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
Eureka Ready Mix	Drake Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
Mercer Fraser Co.	Sandy Prairie: Plant A	A1	trench	21,439	12,313	57%	0.9
Mercer Fraser Co.	Sandy Prairie: Plant A	A2	narrow skim	19,705	17,505	89%	4.8
Mercer Fraser Co.	Sandy Prairie: Plant A	A3	narrow skim	46,335	30,090	65%	4.1
Mercer Fraser Co.	Sandy Prairie: Plant B	A2	narrow skim	11,200	10,728	96%	4.0
Mercer Fraser Co.	Sandy Prairie: Plant B	A3	narrow skim	24,212	3,332	14%	0.1
Mercer Fraser Co.	Sandy Prairie: Plant B	B1	REE	23,261	1,234	5%	0.6
Mercer Fraser Co.	Sandy Prairie: Plant B	B2	alcove	19,890	24,150	121%	4.1
Mercer Fraser Co.	Sandy Prairie: Plant B	B3	narrow skim	21,644	16,770	77%	5.7
Mercer Fraser Co.	Sandy Prairie: Plant B	B4	alcove	19,780	20,357	103%	1.7
Hansen Truck Shop	Hansen Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
Eureka Ready Mix	Hauck Bar	A	narrow skim	4,535	4,550	100%	1.7
Eureka Ready Mix	Hauck Bar	B	trench	11,552	11,852	103%	1.1
Eureka Ready Mix	Hauck Bar	C1	REE	3,194	2,653	83%	0.3
Eureka Ready Mix	Hauck Bar	G	alcove	8,200	6,700	82%	0.8
River Reach Totals =		**13**	---	**234,947**	**162,234**	**69%**	**29.9**

Table 6. Middle Eel River gravel extractions, 2022.

Operator	Site	Area No.	Method	Approved Volume (cu. yds.)	Extracted Volume (cu. yds.)	Percent of Approved Volume	Extracted Area (acres)
Humboldt Redwoods Co.	Scotia Dam Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
Humboldt Redwoods Co.	Truck Shop Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
Humboldt Redwoods Co.	Three Mile Bridge Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
Humboldt Redwoods Co.	Dinner Creek Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
Humboldt Redwoods Co.	Elinor Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
Humboldt Redwoods Co.	Larabee Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
Humboldt Redwoods Co.	South Fork Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
Humboldt Redwoods Co.	Bowley Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
Humboldt Redwoods Co.	Maynard Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
Humboldt Redwoods Co.	Vroman Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
River Reach Totals =		**0**	---	**0**	**0**	n/a	n/a

Table 7. Van Duzen River gravel extractions, 2022. Red font indicates extraction exceeding 10% above (or 110% of) that approved.

Operator	Site	Area No.	Method	Approved Volume (cu. yds.)	Extracted Volume (cu. yds.)	Percent of Approved Volume	Extracted Area (acres)
Leland Rock	downstream	C2	REE	12,258	10,105	82%	0.8
Leland Rock	downstream	D	trench	3,875	3,195	82%	0.4
Leland Rock	upstream	E	REE	10,285	17,263	168%	2.0
Leland Rock	upstream	F	alcove	14,490	13,319	92%	1.5
Van Duzen River Ranch	South Bank	A	trench	12,090	11,945	99%	0.7
Van Duzen River Ranch	South Bank	B	narrow skim	49,960	45,655	91%	9.0
Tom Bess	West Site	A	trench	7,675	7,600	99%	0.5
Tom Bess	West Site	B	REE	12,325	10,000	81%	1.7
Humboldt County PWD	PL-Van Duzen Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
Humboldt County PWD	Charles Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
River Reach Totals =	**3**	**9**	---	**122,958**	**119,082**	**97%**	**16.6**

Table 8. South Fork Eel River gravel extractions, 2022.

