COUNTY OF HUMBOLDT EXTRACTION REVIEW TEAM (CHERT)
2003 POST-EXTRACTION REPORT

DISCUSSION DRAFT

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County of Humboldt extraction Review team (CHERT)

For the

Humboldt County Board of Supervisors

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No comments were received on the Discussion Draft.
This version represents the Final 2003 CHERT Post Extraction Report.

LIST OF TABLES

EXECUTIVE SUMMARY

This report represents the Humboldt County CHERT gravel extraction compilation and analysis for the 2003 mining season. CHERT site-specific recommendations regarding extraction designs submitted by the operators or their consultants as well as operator performance in meeting approved designs and specifications are briefly summarized. In 2003, CHERT reviewed 47 extraction areas distributed among 26 mining sites in Humboldt and Mendocino Counties (many sites had more than one extraction area). The total volume of gravel approved for extraction in 2003 was about 881,160 cubic yards (cy). The total volume actually extracted was about 581,860 cy, or about 66% of that approved for extraction. The relatively low extraction in 2003 was primarily due to the short extraction season under the Corps LOP permit program.

The concept of sustained yield extraction is used to avoid over-extraction and resultant cumulative effects on aquatic and riparian habitat and infrastructure (bridges, levees, etc.). Site-specific measures recommended by CHERT are used to reduce both cumulative and local effects of mining on riparian and aquatic habitat. CHERT utilizes an adaptive management strategy and these criteria on an annual and multi-year basis to meet extraction management objectives.

I. INTRODUCTION

This 2003 annual post-extraction report of the County of Humboldt Extraction Review Team (CHERT) summarizes CHERT recommendations and agency approvals for gravel extraction operations for the 2003 season, as well as descriptions of any substantial deviations from approved mining plans.

The Humboldt County instream gravel mining program is conducted pursuant to the California Surface Mining and Reclamation Act (SMARA). The US Army Corps of Engineers (COE) and the California Department of Fish and Game (DFG) also regulate Instream mining. CHERT review of instream gravel mining is authorized by SMARA (Public Resources Code, Division 2, Chapter 9, Section 2774 (b), the Interim Monitoring Program for the Lower Eel and Van Duzen Rivers adopted by the Humboldt County Board of Supervisors on July 2, 1996. and 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 and is also required by the COE and DFG.

Various extraction reaches are identified in Table 1. Extraction data are organized by these reaches. CHERT uses a three-letter code to identify the 16 Humboldt County operators. They are listed 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 Reach** The South Fork Reach extends from Garberville (River mile 33) upstream to Cooks Valley near the Mendocino County line (River mile 50), a distance of approximately 17 miles.
15	**Trinity River Reach** The Trinity River Reach extends downstream about 15 miles from near Willow Creek into the Hoopa Valley.
	"Isolated Sites" Five extraction sites are more or less isolated from the rest of project. 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.

Table 2. Humboldt County Gravel Operators and CHERT Identifying Codes.

Operator Name	Operator Code
Tom Bess	BES
Drake Materials	DRA
Eureka Sand & Gravel	ESG
Granite Construction	GRA
Hansen Truck Stop	HAN
Humboldt County	HUM
Klamath Trinity Aggregates	KTA
Mercer Fraser Corporation	MFC
Miller-Almquist	MIA
Mad River Sand & Gravel	MRS
Van Duzen River Ranch	NOB
PALCO	PAL
Randal Sand & Gravel	RAN
Rock and Gadberry	ROC
Fort Seward Ranch	SAT
Wallan & Johnson	WAL

II. SUSTAINED YIELD MANAGEMENT

The 2003 gravel management strategies were guided by U.S. Army Corp's of Engineers requirements, California Department of Fish and Game requirements, and Endangered Species Act considerations for listed species (Coho Salmon and Snowy Plover). Management strategies for gravel extraction on the lower Mad River and the lower Eel and Van Duzen rivers were also guided by environmental impact reports (EIRs) specific to each area. Both EIRs require, among other things, that gravel-mining volumes be constrained so that excessive channel bed degradation (net lowering) does not result from gravel mining. Excessive channel bed degradation can negatively impact fish passage, riparian vegetation and channel infrastructure and is but one of many potential negative effects linked to gravel mining in environmental documents and published scientific literature from case studies from many areas around the globe. Other potential negative effects include changes in bar morphology resulting in a loss of bar function, a reduction in the quality and/or quantity of instream aquatic and shoreline habitat, channel widening through increased bank erosion, channel braiding (establishment of multiple flow channels across a bar) and loss of confinement within low and moderate flow channels. These effects increase in geographical extent and severity as the volume of gravel mined in a river reach approaches (or exceeds) the volume of gravel supplied to the reach by fluvial (streamflow) transport during winter storms. Additional discussion on these potential adverse impacts of gravel extraction is included in the CHERT 2000 Post Extraction Report.

