COUNTY OF HUMBOLDT EXTRACTION REVIEW TEAM (CHERT)
1999 POST-EXTRACTION REPORT

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For the

Humboldt County Board of Supervisors

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No comments were received on the Discussion Draft.
This version represents the Final 2000 CHERT Post Extraction Report.

I. EXECUTIVE SUMMARY

This report represents the compilation and analysis of information on gravel extractions in the 1999 mining season in Humboldt County. Individual extraction designs recommended by CHERT (agent for Humboldt County Board of Supervisors) and approved by regulatory and trustee agencies (US Army Corps of Engineers, California Department of Fish and Game, California Coastal Commission) are summarized as well as operator performance in achieving approved designs and specifications. In 1999, CHERT reviewed 46 extraction areas distributed among 26 mining sites in Humboldt County (many sites had more than one extraction area). The total volume of gravel approved for extraction in 1999 was about 1,084,260 cubic yards (cy). The total volume actually extracted was about 901,224 cy, or 83% of that approved for extraction. Primary conclusions drawn from this report are:

- Both the quality of extraction designs and monitoring information have steadily improved since 1992. With few exceptions, pre- and post-extraction submittals provided clear, complete information for evaluating mining proposals and performance in meeting approved plans.

- Extraction operations significantly varied from their approved extraction plans at 3 of the 26 sites reviewed, down from 7 in 1998. Where actual extraction volumes were significantly below the approved volumes, several sites were left in configurations inconsistent with reclamation criteria for instream mining (insufficient vertical offset of skim surface above low flow channel, insufficient horizontal buffer between extraction and/or graded areas and aquatic habitat features, closed depressions impeding drainage). Also, several operations which extracted the full approved volume deviated significantly from their approved plans and specifications in doing so. While this did not necessarily create adverse river configurations in all cases, it is important for operators to follow approved plans and specifications.

- As was mentioned last year, biological monitoring requirements in the Corps of Engineers Letter of Permission (LOP) and the County's Interim Monitoring and Adaptive Management Program for the Lower Eel and Van Duzen Rivers, while providing a limited basis for evaluating gravel mining effects over the long term, do not provide guidance for identifying potential impacts to aquatic resources in the near term or for improving mining practices. Consequently, results of biological monitoring to date should not be considered assessments of potential impacts of gravel mining on aquatic and riparian resources. As was mentioned last year, biological monitoring requirements should be revised to ensure meaningful data are collected cost-effectively.

II. INTRODUCTION

Following is the 1999 annual report of the County of Humboldt Extraction Review Team (CHERT) as authorized under the US Army Corps of Engineers (COE) Letter of Permission (LOP) adopted on August 19, 1996, and the Interim Monitoring Program for the Lower Eel and Van Duzen Rivers adopted by the Humboldt County Board of Supervisors on July 2, 1996. The adoption of these two programs enlarged the geographical extent of scientific overview of gravel extraction operations over that described in the 1992 Memorandum of Agreement (MOA) and Programmatic Environmental Impact Report on Gravel Removal from the Lower Mad River (certified by the Humboldt County Board of Supervisors on May 31, 1994). The MOA authorized the formation of a Mad River Scientific Committee, and the Mad River PEIR authorized the continuation of the scientific review process and changed the name of the committee to the Mad River Scientific Design and Review Committee (SDRC).

While the two County programs cover both the Lower Mad River and the Lower Eel and Van Duzen Rivers (representing most operations in the County), the LOP covers all instream gravel mining operations

extraction more than 5,000 cubic yards of gravel annually in Humboldt County, including parts of the Trinity River near Willow Creek, Mattole River and all other rivers in the County except for Redwood Creek near Orick. The County and federal programs are intended to overlap in process and, for the most part, geographical extent by incorporating scientific review by the CHERT. In addition, the CHERT coordinates with the California Department of Fish and Game (CDFG), which oversees gravel extraction through the 1603 Streambed Alteration Agreement process. For a description of the county and federal programs in general, and the role and function of the CHERT in particular, the reader is referred to the Interim Monitoring Program for the Lower Eel and Van Duzen Rivers, the PEIR on Gravel Removal from the Lower Mad River and the LOP.

This report summarizes CHERT recommendations and COE approvals for volumes and design specifications of gravel extraction operations for the 1999 season, as well as evaluations of how well operators and their consultants met the recommendations.

Substantial monitoring at mine operations on the Eel and other rivers began in 1995. A report on historical channel changes in the Lower Eel and Van Duzen rivers was completed by the Corps of Engineers in May, 1999 (COE, 1999). Riverbed elevation changes from 1968 to 1998 were quantified at several cross sections on the South Fork and lower main channel Eel River as well as two on the lower Van Duzen River.

A. Generalized Criteria for Mining in Humboldt County

1. Mean Annual Recruitment, Sustained Yield, and Cumulative Effects

In order to minimize the potential cumulative effects of gravel extraction on the County's rivers, CHERT uses the concept of sustained yield. As defined by CHERT, *mean annual recruitment* (MAR) is an estimate of the long term average annual volume of gravel bed material that is supplied to a river reach by high flows. It is estimated most precisely by comparing measured rates of bedload transport with topographic information in a sediment balancing analysis. *Sustained yield* is the long-term average annual volume that can be safely extracted from a river reach without significantly increasing the risks of adverse effects on riparian habitat or infrastructure. To be sustainable, annual mining volumes must be no greater, and perhaps significantly less, than MAR to avoid or reduce cumulative effects from gravel mining. Many rivers in California and elsewhere provide examples of damage to infrastructure and riparian habitat where mined volumes have exceeded sustained yield.