Operator	Site	Area No.	Method	Approved Volume (cu. yds.)	Extracted Volume (cu. yds.)	Percent of Approved Volume	Extracted Area (acres)
Wallan and Johnson	Wallan and Johnson Bar	n/a	no extr. proposed	n/a	n/a	n/a	n/a
Randall Sand and Gravel	Home Bar	1	REE	38,800	11,610	30%	1.1
Mercer Fraser Co.	Cooks Valley: MEN *	n/a	no extr. proposed	n/a	n/a	n/a	n/a
Mercer Fraser Co.	Cooks Valley: HUM *	n/a	no extr. proposed	n/a	n/a	n/a	n/a
River Reach Totals =		**1**	---	**38,800**	**11,610**	**30%**	**1.1**
* "HUM" is in Humboldt County, "MEN" is in Mendocino County							

Humboldt County extraction volumes and surface areas aggregated by extraction method for 2022 are shown in Table 9. Unlike in recent years, narrow skims were the dominant extraction method used in 2022. In 2019-2021,

REE was the dominant method because of poor replenishment due to low flows. However, in 2022, bars that had not been skimmed for several years had extractable gravel and thus were relied upon for over half the gravel extracted in 2022.

Table 9. Humboldt County gravel extraction volumes and areas by extraction method, 2022.

Extraction Method	No. of Areas	Extracted Volume (cy)	Percent of Total Volume	Area (acres)	Percent of Total Area
alcove	5	70,376	19.5%	8.6	13.1%
narrow skim	13	149,907	41.5%	36.3	55.5%
riparian enhancement extraction (REE)	13	77,843	21.5%	10.4	15.9%
wet trench	6	50,220	13.9%	4.1	6.3%
wide shoreline skim	3	13,251	3.7%	6.0	9.2%
Humboldt County Totals =	**40**	**361,597**	**100.0%**	**65.4**	**100%**

PERFORMANCE ISSUES: 2022

To evaluate operator performance and compliance, CHERT and regulatory agency staff conduct post-extraction field reviews in the fall after completion of operations and review post-extraction documentation (cross sections, air photos, and other materials) to ensure approved mining plan design specifications were met and that all requirements of the Corps' LOP 2015 are fulfilled. Overall, operator performance in conducting their 2022 operations consistent with approved mining plans was very successful, but problematic conditions were noted at a few sites, as described below.

Pre-extraction Preparations

One area for improvement is in the preparation for field reviews. Gravel operators did not always come to pre-extraction site-visits with adequate materials for informing the review process, such as absence of cross sections and not showing the 35% flow elevation on the cross sections. At the Noble site, for example, mined by Mercer Fraser Co. in 2022, cross sections were provided but they didn't extend far enough away from the water's edge to capture the high point of the bar. This hampered our review and approval of the operator's mining plan. Revisions to the initial mining plan were necessary, but were made difficult by the lack of adequate topographical information.

At the Sandy Prairie site (Mercer Fraser Co.) a proposed bridge across the low flow channel required additional topographic information than initially provided, and several design iterations to resolve the bridge's location and construction details.

At several sites pre-extraction narratives were either absent or incomplete. Having to request the required materials for pre-extraction reviews can delay approval of a mining plan and shift operations to later in the season. This can delay mining plan reviews and implementation of mining, sometimes triggering mining extension requests.

Over-extraction and Other Deviations from Approved Mining Plans

Although most extractions were below their approved volumes, several significantly exceeded their approved volumes, as mentioned above and shown in Tables 4-8. At most mined areas, the actual extraction volume was less than that approved, and one area approved for extraction was left unmined by the operator's choice (see Table 4, Mad River).

Mined areas that extracted 10% or more above (or 110% of) their approved volumes are shown in red font in the following tables. The 10% 'threshold' (i.e., extraction exceeding 110% of approved volume) has been used for

years as an informal trigger for distinguishing over-extraction from unavoidable inaccuracies in pre- and post-extraction surveys and volume computations. The sites where extraction volume exceeded that approved by 10% or more were at the Mad River Sand and Gravel site and Blue Lake Bar, Mad River (Table 4); Mercer Fraser's Sandy Prairie site on the Lower Eel (Table 5); and the Leland Rock site on the Van Duzen River (Table 7). The over-extractions and any other problems observed during the course of gravel mining review are noted below.