The concept of "sustained yield", simply stated, requires that mining methods and volumes be constrained to provide a more or less uniform annual rate of gravel extraction while allowing river processes and conditions (and by extension, habitat) to continue relatively unaffected by gravel extraction. Infrastructure and habitat protection require a sustainable aggregate extraction strategy, one that harvests less than recruitment when averaged over several years or longer. A sustainable extraction strategy limits average annual extraction to a volume less than mean annual recruitment in such a manner as to maintain or recover a complex channel morphology and aquatic habitat within the immediate area of mining, as well as to prevent or reverse mining-induced cumulative effects upstream and downstream. Additional discussion on the subject of sustained yield can be found in the CHERT 2000 Post Extraction Report.

While the volume of gravel transported ("recruited") to a mining reach can vary tremendously from year-to-year, the long-term annual average recruitment volume provides an essential tool for managing the potential cumulative effects from gravel extraction. We call this value the "mean annual recruitment", or MAR. It is the cornerstone of sustained yield management and can be estimated by several techniques that vary in accuracy.

Using MAR as a basis for determining sustainable extraction volumes is a robust method for ensuring or evaluating sustainability. Although different terms are used to describe this recruitment-based approach, it has been used to develop sustainable extraction strategies in a number of locations in the western US (Collins and Dunne, 1990; Collins, 1992; Lehre, 1993). It applies the basic concept of the river continuum in avoiding cumulative effects by ensuring that extraction volumes remain low enough to leave sufficient sand and gravel in the river to maintain channel alluvial structure (gravel bars, channel bends, floodplains, riparian tree stands). Risk (to bridges, salmonid habitat, and other issues dependent on alluvial structure) will generally increase with an increasing percentage of MAR extracted. Additional discussion about MAR can be found in the CHERT 2000 Post Extraction Report.

In Humboldt County, at present, MAR has only been estimated with reasonable confidence for the Mad and Van Duzen Rivers. Recent activities to reopen the railroad between the Eureka area and Mendocino County include mention of supporting railroad operations with additional gravel mining from the Eel River. There will likely be increasing demand for aggregate if the rail line

connecting Humboldt County to southern markets becomes functional. We believe an objective analysis of MAR on the Eel River, especially one that includes contemporary bedload transport data and assesses the potential impacts on aquatic habitat and existing mining operations, is critically needed prior to any development activity that depends on increasing mining volumes in the Eel River. This analysis should be performed at the earliest possible time.

III. MINING DESIGN CRITERIA FOR MINIMIZING LOCALIZED IMPACTS

With few exceptions, the 2003 CHERT recommended gravel extractions were designed as skims on unvegetated or sparsely vegetated bar surfaces. Point bar and lateral bar skim configurations are of two general forms: bench skims (most common) located near to or far from the edge of the low flow channel and planar skims of the crown of a bar (crown skim). Skims may also occur in dry over flow channels and elsewhere. Skims are also categorized as outboard skims when the edge of extraction daylights towards the river and inboard skims when there is substantial bar and or vegetation separating the edge of extraction from the water's edge. Various alternative extraction designs (horseshoe, dry trenches, wet trenches, and others) were also used.

Horizontal limits of point bar 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 in an attempt 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 aligned 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.

Traditional skimming designs required a vertical offset that would keep the skim floor at or above the 35% exceedence flow water surface elevation (a water surface elevation or flow rate exceeded 35% of the time; lower than a winter stormflow, but higher than summer low flow). The 35% exceedence flow for various river reaches is shown in Table 3. The basis for this criterion was described in the 2002 CHERT Post Extraction Report.

Table 3. River system 35% exceedence flow (cfs) as provided by NOAA Fisheries.

River System and Gage	35% Exceedence Flow (cfs)
Mad River at Arcata	900
Eel River at Scotia	3,800
Van Duzen River at Bridgeville	500
South Fork Eel at Miranda	900
Trinity River at Hoopa	4,700

Drainage of receding river flows was provided by designing extraction surfaces that slope either directly toward (perpendicular to) the low flow channel or in a downstream direction and avoiding closed depressions that could strand salmon.