In Humboldt County at present, MAR has only been estimated with reasonable confidence for the Mad River (150,000 cy/year is a best estimate, but the true value could be as high as 200,000 or as low as 100,000 cy/year). Since 1992, the gravel extraction on the Mad River has been constrained to approximately 100% of the upper estimate of MAR. (average annual extraction recommended between 1993 and 1999 was 197,628 cubic yards or approximately 1.32 times the best estimate of MAR). Mining volumes on other rivers (primarily the Eel and Van Duzen rivers) are, at present, only limited by site-specific conditions and/or by permitted volumes (vested rights and Conditional Use Permits, or CUPs). While this may be sufficient to avoid adverse impacts in areas with few mining operations, there is a potential to exceed sustained yield in river reaches where numerous mining sites are concentrated. The COE report mentioned above could contribute substantially to development of sustained yield mining programs on these river systems if it was incorporated into a gravel budgeting analysis similar to that performed on the Mad River, but no such analysis is scheduled. We believe such an analysis, especially one that includes contemporary bedload transport data, is critically needed and should be performed at the earliest possible time. This remains an unfulfilled promise of the PEIR on Gravel Extraction in the Lower Eel and Van Duzen Rivers (1992). Moreover, we believe agencies should not grant new Conditional Use Permits (CUPs) or other permits, or increases in existing permitted volumes in Humboldt County without reliable estimates of MAR and sustained yield. There will undoubtedly be increasing demand for aggregate when the rail line

connecting Humboldt County to markets to the south is once again functional, making the need for scientifically-based estimates of MAR for the Eel and Van Duzen rivers all the more critical.

2. Site-Specific Considerations

With few exceptions, 1999 gravel extractions in Humboldt County were designed as skims on unvegetated or sparsely vegetated bar areas. Skim configurations were of two general forms: a bench located near the edge of the low flow channel (most common) and a planar skim of the crown of a bar. Horizontal limits of skims were laid out to conform to the overall shape of the bar, typically in a crescent shape. On large-amplitude meander bends, the upstream end of the bar was left undisturbed to discourage meander cutoff and bar destabilization.

Where significant clumps of vegetation (mostly willows) occurred near the edge of a proposed skim, the boundaries of the skim were realigned to avoid them. Where such vegetation was located in the interior of a skim, these clumps were left as undisturbed "islands" within the skim boundaries. In most extraction areas, designs included a vertical offset of 1-2 feet above the low water surface to confine the low flow channel. Commonly, this offset was tied to a light colored "silt band" found along the edge of the channel. This silt band provided a reliable means to allow consistency in vertical offset for individual bars and between the numerous bars extracted along the river. Drainage of receding river flows was provided by designing extraction surfaces which slope either directly toward (perpendicular to) the low flow channel or in a downstream direction and avoiding leaving closed depressions that could cause salmonid stranding.

III. 1999 GRAVEL MINING RECOMMENDATIONS AND OPERATOR PERFORMANCE

In the 1999 extraction season, a total of 1,084,260 cubic yards (cy) was approved for Class A (annual extraction greater than 5,000 cy) operations in Humboldt County. Of this, 898,994 cy (or 83% of the approved volume) was actually extracted, as documented in post-extraction submittals from the operators. The following sections provide information specific to each operation in the County, segregated by river reach.

CHERT recommendations and other communications from the operators, their consultants, and agencies were compiled in numerous electronic mailings generated throughout the mining season. While this expedited the process of information exchange and approval of mining plans, no single report containing all recommendations was compiled. Consequently, this report is the only document summarizing all CHERT recommendations for the 1999 extraction season. In addition to comparing the recommended/approved and extracted volumes, compliance is also evaluated by comparing the configuration of our recommendations on individual cross sections with the post-extraction bar surface configurations. We note specific operations where the actual extraction deviated significantly from our recommendations and approved mining plans, both in terms of extraction volumes and post-extraction bar configuration.

A. Mad River

In the 1999 extraction season, ten extraction areas distributed among five operators on the Mad River were mined. The sum of all initial proposals received from operators totaled 269,631 cubic yards (cy), or about 119,000 cy above the best estimate of sustained yield (150,000 cy, as determined in the Technical Supplement to the Mad River PEIR). Table 1 shows the volumes recommended by CHERT, the actual extraction volumes (calculated by the operators' consultants from cross sections), and the deviations between recommended and actual volumes, expressed as a percentage. Note that the volume actually extracted by Arcata Readimix is an estimate based on the assumption that they extracted what was

recommended by CHERT. Their post-extraction report did not include cross sections reflecting bar disturbance at the O'Neill Bar which occurred after the spring, 1999, surveys but before CHERT review.

1. Comparison of Recommended, Approved and Extracted Volumes

As indicated in Table 1, total extraction recommended by CHERT on the Mad River for the 1999 season was approximately 196,212 cy, while the total gravel volume actually extracted was approximately 174,974 cy, or about 89% of that recommended by CHERT.

Table 1. Recommended and extracted volumes for Mad River sites (in downstream order), 1999.