Guynup Site (Mad River Sand and Gravel): A skim (Area 2) was over-extracted by over 800 cy. The extraction floor was excavated about one foot too deep in some areas, accounting for the over-extraction. No problems were noted from the over-extraction during the post-extraction field review.

The gravel volume extracted from Area 3 was less than that approved. It was noted during the 2022 pre-extraction field review that the previous extraction of this feature, done in 2021, was not deep enough to provide moisture conditions encouraging riparian plant growth. So, it was recommended that it be dug deeper and that scrap metal lying around the area be removed. This was accomplished, as was evident on the post-extraction field review. The under-extraction is not seen as a problem as groundwater was observed in the feature in late fall, 2022.

Blue Lake Bar (Gary Johnston): Three extraction areas were over-extracted at the site in 2022; one trench and two REEs. The approved trench volume was exceeded by about 300 cy. It is generally understood that the volumes extracted from trenches are difficult to survey with great accuracy because of slumping side walls and the requirement to survey under water. Therefore, the extracted volume reported may or may not be accurate, and in any case did not pose any risk to fish.

Over extraction at the two REEs did not appear to pose any adverse effects. In fact, the excavation depth for REEs cannot be known with accuracy pre-extraction as it depends on late season groundwater levels. A primary goal of REEs is to provide a hydroperiod (length of time a feature is wet) sufficient for riparian colonization and survival. Thus, REEs must be excavated down to moist gravel regardless of the approve pre-extraction plan. Consequently, post-extraction volumes may disagree with approved plans and, unlike other extraction methods, that is acceptable.

Sandy Prairie (Mercer Fraser Co.): The alcove located within the middle channel (Area B2) was over-extracted by 4,260 cy, 21% above the approved volume. The post-extraction cross sections show that the excavated depth was about two feet lower than approved throughout the extraction area. Although no problems were identified during the post-extraction field review, and none are anticipated with the onset of winter stormflows, this over-extraction deviated significantly from approved plans.

Leland Rock Site: Approved extraction was exceeded by approximately 7,000 cy at Area E, a REE extraction located upstream of the Highway 101 bridge over the Van Duzen River. This over-extraction occurred because the approved depth was exceeded. As discussed regarding the Blue Lake Bar site (above), the extraction depths for REE extractions must intersect the summer groundwater to meet the goals for riparian enhancement. But because the depth to groundwater cannot be accurately known before extraction, the depth, and therefore volume, of actual extraction will often vary from that approved. During the post-extraction field review, it was agreed by all that the deeper extraction was beneficial to the colonization of the extraction area by riparian plants.

As an aside, the post-extraction field review revealed very poor conditions for fish passage in between extraction areas on the dry (at the time) bar downstream of the Highway 101 bridge. The dry channel was essentially flat and thus fall flows would sheet across the bar and possibly strand adult salmonids. Several recommendations were made to connect the extraction areas with shallow channels to facilitate fish passage upon arrival of fall flows. The operator voluntarily, and at his own expense, cut small channels across the bar to connect the extraction areas.

Christie Bar (Eureka Ready Mix): During the post-extraction field review, it was noted that the connection of this extraction to the active channel of the Mad River was too small for effective exchange of high water. This would reduce the REE's ability to receive backwater from high flows and the riparian seed sources necessary for plant colonization. The operator was requested to remove this "plug" from REE outlet, which was done soon afterwards.

Simpson Bar (G. R. Sundberg, Inc.): The REE at this site, the sole extraction there in 2022, was not excavated low enough to intersect late summer groundwater. As discussed above, depth to groundwater is difficult to anticipate before extraction. In this case, it may render the extraction floor too dry for vigorous plant growth. Where this has been observed at other sites, the REE floor has been excavated lower in a subsequent year. This may happen at this bar in the future, but it is avoided, when possible, so as not to disturb any vegetation that has already begun to colonize the area.