Some skims were located in or adjacent to dry overflow channels. Other skims resulted in shallow pits on frequently inundated flood plains. Deep wet trenches in the active channel were also utilized. Both deep flood plain pits and deep wet trenches extend well below the water table. Deep frequent flood plain pits are sometimes used but none were established this year.

There exists a large body of scientific literature on gravel mining that describes the spectrum of observed effects on channel geomorphology, aquatic and riparian plant and animal communities, and infrastructure. While some of the literature provides general

recommendations for impact reversal or avoidance, it stops short of providing specific mining plan design criteria for minimizing localized impacts. In Humboldt County's mining program, several site-specific criteria may be employed to minimize geomorphic and/or habitat impacts at mining sites. They are described below.

1) Outboard skim boundaries are typically laid out as benches along the outside of point bars and other bars as this usually provides a good replenishment configuration without preventing riparian colonization or encouraging braiding;
2) Skim widths are constrained to avoid braiding (divided flow) by being no wider than about half the unvegetated bar width;
3) Narrow skims with a width that does not exceed one third of the unvegetated bar width are also utilized;
4) Skim floors are sloped to provide for drainage following inundation (either directly toward the low flow channel, in a downstream direction, or somewhere in between) to reduce salmonid stranding potential;
5) The usual skim floor is at or above the 35 percent exceedence flow surface to help retain sufficient low flow channel confinement;
6) The upstream one-third of a bar is usually left undisturbed to maintain bar function, provide confinement of flows entering the bend and to discourage braiding;
7) In low recruitment years, bar skimming may be forgone in favor of wetland pits outside the active channel, but on surfaces no higher than the approximate 5-year floodplain;
8) Gentle (10:1) side slopes are provided around the outer edges of wetland pits, with deeper areas in the interior to increase volumes;
9) Wetland pit boundaries are laid out to limit disturbance to existing riparian vegetation by conforming to existing openings in perennial riparian vegetation;
10) Wetland pits are avoided near the upstream ends of bars to reduce elevating the risk of meander cutoff;
11) Total pit area on a bar should not exceed about 10% of the bar's surface area to avoid elevating the risk of meander cutoff.

These criteria are intended to be flexible (i.e., adaptive) and are recommended by CHERT as needed during mining plan review in an effort to avoid localized geomorphic and/or habitat impacts. Avoidance is preferable to attempting to reverse observed impacts. They appear to be reasonably successful in avoiding potential impacts associated with historical mining methods. Consultants for the operators incorporate these criteria in mining plan preparation. CHERT reviews proposed mining plans for conformance to these criteria and applicable SMARA reclamation standards (California Code of Regulations, Title 14, Division 2, Chapter 8, Subchapter 1, Article 9). CHERT also reviews extraction designs for conformance with U.S. Army Corps of Engineers requirements.

During the 2003 Army Corps of Engineers permit process NOAA Fisheries imposed a 2003 Mad River volume cap of 150,000 cubic yards but did not allocate this volume among the five Mad River operators. The 1996-2002 CHERT average annual volume recommendations were used to apportion the 2003 150,000 cubic yard volume cap among the Mad River operators (Table 4).

Table 4. Mad River 2003 Operator Extraction Allocation

Operator	Volume (cubic yards)	Percent
ESG	67,651	45.1
GRA	45,362	30.2
MIA	5,357	3.6
MFC	2,853	1.9
MRS	28,776	19.2
TOTAL	149,999	100.0

Reported in an August 29, 2003 email from Kirk Girard

Table 5. Summery of 2003 CHERT recommended extraction methods. Some of these extractions did not occur. Numbers in parentheses indicate the number of extractions at each site.

Site	CHERT Recommended Extraction Methods
Mad River	
ONeill	Outboard Bench Skim (1)
Johnson-Spini	Outboard Crown Skim (1)
Miller-Almquist	Outboard Bench Skim (1)
Essex	Outboard Bench Skim (1)
Johnson	Inboard Horseshoe Skim (1)
Christie	Skim in dry overflow channel (1)
Table 4. continued	
Blue Lake	Inboard Horseshoe Skim (1); Expand Deep Pit near Edge of Active Channel (1); Outboard Bench Skim (1)
Emmerson	No Plan Submitted
Guynup	Inboard Skim (2); Dry perpendicular trenches (5)
Lower Eel River	
Singley	No Plan Submitted
Worswick	No Plan Submitted
Drake	No Plan Submitted
Sandy Prairie B	Inboard Bench Skim (1); Skim in Dry Overflow Channel (3)
Sandy Prairie A	Outboard Bench Skim (2)
Hansen	Inboard Bench Skim adjacent to a Dry Overflow Channel
Hauck	Inboard Bench Skim (2)
Van Duzen River	
Rock	Inboard Skim (1); Outboard Bench Skim (1); Dry Perpendicular Trenches (2)
Noble	Outboard Bench Skim (1)
Bess	Outboard Bench Skim (1)