Operator; site/bar	Approved Volume (cy)	Extracted Volume (cy)	Percentage Extracted
MRS&G; Guynup Upper Bar	13,400	9,854	74%
MRS&G; Guynup Lower Bar	33,000	23,335	74%
REA; Emmerson Bar Area 1 (upper bar)	23,250	23,437	101%
REA; Emmerson Bar Area 2 (lower bar)	8,250	8,788	107%
REA; Blue Lake Bar	26,700	26,700	100%
ERM; Christie Bar, Area 1	29,000	26,631	92%
ERM; Christie Bar, Area 2	15,307	13,778	90%
REA; Johnson Bar	7,900	5,704	72%
MFC; Essex Bar	3,525	3,097	88%
ARM; John-Spini Right Bank Bar	35,880	33,650	94%
ARM; John-Spini Left Bank Bar	N/A	N/A**	N/A**
ARM; O'Neill Bar	N/A	N/A**	N/A**
Total for Mad River	**196,212**	**174,974**	**89%**

* assumes the volume extracted was the same as that recommended by CHERT

** assumes no extraction occurred in 1999

2. Summaries of Site-specific CHERT Recommendations and Post-Extraction Observations

Guynup Bars (Mad River Sand and Gravel, MRS&G): Recommendations at this site consisted of skimming the unvegetated bar surfaces of the upper and lower bars adjacent to the low flow channel. The CHERT recommendations included a vertical offset of about 1.5 feet above the low water surface. The upper and lower bar skims were significantly under-extracted (Table 1). On the upper bar, this under-extraction left the skim area with undulating topography and several minor depressions (as indicated on cross sections and by post-extraction field review), similar to conditions observed in 1997-98 but less problematic in terms of facilitating drainage following inundation.

Emmerson Bar (Redwood Empire Aggregates, REA): Recommendations at this site consisted of skimming the unvegetated bar surfaces adjacent to the right and left sides of the low flow channel (Areas 1 and 2, Table 1) with a downstream slope and a vertical offset of about 1-2 feet above the low water surface. Both the approved volume and the post-extraction skim configurations were well met at this site.

Blue Lake Bar (Redwood Empire Aggregates, REA): Recommendations at this site consisted of skimming an unvegetated bar surface adjacent to the right side of the low flow channel along the lower two-thirds of the bar with a downstream slope and a vertical offset of about 1-2 feet above the low water surface. The CHERT recommendation was well met at this site, as indicated in the post-extraction report of October 8, 1999. During the post-extraction field review (October 25), we recommended a minor additional extraction

of about 1,700 cy from a wedge of gravel left within the original extraction boundaries, giving a total of about 26,700 cy recommended for and extracted from this site.

Christie Bar (Eureka Ready Mix, ERM): Recommendations at this site consisted of skimming the unvegetated bar surface adjacent to the right (Area 1) and left (Area 2) sides of the low flow channel bisecting the site. The CHERT recommendations included a vertical offset of about 1-2 feet above the low water surface. The CHERT recommendation was generally well-met at this site, with the exception that the extraction went slightly below (about 1 foot) the approved elevation near the upstream part of the Area 2 skim (on extraction cross section no. 2), creating a minor depression. No drainage problems are anticipated with this site despite the minor depression.

Johnson Bar (Redwood Empire Aggregates, REA): Recommendations at this site consisted of skimming the unvegetated bar surface adjacent to the left side of the low flow channel near the apex of this bar. The extraction plans included a vertical offset of about 1-2 feet above the low water surface, exclusion of vegetation clumps from the extraction area, and avoidance of backwater habitat areas near the downstream end of the site, as in 1997-98. The approved designs were well met at this bar.

Essex Bar (Mercer Fraser Company, MFC): Recommendations at this site consisted of skimming the unvegetated bar surface adjacent to the right side of the low flow channel. The CHERT recommendations included a vertical offset of about 1-2 feet above the low water surface with an essentially flat skim. This is a small bar, thus the likelihood of drainage problems arising from the flat, level skim was minimal. Recommendations were well met at this site.

Johnson-Spini Bar (Arcata Readi Mix, ARM): Although CHERT received a mining proposal from ARM on July 22, 1999, we did not perform a field or office review of these materials until the operator reimbursed us for services rendered over the previous year (payment was made on Sept. 15, 1999, a few weeks before the end of the extraction season, and we began our review of the proposal on the same day). During the initial field review on Sept. 16, we observed that O'Neill Bar had been extensively disturbed by heavy equipment and that the cross sections provided to us reflected the pre-disturbance condition and were thus obsolete. Pending receipt of current survey information for that bar, we completed field reviews of the other two bars at the site (Johnson-Spini right bank and left bank bars) the same day. CHERT recommendations were made for Johnson-Spini right bank bar, which consisted of raising proposed skim floor elevations of the unvegetated surface of an upper mid-channel bar to the right of the low flow channel (Johnson-Spini Right Bank Bar, Table 1) to better preserve low flow channel confinement and discourage braiding. We requested (of both the operator and the COE), but were never given, cross sections reflecting the current (post-grading) conditions of the O'Neill Bar, thus we were not able to develop further recommendations for the site

CHERT was not provided with post-extraction information (cross sections, mined volumes, etc.), soon enough to conduct a post-extraction field review (prior to the onset of winter stormflows). A post-extraction submittal was given to the CHERT administrator on Dec. 4 (about a month later than required) with neither a cover letter nor any other indication that this was supposed to have been passed along to the technical members of CHERT (earlier submittals from ARM, as well as all other operators, were accompanied by some indication, in the form of either a cover letter or a verbal description of what the CHERT administrator was supposed to do with the materials submitted). Consequently, it was mistakenly assumed that another copy of the materials had been given to the authors of this report, and that the materials given to the CHERT administrator were meant to provide a copy for placing in his files. It wasn't until Feb. 1, 2000, that this was realized and the post-extraction submittal was provided to the technical CHERT members. Even if the materials had been given to the CHERT technical members immediately after they were given to the administrator, the post-extraction conditions had already been altered by high flows, thus precluding an

effective post-extraction field review. All other sites on the Mad River were field reviewed on October 25, 1999, following receipt of post-extraction submittals.

Upon examination of the ARM submittal, it was found to be deficient in that cross sections reflecting the disturbance to O'Neill Bar were not included, as requested on numerous occasions. In addition, electronic cross section files were not provided, as required in the LOP. Timely, complete submittals for both the pre- and post-extraction reviews in the future will help both CHERT and the operator in minimizing costs and avoid miscommunications. For the area where extraction was documented (Johnson-Spini right bank bar), cross sections indicate that approved plans were well met.