O'Neill Bar (Eureka Ready Mix): The post-extraction field review indicated that the extraction floor appeared too low within the central area of this skim, the sole extraction area at this site: it had clearly been over-extracted. Thus, the extraordinary requirement of replacing mined gravel back onto the bar was implemented. Based on guidance from the operator's surveyor, approximately 1,500 cubic yards of gravel was replaced on the bar to achieve approved grade. Although the area was over-extracted initially, the replacement of the excess gravel mined resulted in no net over-extraction.

Randall Site (South Fork Eel River): The sole approved extraction for the Randall site in 2022 was an REE near the upstream end of the site. As shown in Table 8, the actual extraction volume was much smaller that the approved volume at only about 30%. According to the operator's consultant, most of the approved extraction area had unsuitable material. Rather than marketable gravel, it was largely composed of silt and thus left behind in the extraction area.

During the post-extraction field review, CDFW and NCRWQCB staff requested several remedial actions at the site. One was to re-grade the extraction floor to be more level. Apparently, the fine sediment composing the extraction floor was so wet that the equipment had sunk down and left low spots within the extraction area. Another concern was that the connection between the REE and the main channel was too narrow and should be widened. Finally, it was requested that some unwanted silt piled up into a side channel be moved to the river bank and stabilized. It is assumed that these actions were carried out satisfactorily.

APPENDIX A: HISTORICAL EXTRACTION VOLUME SUMMARIES

Humboldt County Totals ("---" means unknown)			
Year	Approved Volume (cubic yards)	Extracted Volume (cubic yards)	Percent
1992	---	---	---
1993	---	---	---
1994	---	---	---
1995	---	---	---
1996	---	---	---
1997	---	---	---
1998	1,075,095	820,952	76%
1999	1,142,212	860,974	75%
2000	987,848	706,234	71%
2001	979,515	494,819	51%
2002	1,023,866	748,461	73%
2003	881,090	581,800	66%
2004	692,020	440,710	64%
2005	664,565	493,240	74%
2006	700,660	561,845	80%
2007	784,108	612,132	78%
2008	659,022	534,821	81%
2009	454,213	211,207	46%
2010	562,303	374,313	67%
2011	774,582	505,805	65%
2012	553,704	384,514	69%
2013	362,222	226,362	62%
2014	376,467	285,527	76%
2015	400,919	272,240	68%
2016	545,275	463,382	85%
2017	563,540	363,297	64%
2018	456,236	368,681	81%
2019	522,886	465,564	89%
2020	384,617	266,403	69%
2021	397,045	332,048	84%
2022	465,081	361,597	78%
Totals	**16,409,091**	**11,736,928**	**72%**
Averages	**656,364**	**469,477**	**72%**

Mad River ("---" means unknown)			
Year	Approved Volume (cubic yards)	Extracted Volume (cubic yards)	Percent
1992	115,000	115,000	100%
1993	122,100	138,400	113%
1994	134,500	134,898	100%
1995	210,637	226,265	107%
1996	203,998	189,517	93%
1997	252,926	210,976	83%
1998	265,795	223,352	84%
1999	196,212	174,974	89%
2000	204,748	146,534	72%
2001	199,215	167,719	84%
2002	204,991	171,937	84%
2003	150,390	136,790	91%
2004	156,540	141,250	90%
2005	138,475	127,200	92%
2006	174,245	162,360	93%
2007	165,504	153,341	93%
2008	142,043	130,613	92%
2009	0	0	n/a
2010	111,439	86,246	77%
2011	147,380	143,124	97%
2012	111,317	100,329	90%
2013	80,525	76,919	96%
2014	69,322	66,743	96%
2015	70,230	69,719	99%
2016	145,769	142,510	98%
2017	153,778	113,841	74%
2018	83,945	80,270	96%
2019	143,727	126,460	88%
2020	60,680	56,609	**93%**
2021	68,760	71,008	**103%**
2022	68,376	68,671	**100%**
Totals	**4,352,567**	**3,953,575**	**91%**
Averages	**140,405**	**127,535**	**91%**