Table 5 - continued	
Middle Reach of Eel River	
Scotia	Outboard Bench Skim (1)
Truck Shop	Outboard Bench Skim (1); Wet Trench (1)
Dinner Creek	Outboard Bench Skim (1); Inboard Skim (1)
Three Mile	No Plan Submitted
Larabee	No Plan Submitted
South Fork	No Plan Submitted
Bowlby	No Plan Submitted
Vroman	No Plan Submitted
Maynard	No Plan Submitted
South Fork Eel River	
Wallan	Outboard Bench Skim (1); Inboard Skim (1)
Randall	Outboard Bench Skim (2); Inboard Skim (1)
Cooks Valley HC	Inboard Skim (2); Outboard Skim (1); Dry Trench (1)
Cooks Valley MC	Inboard Skim (1); Deep Wet Trench (1);
Trinity River	
Rowland	Outboard Bench Skim (1)
Willow Creek Big Rock	Outboard Bench Skim (1); Wet Trench (1)
McKnight	Outboard Bench Skim (1)
Isolated Sites	
Branstetter	No Plan Submitted
Charles	No Plan Submitted
Cook	No Plan Submitted
PL	No Plan Submitted
Satterlee	No Plan Submitted

IV. MONITORING AND ADAPTIVE MANAGEMENT

Detailed descriptions of methods and standards for 2003 instream gravel extraction monitoring data collection and presentation for the project area can be found in: 1) the California Department of Fish and Game's (CDFG) Humboldt County monitoring guidelines (contained in a May 9, 1995, memo from Richard Elliot, Regional Manager, Region 1), 2) the 1996 Letter of Permission (LOP 96-1) issued by the Army Corps, and 3) the 1996 Interim Monitoring and Adaptive Management Program issued by the Humboldt County Department of Public Works. These documents either require or recommend physical and/or biological monitoring methods to be implemented by all gravel operators within their respective geographic scopes.

Adaptive management strategies can be divided into two general categories: 1) those that are aimed at avoiding or reducing cumulative effects (accumulating in space and/or time), and 2) those that are geared towards localized, site-specific effects. In reality, the distinction is somewhat arbitrary; pervasive localized effects of mining (for example, excessively low bar skimming on a concentration of mined bars within a mining reach) may also precipitate cumulative effects (e.g., reach-wide depletion of gravel, braiding, loss of low flow channel confinement, habitat loss). Adaptive management for localized effects is a goal of the Mad

River and lower Eel and Van Duzen rivers EIRs, the IMP, and the COE regulatory program and is reasonably well-accommodated by annual CHERT review and comment on mining plans. However, periodic (once every five years or so) quantitative analysis using cross sections, air photos, and other information to assess effects of mining occurring over larger geographic areas and/or longer time periods is needed to ensure cumulative effects are being adequately minimized. CHERT conducted such an analysis for the Mad River in 1997. CHERT recommends a similar analysis now be repeated for the Mad River and first time analyses be prepared for other mining reaches in Humboldt County.

V. 2003 GRAVEL EXTRACTION OPERATIONS

Table 6 lists 2003 gravel extraction, grouped by river reach. As shown in Table 6, a total of 881,160 cubic yards (cy) was approved for Class A (annual extraction greater than 5,000 cy) operations in Humboldt County during the 2003 extraction season. Of this, 581,860 cy (or about 66% of the approved volume) was actually extracted, as documented in post-extraction submittals from the operators and summarized by operator in Table 7 and by mining area in Table 8.

Table 6. Gravel extraction totals for Humboldt County Rivers, 2003.

River Reach	Approved Volume (cy)	Extracted Volume (cy)	Percent Extracted
Mad River	150,390	136,790	91
Lower Eel River	318,340	163,930	51
Van Duzen River	175,130	123,030	70
Middle Reach of Eel River	74,030	54,060	73
South Fork Eel River a/	87,060	54,660	63
Trinity River	76,210	49,390	65
Total	881,160	581,860	66

a/ Includes some volume in Mendocino county (part of the CHERT/Corps program).