B. Main Stem Eel River

1. Comparison of Recommended, Approved and Extracted Volumes

As shown in Table 2, the total volume actually extracted on the main stem Eel River in 1999 was approximately 415,344 cy distributed among 13 areas at 10 sites. This volume is about 75% of that recommended by CHERT (556,370 cy).

Table 2. Recommended and extracted volumes for the Main Stem Eel River sites (in downstream order), 1999.

Operator; site/bar	Recommended Volume (cy)	Extracted Volume (cy)	Percentage Extracted
PALCO; Bowlby Bar	28,000	28,104	100%
PALCO; South Fork (Dyerville) Bar	27,800	25,600	92%
PALCO; Elinor Bar	28,120	29,077	103%
PALCO; Three Mile Bridge Bar	27,500	24,087	88%
PALCO; Dinner Creek Bar	7,800	3,074	39%
PALCO; Truck Shop Bar	15,700	14,869	95%
Eureka Ready Mix; Hauck Bar	70,250	42,700	61%
Hansen Site; Hansen Bar	45,300	34,908	77%
Mercer Fraser Co; Sandy Prairie Area 1 (A)	55,880	51,586	92%
Mercer Fraser Co; Sandy Prairie Area 1 (B)	48,650	32,555	67%
Mercer Fraser Co; Sandy Prairie Area 2 (B)	71,500	61,419	86%
Mercer Fraser Co; Sandy Prairie Area 3 (B)	29,870	6,349	21%
Mercer Fraser Co; Sandy Prairie Area 4 (A)	13,600	11,947	88%
Humboldt County PWD; Worswick Bar	N/A*	N/A*	N/A*
Mallard Pond; Drake Bar	86,400	49,069	57%
Total for Main Stem Eel River	**556,370**	**415,344**	**75%**

* not proposed for extraction in 1999

2. Summaries of Site-specific CHERT Recommendations and Post-Extraction Observations

Bowlby Bar (PALCO): CHERT recommendations at this site consisted of accepting the operator's proposal as originally submitted, which was to skim the inner (riverward) edge of a large, unvegetated, and frequently mobile point bar. The recommendations were well met at this site.

South Fork Bar (PALCO): CHERT recommended approval of the operator's proposal as submitted, which was to skim the inner (riverward) edge of a large, unvegetated, and frequently mobile point bar. The recommendations were well met at this site.

Elinor Bar (PALCO): The operator's proposal for this site was to skim the riverward edge of a large, unvegetated, and frequently mobile point bar. CHERT recommended approval of the operator's proposal as submitted. The approved plans were well met at this site.

Three Mile Bridge Bar (PALCO): The operator's proposal was to skim the riverward edge of a large, unvegetated, and frequently mobile lateral bar. CHERT recommended approval of the operator's proposal as submitted. The approved plans were well met at this site.

Dinner Creek bar (PALCO): The operator's proposal was to skim the crown of a large, sparsely vegetated, and frequently mobile lateral bar. CHERT recommended approval of the operator's proposal as submitted, which included provisions to transplant willows rooted within the extraction area. The site was significantly under extracted, which eliminated disturbance to vegetation and the need for transplanting, but was left in good condition without depressions.

Lower Truck Shop Bar (PALCO): The operator's proposal was to skim the crown of a large, unvegetated, and frequently mobile lateral bar. CHERT recommended approval of the operator's proposal as submitted. The approved plans were well met at this site.

Hauck Bar (Eureka Ready Mix): CHERT recommendations at this site consisted of accepting the operator's proposal as submitted, which was to skim the inner (riverward edge) of bar on the right side of the channel (part of the downstream edge of the Van Duzen River delta). Approved designs included about 2 feet of vertical offset from the low water surface and leaving a clump of willows within the extraction area boundaries undisturbed with a 25 foot buffer. This bar was significantly under-extracted (Table 2). Under-extraction was accomplished by leaving undisturbed the landward edge of the extraction area on the lower two-thirds of the site. This resulted in the final skim surface being narrower than approved and in a condition favorable to proper drainage following inundation.

Hansen Bar (Charles Hansen, Sr.): CHERT recommendations at this site consisted of accepting without modification the operator's proposal, which was to skim the upper portions of a large, unvegetated, and frequently mobile mid-channel bar. The proposal left about 2 feet of vertical offset from the low flow water surface. The volume extracted was less than that approved, mainly because the extraction did not go as far downstream as planned and approved. Post-extraction surveys indicated that a large hump was left at extraction cross section number 5 and extraction was terminated shortly downstream (between extraction cross sections 5 and 6). Depending on the topographic details in this area (not discernable from the cross sections), it may have created a condition of impeded drainage following inundation by stormflows. In the future, we recommend post-extraction grading be carried out to smooth out such features prior to the onset of winter storms.

Sandy Prairie Bar (Mercer Fraser Co.): This bar feature is fairly complex, consisting of several high flow channels and intervening dissected bars. The extraction proposal consisted of skimming four unvegetated bar surfaces at four areas, leaving 1-2 feet vertical offset above the low water surface and generally sloping either across-channel or downstream. CHERT recommended the proposal be approved without modification. Although significantly under-extracted in some areas, recommended extraction plans were well met by the operator at this site except that the skim went about 1 foot too low (to 18 feet elevation) in Area 1 on cross section 9. We consider this to be a minor deviation considering the size and complexity of this operation.

Worswick Bar (Humboldt County Public Works Dept.): No mining proposal was made for extraction at this bar in 1999. A correction to the volume extracted in 1997 was provided to CHERT in May, 1998. The previously reported extraction volume was 24,666 cy, while the revised volume was 30,000 cy.