APPENDIX A (continued)

Lower Eel River ("---" means unknown)			
Year	Approved Volume (cubic yards)	Extracted Volume (cubic yards)	Percent
1992	---	---	---
1993	---	---	---
1994	---	---	---
1995	---	---	---
1996	---	---	---
1997	561,700	326,500	58%
1998	399,100	273,000	68%
1999	471,400	290,500	62%
2000	291,300	208,600	72%
2001	389,900	119,300	31%
2002	387,300	220,000	57%
2003	318,300	163,900	51%
2004	188,840	120,305	64%
2005	199,370	166,280	83%
2006	235,495	208,240	88%
2007	243,097	177,334	73%
2008	237,955	215,760	91%
2009	229,386	106,467	46%
2010	208,286	188,730	91%
2011	301,537	214,730	71%
2012	226,520	188,994	83%
2013	176,477	80,918	46%
2014	127,671	97,232	76%
2015	168,581	94,954	56%
2016	179,659	151,456	84%
2017	183,063	102,683	56%
2018	163,775	145,540	89%
2019	129,476	126,350	98%
2020	154,619	98,786	64%
2021	206,461	195,449	95%
2022	234,947	162,234	69%
Totals	**6,614,215**	**4,444,242**	**67%**
Averages	**254,393**	**170,932**	**67%**

Middle Eel River ("---" means unknown)			
Year	Approved Volume (cubic yards)	Extracted Volume (cubic yards)	Percent
1992	---	---	---
1993	---	---	---
1994	---	---	---
1995	---	---	---
1996	---	---	---
1997	147,300	84,900	58%
1998	157,900	99,400	63%
1999	134,900	124,900	93%
2000	160,100	131,000	82%
2001	116,100	64,000	55%
2002	132,767	121,608	92%
2003	74,030	54,060	73%
2004	0	0	n/a
2005	0	0	n/a
2006	0	0	n/a
2007	89,990	64,424	72%
2008	0	0	n/a
2009	0	0	n/a
2010	0	0	n/a
2011	76,715	35,618	46%
2012	29,569	25,880	88%
2013	0	0	n/a
2014	59,298	45,394	**77%**
2015	48,146	39,350	82%
2016	82,276	78,731	96%
2017	59,409	44,316	75%
2018	27,853	24,570	88%
2019	84,345	82,147	97%
2020	0	0	n/a
2021	0	0	n/a
2022	0	0	n/a
Totals	**1,480,698**	**1,120,298**	**76%**
Averages	**56,950**	**43,088**	**76%**

APPENDIX A (continued)

South Fork Eel River ("---" means unknown)

Year	Approved Volume (cubic yards)	Extracted Volume (cubic yards)	Percent
1992	---	---	---
1993	---	---	---
1994	---	---	---
1995	---	---	---
1996	---	---	---
1997	67,700	74,700	110%
1998	75,400	70,100	93%
1999	85,400	75,900	89%
2000	75,700	53,700	71%
2001	66,000	43,100	65%
2002	58,163	48,122	83%
2003	87,060	54,660	63%
2004	80,730	50,745	63%
2005	82,770	36,480	44%
2006	92,000	35,075	38%
2007	90,737	73,956	82%
2008	32,358	24,833	77%
2009	40,170	24,986	62%
2010	42,864	27,732	65%
2011	36,063	14,244	39%
2012	19,039	0	0%
2013	27,588	17,212	62%
2014	32,341	24,754	77%
2015	20,610	15,129	73%
2016	34,863	23,657	68%
2017	36,679	17,010	46%
2018	34,751	20,306	58%
2019	38,724	14,451	37%
2020	34,885	8,476	24%
2021	22,642	6,547	29%
2022	38,800	11,610	30%
Totals	**1,354,037**	**867,485**	**64%**
Averages	**52,078**	**33,365**	**64%**