Drake Bar (Drake Materials): CHERT recommendations at this site consisted of accepting the operator's proposal, as submitted, which was to skim the inner (riverward edge) of bar on the left side of the low flow channel. The site was significantly under-extracted, but in such a way that the post-extraction configuration provided for adequate drainage following inundation and was compatible with local bar morphology. As was the case in 1997-98, this site provides a good example of how to conduct under-extraction without leaving the bar in an undesirable configuration.

C. South Fork Eel River

1. Comparison of Recommended and Extracted Volumes

As shown in Table 3, the total volume actually extracted on the South Fork Eel River in 1999 was approximately 75,945 cubic yards (cy). This volume is about 88% of that recommended by CHERT and approved by agencies (86,118 cy).

Table 3. Recommended and extracted volumes for the South Fork Eel River sites (in downstream order), 1999.

Operator; site/bar	Recommended Volume (cy)	Extracted Volume (cy)	Percentage Extracted
Mercer Fraser Co; Cooks Valley, Area 1*	3,000	2,553	85%
Mercer Fraser Co; Cooks Valley, Area 2*	17,100	17,529	103%
Mercer Fraser Co; Cooks Valley, Area 3	8,450	8,254	98%
Mercer Fraser Co; Cooks Valley, Area 5	12,068	11,089	92%
Randall Sand and Gravel; County Bar	5,000	2,878	58%
Randall Sand and Gravel; Home Bar	27,000	22,135	82%
Randall Sand and Gravel; Tooby Park Bar	3,500	3,679	105%
Wallan and Johnson; Wallan & Johnson Bar	10,000	7,828	78%
Total for South Fork Eel River	**86,118**	**75,945**	**88%**

* located in Mendocino County

2. Summaries of Site-specific CHERT Recommendations and Post-Extraction Observations

Cooks Valley Site (Mercer Fraser Co.): This site straddles the line between Humboldt and Mendocino Counties on a large forced meander bend. Three areas were proposed for skimming: areas 1 and 2 in Mendocino County and areas 3 and 4 in Humboldt County. Area 1 is located on the inside of the bend near the upstream end. Areas 2 and 3 are contiguous on a mid-channel bar along the outside of the bend in the river while area 4 is located on another mid-channel bar near the downstream end of the bend. A secondary channel flows along the right bank adjacent to Areas 1 and 2 and then crosses over upstream of Area 3. The operator's initial proposal was to skim all four areas with either cross-stream or downstream slopes incorporated into the designs. Modifications to the proposal were recommended by CHERT to reduce the volume proposed for area 1 to comply with a Mendocino County volume limit of 20,000 cy and to increase the depth and length of a shallow trench along the upstream end of area 2. During a mid-extraction site visit on August 26, we noticed that extraction was occurring outside of the approved limits in area 1, leading to the reduction mentioned above. On September 14, the operator proposed to drop area 4 from the work plan in favor of adding a new area (area 5, a wet trench on a right bank lateral bar between areas 3 and 4), which was approved by oversight agencies. Approved mining plans appear to have been reasonably well met at this site.

Randall Site (Randall Sand and Gravel); CHERT recommendations for this site consisted of clarifying several elements of the proposal, then recommending extraction occur consistent with the clarifications. The three areas proposed for extraction were: 1) a lateral bar, called "County Bar", near the upstream end of the site, consisting of a skim which avoided a strand of willows along the low flow channel margin, similar to previous years, 2) a skim on Tooby Park Bar, adjacent to Tooby Park on the south bank, and 3) a skim on the downstream half of Home Bar on the inside of the meander bend adjacent to the processing facilities. This is a forced meander exhibiting very consistent replenishment and morphology from year to year.

Although the mined volume was below that approved (Table 3), post-extraction cross sections indicated the skim went 1-2 feet below approved grades on Home Bar near the river's edge at cross sections 8, 7E, and 9 (virtually throughout the extraction area) and closer to the river's edge at cross section 9. In addition, the extraction area on County Bar appears to have been moved downstream from approved plans (there was no extraction evident on cross sections 1E and 2E, but extraction was documented on cross section 3E, where none was planned or approved). On Tooby Park Bar, extraction went well below the approved plans on cross section 5 (about 3.5 feet) and about 1.5 feet on cross section 4E. While CHERT feels these deviations from approved plans are not likely to result in significant damage to stream resources, it is nonetheless important for operators to either follow approved plans reasonably closely or seek review and approval for desired modifications.

Wallan and Johnson Bar (Wallan and Johnson); This site is located on a large, unvegetated, frequently mobile lateral bar along the right side of the channel. CHERT recommendations consisted of accepting the operator's proposal without modification, which was to skim the top of the bar well above the low water surface. Approved plans were well met at this site.

D. Van Duzen River

1. Comparison of Recommended and Extracted Volumes

As shown in Table 4, the total volume actually extracted on the Van Duzen River in 1999 was approximately 146,814 cubic yards (cy). This volume is about 94% of that recommended by CHERT and approved by agencies (156,860 cy).

Table 4. Recommended and extracted volumes for the Van Duzen River sites (in downstream order), 1999.

Operator; site/bar	Recommended Volume (cy)	Extracted Volume (cy)	Percentage Extracted
Bess Site; East Area	1,860	1,889	102%
Bess Site; West Area	18,000	10,248	57%
Noble Site; Fisher Road Bar	40,000	38,000	95%
Leland Rock; East Area ("D")	6,000	7,851	131%
Leland Rock; Middle Area ("B")	32,000	36,726	115%
Leland Rock; West Area ("C", Dwelley Bar)	59,000	52,100	88%
Total for Van Duzen River	**156,860**	**146,814**	**94%**

2. Summaries of Site-specific CHERT Recommendations and Post-Extraction Observations

Bess Site (Tom Bess); Two extraction areas (east and west) were proposed for this site, as in 1998. Extraction areas consisted of skims on active, unvegetated bars on both sides of the river. The east area was located on a lateral bar along the left side of the low flow channel near the upstream end of the site, and the western area was located on a lateral bar along the left side of the low flow channel near the downstream

end of the site. Although the west extraction area was significantly under-extracted (Table 4), it was left in a good condition conducive to proper drainage following inundation. The east area approved plans were well met, although it appears that on cross section 14+00, either the top of the bank was raised 3 feet by fill placement between pre- and post-extraction surveys, or there was a survey error.

Noble Site (Jack and Mary Noble); CHERT recommendations consisted of accepting the operator's proposal as submitted, which was to skim the riverward edge of a point bar, leaving a cross-channel slope of 1-2%. Approved plans were well met at this site.

Leland Rock Site (Leland Rock); CHERT recommendations for this site consisted of slight modifications to the operator's proposal for the two primary areas (B, just above the Highway 101 and railroad bridges, and C, on the delta at the confluence with the Eel River), deleting an area (A) on a dissected (braided) mid-channel bar which included two high flow channels, and adding an area (D) at the downstream tip of a mid-channel bar at the upper end of the site. CHERT recommended that the skim floor elevations be raised on area D to maintain better low flow channel confinement, and this was agreed to by the operator and reflected in approved plans.

Over-extraction occurred on areas B and D. On area B, extraction exceeded that approved by nearly 5,000 cy, but the pre- and post-extraction cross sections seem to agree well, with the exception that the depth of cut was shallower than approved on cross section 16, which should have yielded less volume than that approved. We suggest the operator review the survey data, plots, and volume calculations for this area to ascertain how a greater than approved volume could have been taken given the cross section comparisons described above. The excess volume extracted on area D appears to be the result of extracting to elevations as originally proposed (one foot lower than those recommended by CHERT and approved by agencies). Although the total site extraction volume was below that approved, excess extraction at area D resulted in loss of low flow channel confinement. The apparent over extraction at area B needs to be clarified by the operator and his consultants.

E. Miscellaneous Humboldt County Sites

1. Comparison of Recommended and Extracted Volumes

As shown in Table 5, the total volume actually extracted on miscellaneous sites in 1999 was approximately 85,917 cubic yards (cy). This volume is about 97% of that recommended by CHERT and approved by agencies (88,700 cy).

Table 5. Recommended and extracted volumes for miscellaneous sites in Humboldt County (Trinity River, North Fork Mattole River), 1999.

Operator; site/bar	Recommended Volume (cy)	Extracted Volume (cy)	Percentage Extracted
Hoopa Valley Ready Mix; Trinity River	20,000	28,028	140%
Mercer Fraser Co; Trinity River, Area 1	12,700	14,777	116%
Mercer Fraser Co; Trinity River, Area 2	8,000	6,833	85%
Mercer Fraser Co; Trinity River, Area 3	18,000	17,251	96%
Humboldt County; NF Mattole River, Cook Bar	30,000	19,028	63%
Total for miscellaneous sites	**88,700**	**85,917**	**97%**

2. Summaries of Site-specific CHERT Recommendations and Post-Extraction Observations

Rowland Bar, Trinity River (Hoopa Valley Ready Mix): This site is located on the Trinity River on the Hoopa Indian Reservation. After clarifying that CHERT review was necessary at the site, the operators proposal was recommend for approval. The proposal was to skim the riverward part of a bar in a bench fashion, leaving 2-3 feet of vertical offset above the low water surface. Actual extraction was well above the recommended volume (Table 5). The Corps' approval was for 24,625 cy; but we're not sure why the discrepancy between the proposed volume and CHERT recommendation (20,000 cy) occurred. The actual extraction was quite different from approved designs as well, with skim floor elevations (as documented on post-extraction cross sections) going from two to six feet below approved limits. This was a major deviation from approved designs. The jurisdiction issue over whether or not CHERT review is required at this site must be resolved between Hoopa tribal authorities and the COE prior to the coming extraction season so that site reviews can be efficiently scheduled.

Willow Creek Site, Trinity River (Mercer Fraser Co.): The proposal for this site consisted of extracting at three areas: area 1 was a skim on a right lateral bar, area 2 was a trench along the left bank of the Trinity River, separated from the river flow by a residual berm, and area 3 was a skim on a point bar on the right side of the river near the downstream end of the site. CHERT recommendations included lowering skim floor elevations on area 1, reducing the depth of the trench at area 2, and increasing the width of area 3. Area 1 was over-extracted according to the volume calculations provided with the post-extraction cross sections, however, the cross section plots do not indicate over-extraction. An explanation for this discrepancy should be provided by the operator. At areas 2 and 3, the approved plans were well met.

Cook Bar, North Fork Mattole River (Humboldt County Public Works Dept.): This extraction was proposed as two skims on either side of the North Fork Mattole River channel where it flows across the delta at the confluence with the main stem Mattole. This is a highly mobile bar feature and appears aggraded. CHERT recommendations were to increase the horizontal setbacks from the channel to leave broader banks, thereby increasing the river flow required to breach the berms. The recommendation was accepted by the operator and approved by agencies. The site was under-extracted, primarily by reducing the volume on the west side of the channel. Approved plans were reasonably well met at this site and the under-extraction was conducted such that proper drainage would occur following inundation.