Van Duzen River ("---" means unknown)

Year	Approved Volume (cubic yards)	Extracted Volume (cubic yards)	Percent
1992	---	---	---
1993	---	---	---
1994	---	---	---
1995	---	---	---
1996	---	---	---
1997	120,000	81,600	68%
1998	119,100	103,700	87%
1999	159,900	108,800	68%
2000	194,800	121,300	62%
2001	161,700	85,600	53%
2002	202,500	167,400	83%
2003	175,100	123,000	70%
2004	179,045	92,610	52%
2005	159,090	123,170	77%
2006	134,910	104,750	78%
2007	152,773	113,184	74%
2008	209,176	137,850	66%
2009	175,132	73,236	42%
2010	169,041	69,917	41%
2011	175,724	71,903	41%
2012	142,191	47,760	34%
2013	63,111	41,713	66%
2014	74,701	51,404	69%
2015	85,978	53,088	62%
2016	92,995	67,028	**72%**
2017	108,686	76,526	70%
2018	108,276	79,609	74%
2019	126,614	116,156	92%
2020	134,433	102,532	76%
2021	99,182	59,044	60%
2022	122,958	119,082	97%
Totals	**3,647,116**	**2,391,962**	**66%**
Averages	**140,274**	**91,999**	**66%**

APPENDIX A (continued)

Trinity River ("---" means unknown)			
Year	Approved Volume (cubic yards)	Extracted Volume (cubic yards)	Percent
1992	---	---	---
1993	---	---	---
1994	---	---	---
1995	---	---	---
1996	---	---	---
1997	47,500	40,000	84%
1998	35,000	28,100	80%
1999	64,300	66,900	104%
2000	18,000	22,200	123%
2001	46,600	15,100	32%
2002	38,145	19,394	51%
2003	76,210	49,390	65%
2004	62,075	32,700	53%
2005	64,100	30,570	48%
2006	64,010	51,420	80%
2007	42,007	29,893	71%
2008	12,490	11,701	94%
2009	0	0	n/a
2010	30,673	1,688	6%
2011	37,163	26,186	70%
2012	25,068	21,551	86%
2013	5,521	723	13%
2014	13,134	0	0%
2015	7,374	0	0%
2016	9,713	0	0%
2017	21,925	8,921	41%
2018	17,109	0	0%
2019	0	0	n/a
2020	0	0	n/a
2021	0	0	n/a
2022	0	0	n/a
Totals	**738,117**	**456,437**	**62%**
Averages	**28,389**	**17,555**	**62%**

Isolated Sites ("---" means unknown)			
Year	Approved Volume (cubic yards)	Extracted Volume (cubic yards)	Percent
1992	---	---	---
1993	---	---	---
1994	---	---	---
1995	---	---	---
1996	---	---	---
1997	---	---	---
1998	22,800	23,300	102%
1999	30,100	19,000	63%
2000	43,200	22,900	53%
2001	0	0	n/a
2002	0	0	n/a
2003	0	0	n/a
2004	24,790	3,100	13%
2005	20,760	9,540	46%
2006	0	0	n/a
2007	0	0	n/a
2008	25,000	14,064	56%
2009	9,525	6,518	68%
2010	0	0	n/a
2011	0	0	n/a
2012	0	0	n/a
2013	0	0	n/a
2014	0	0	n/a
2015	0	0	n/a
2016	0	0	n/a
2017	0	0	n/a
2018	0	0	n/a
2019	0	0	n/a
2020	0	0	n/a
2021	0	0	n/a
2022	0	0	n/a
Totals	**176,175**	**98,422**	**56%**
Averages	**7,047**	**3,937**	**56%**