IV. SUMMARY OF RIVER CONDITIONS AND TRENDS

River conditions vary from year-to-year vary by the amount of gravel bedload transported by winter stormflows, which is determined primarily by the size and duration of the largest flow event produced by winter rains. Numerous smaller events may also affect the way the river looks each spring if they are large enough to move bedload, but their influence is overshadowed by the effects of large floods. Annual or seasonal rainfall is a relatively poor predictor of river changes, as seen last year when rainfall was above normal, but was distributed over the rainy season in numerous rainstorms of only small or moderate size. Such storms do not produce the large, long duration river flows required to transport large volumes of gravel, even though turbidity (caused by fine sediment in suspension) may be high for extended periods. It is also the larger flow events that re-supply mined bars with new gravel and allow mining on a recurring basis on an individual bar.

In previous post-extraction reports, we have developed quantitative information on changes in river conditions for the Mad River from compilation and comparison of large amounts of data. This is a time consuming task and is expensive for the operators who reimburse us for our time. It is also difficult to perform a comprehensive analysis within the time frame allowed by the County program. We feel such an analysis is important, but would be more appropriately performed in the context of a larger planning effort, such as reauthorization of environmental impact reports. Consequently, this report includes only a brief narrative describing river conditions and trends for each of the major locations of instream mining in

Humboldt County based on observations made during the course of field reviews, looking at air photos of mining sites, and summarizing observations made by others.

A. Mad River

The Mad River underwent more rapid geomorphic changes since 1995 than either in the early years of the scientific review program (1992-94), when winter flows were relatively low, or in the recent past, when rainfall was above normal, but peak river flows were either relatively small or of short duration. However, the 1998-99 winter runoff season produced only a single significant stormflow (in November, 1998), and recruitment was fairly low despite above normal rainfall. Recruitment for the present winter runoff season (1999-2000) is shaping up to be low as well and normal recruitment is expected only if unusually large flow events, uncharacteristic of the remaining winter high flow months (February and March), occur.

As discussed in last year's report, the predominant changes since 1992 have been in the river's planform (configuration of the river viewed from above, as in maps or air photos). Several meanders have tightened their radii and migrated downstream over the last decade (e.g., Blue Lake, Leavey, and Christie meander bends). This is a natural process in alluvial rivers and has resulted in large volumes of bank erosion in high flow years at several locations in the river reach near the City of Blue Lake. The main flow channel at Christie Bar has cut across the middle part of the bar. Minor planform change or bank erosion was observed in the river reach downstream from the Annie and Mary Railroad Bridge since 1992.

B. Eel, South Fork Eel, and Van Duzen Rivers and Miscellaneous Humboldt County Rivers

At this time, no quantitative assessment has been made of river conditions and trends in the South Fork Eel, Lower Eel and Van Duzen rivers except for the relatively brief 1999 report on these rivers by the COE (1999). As mentioned earlier, the COE has completed an analysis of several cross sections surveyed in 1968 and again in 1998 on the South Fork Eel, lower Eel, and Van Duzen rivers. While it is difficult to make broad generalizations about channel changes over many miles of river with just a few cross sections, results of this analysis suggest the following: the South Fork Eel experienced significant net aggradation over the 30-year period, while the lower Eel degraded and the lower Van Duzen aggraded slightly. Insufficient information precludes summarizing changes in river conditions and trends at miscellaneous County mining sites (Trinity River, North Fork Mattole River).

V. EVALUATION OF BIOLOGICAL MONITORING PROTOCOLS AND 1999 RESULTS

We have reviewed the four 1999 reports on biological monitoring required of gravel mining operations in Humboldt County. The reports are listed below along with brief summaries of findings:

- 1999 Fisheries Monitoring Program for Gravel Extraction Operations on the Mad, Eel, Van Duzen, and Trinity Rivers. Prepared by Andrew Jensen, Natural Resource Management Corp (NRM). This report documents the results of fish habitat mapping, summer steelhead dive surveys, fall adult salmonid migration surveys, fall adult salmonid spawner surveys, and summer/fall water temperature monitoring on the Mad, lower Eel, Upper Eel (near Fort Seward), South Fork Eel, Van Duzen, Trinity, North Fork Mattole rivers and Larabee Creek. Observations of other species, such as amphibians and juvenile salmonids were also noted during these surveys. Of the rivers surveyed, salmonid spawning was only observed on the Mad River. Outmigration of juvenile steelhead appeared to occur between October 7 and 19 on the Mad River and on or soon after October 14 on the Trinity River. Maximum recorded water temperatures 22 to 24 degrees C for extended periods, which is considered to be stressful or lethal for most juvenile salmonid species, although no massive die-off was recorded. A general decrease in water temperature with increasing proximity to the

coastal fog influence was recorded in 1999, similar to results from earlier years. The Mad River experienced a precipitous drop in summer steelhead numbers in 1999 compared to 1997-98. Adult upstream migration surveys ended in mid-October in 1999, and no coho were observed on any of the rivers surveyed. In earlier years (1996-97), migrating adult coho were observed in the Mad River, with their numbers increasing into November. Surveys later into the winter season may have documented coho migration, although rising river flows may preclude such surveys in some years.

- Amphibian and Reptile Monitoring Study, Humboldt County Gravel Operations: Final Report. Prepared by NRM. This report summarizes brief, single visit surveys for amphibians and reptiles at two locations of occasional gravel extraction by the Humboldt County Department of Public Works: Charles Bar on Larabee Creek and the delta of the North Fork Mattole River at the confluence with the main stem Mattole River. Only three species were observed at the North Fork Mattole site: Yellow-legged Frogs, Garter Snake, and Western Fence Lizard. None were observed at the Larabee Creek site, which is a broad, unvegetated, heavily aggraded valley with no surface water flow during late summer and early fall. Yellow-legged Frogs were observed using the site no more than one meter from the edge of water, thus it is surmised that the six-foot (two meter, approximately) horizontal buffer required between the extraction area and the water's edge minimizes effects of gravel operations on these species. Surveys were conducted during daylight hours, thus nocturnal species that might be present were not detected.

- Interim Monitoring Program and Adaptive Management Practices for Gravel Removal from the Lower Eel and Van Duzen Rivers: 1999 Annual Report on Avian Monitoring Data. Prepared by LBJ Enterprises. Four years (1996-99) of point count data are presented, with significant year-to-year variability reported. However, it is suggested that at least 10 years of survey data are needed to begin to make valid interpretations of temporal trends. A number of observations of threatened, endangered, and species of special concern were made in 1999, including summer Bald Eagle and Peregrine Falcon use of the lower Eel River. Western Snowy Plovers and Bank Swallows were observed in early August in the lower Eel River as well.

- South Fork of the Eel River Riparian Vegetation Delineation. Prepared by Clare Golec, NRM. Vegetation areas and wetland habitats were mapped using air photos enlarged to a scale of 1inch = 500 feet for the South Fork Eel River reach encompassing the Randall and Wallan and Johnson extraction sites. This constitutes the initial survey to which future conditions will be compared.

These reports appear to fulfill the COE's requirements for fisheries, bird, riparian vegetation, and amphibian monitoring for operations covered by the reports. The reader is referred to the individual reports for more detailed information. In past years' biological monitoring reports, not all operations for which monitoring was required had had it done. In particular, riparian vegetation had not been mapped for operations along the South Fork Eel River. Consequently, this year's vegetation report covers only that area and, as with initial surveys on other rivers, is viewed by the COE as a baseline to which future surveys will be compared. In addition, this year's bird monitoring report contains no information for two sites on the Van Duzen River (the Noble and Bess operations).

In previous reports, we have been critical of the design of biological monitoring programs. Our criticisms focussed primarily on the fact that, as designed, the monitoring programs are only capable of detecting fairly gross and direct impacts, a shortcoming which continues in the present monitoring program. They are incapable of detecting indirect effects of mining or the relative role of instream mining in cumulative effects of land management, nor can they provide meaningful feedback for refining mining practices. That is not to say the information collected has no utility, only that it cannot meet its intended objectives of assessing the full effects of gravel mining on riparian-dependent plant and animal species.

It may very well be that a monitoring program capable of identifying cumulative or indirect effects would be so costly as to be infeasible, however, there are ways to incrementally and cost-efficiently improve upon the state of knowledge. This could be accomplished through focussed research projects that test well-defined hypotheses related to mining effects. This sentiment is also expressed in the 1999 fisheries monitoring report. In the absence of definitive answers gleaned from such research, we attempt to use professional judgement in our review of mining operations to avoid both direct and indirect effects, but it is difficult to tell how successful we are in this regard.

Several specific problems with the biological monitoring program are:

- The biological program depends on comparisons with arbitrary "baselines" (the first year of monitoring, whenever that might be) to measure effects of mining on riparian vegetation and other biological resources. Any pre-existing impacts would be included in the baseline, which is viewed as a reference condition. More importantly, disturbance of bar surfaces by mining, for example, precludes vegetation colonization, thus no re-growth could occur that might be subject to mining impacts.

- Insufficient or no data are collected on riparian areas outside of the river reaches mined or influenced by mining. Studies on the effects of instream mining document biological effects well removed from the actual site of mining. Added emphasis on monitoring in areas unaffected by mining could provide meaningful data for assessing the effects of mining.

- Amphibian and reptile surveys take place in the daytime, thus nocturnal species may not be detected.

VI. RECOMMENDATIONS

We offer the following recommendations to improve the quality of information required in the review process and keep program costs to a minimum. Most operations already follow the recommendations listed below and reap the benefit of efficient reviews and lowered costs. Several of these recommendations were included in last year's report, but bear repeating:

- All spring monitoring and extraction cross section surveys should include: 1) the current water surface, 2) the top of the silt band, if present, and 3) points in the wetted channel as far as is safely wadable. These will facilitate pre-extraction reviews and save time and money. Post-extractions submittals should include both the spring and fall water surface elevations at the time of survey to document the decline over the low flow season.

- Consider a discussion of mining plans, on site if feasible, with CHERT prior to preparing a mining proposal in the spring. This will help minimize changes recommended to the proposal by CHERT and save money and time.

- Post-extraction cross sections should include the final approved mining configuration overlaid onto the pre- and post-extraction survey data. This was also recommended in last year's report, but not all operators included this information, which expedites post-extraction reviews and preparation of this report, saving time and money.

- A brief narrative should be included with the post-extraction submittal. This should note such things as post-extraction grading, stockpile areas, and any other observations relevant to explanations of what took place before, during or after extraction.

- When making pre- and post-extraction submittals, operators should make it clear as to where the materials should go (whether or not they are copies for the files or are to be used by the technical members for review purposes).

- We are dismayed by the continuing lack of timely enforcement by the Corps of Engineers of some requirements of their LOP and the County of some requirements of the Mad River PEIR. In particular, we believe the lack of action to obtain complete, up-to-date, and timely pre- and post-extraction information from Arcata Readimix is disruptive to the County mining program and hampers CHERT's ability to achieve the mitigations included in the Mad River PEIR. The information provided to CHERT by the operators is critical to the annual review process and to minimizing impacts from mining on natural resources. The message implicit in this lack of enforcement is that there will be no repercussions should an operator choose not to go to the expense to comply with the LOP or CEQA mitigation. We urge the regulatory agencies to place more emphasis on ensuring all regulatory provisions are enforced promptly and equally among all Humboldt County gravel operators.

VII. LITERATURE CITED

US Army Corps of Engineers (COE). 1999. Eel and Van Duzen Rivers: General assessment of historical change in channel morphology. San Francisco District. 15 p., with appendices, maps, and photos.