Table 7. Humboldt County 2003 Gravel Extraction by Operator.

Operator	Approved Volume (cy)	Extracted Volume (cy)	Percent Extracted	Operator Code
Tom Bess	19,800	18,150	92	BES
Drake Materials	0	0		DRA
Eureka Sand & Gravel	80,760	67,090	83	ESG
Granite Construction	45,220	45,240	100	GRA
Hansen	50,000	28,720	57	HAN
Humboldt County	0	0		HUM
Rowland	20,000	18,090	90	KTA
Mercer Fraser	354,060	196,050	55	MFC
Miller-Almquist	5,680	3,200	56	MIA
Mad River Sand & Gravel	28,730	18,760	65	MRS
Noble	66,000	16,930	26	NOB
PALCO	74,030	54,060	73	PAL
Randall Sand & Gravel	37,540	22,120	59	RAN
Rock & Gadberry	89,330	87,950	98	ROC
Fort Seward Ranch	0	0		SAT
Wallan & Johnson	10,000	5,500	55	WAL
Total for all operators	881,150	581,860	66	

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 the approval of mining plans, no single report containing all recommendations was compiled. Consequently, this post-extraction report is the only document summarizing CHERT recommendations for the 2003 extraction season.

Table 9 contains site-specific descriptions and comparisons of the recommended and extracted volumes; site specific descriptions of operator success in meeting approved mining plans are also contained in this table. These were evaluated by comparing the approved mining plans with the actual post-extraction information such as the horizontal limits of skimmed areas (delineated on air photos and plotted on cross sections), and elevations of extraction surfaces (plotted on cross sections). The approved mining plans and specifications were well met at 63 percent of the extraction sites. Some deviations from the approved plans were noted at approximately 34 percent of the extraction sites.

The site-by-site descriptions in Table 9 describe those situations where some aspect of the post-extraction condition deviated from approved plans, where compliance issues were identified or where impacts were greater than expected. Should agencies or operators want CHERT to provide more detailed descriptions of deviations from approved plans for compliance or other purposes, these can be requested on a case-by-case basis.

Table 8. Summary of 2003 Gravel Extraction by River Reach, Bar and Extraction Method.

Mad River				
	Approved	Actual	Actual	
Bar/Site	Extraction	Extraction	Percent	Method of Extraction
O'Neill	8,150	8,020	98	Outboard Skim
Miller-Almquist	5,680	3,200	56	Outboard Skim
Johnson-Spini	30,930	31,630	102	Outboard Skim
Essex	2,850	2,500	88	Outboard Skim
Johnson	23,720	23,370		Inboard Skim
Christie	28,830	27,440	95	Overflow Channel Skim
Blue Lake Area 1	5,450	5,490	101	Inboard Skim
Blue Lake Area 2	3,830	4,040	105	Enlarge Wetland Pit
Blue Lake Area 3	12,220	12,340	101	Outboard Skim
Emmerson	0	0		No Extraction
Guynup Area 1	13,470	9,130	68	Inboard Skim
Guynup Area 2	4,800	3,500	73	Dry Perpendicular Trenches
Guynup Area 3	10,460	6,130	59	Inboard Skim
Totals For Reach	150,390	136,790	91	
Lower Eel River				
	Approved	Actual	Actual	
Bar/Site	Extraction	Extraction	Percent	Method of Extraction
Singley	0	0		No Extraction
Worswick	0	0		No Extraction
Drake	0	0		No Extraction
Sandy Prairie B Area 1	40,500	27,070	67	Inboard Skim
Sandy Prairie B Area 2	62,370	29,210	47	Overflow Channel Skim
Sandy Prairie B Area 3	16,800	9,010	54	Overflow Channel Skim
Sandy Prairie B Area 4	67,280	3,990	6	Overflow Channel Skim
Sandy Prairie A Area 1	29,600	26,720	90	Outboard Skim
Sandy Prairie A Area 2	38,940	39,210	101	Outboard Skim
Hansen	50,000	28,720	57	Inboard Skim
Hauck Area 1	9,910	0	0	Inboard Skim
Hauck Area 2	2,940	0	0	Inboard Skim
Totals For Reach	318,340	163,930	51	
Van Duzen River				
	Approved	Actual	Actual	
Bar/Site	Extraction	Extraction	Percent	Method of Extraction
Rock Area 1	70,720	68,440	97	Inboard Skim
Rock Area 2	8,170	8,520	104	Outboard Skim
Rock Area 3	10,440	10,990	105	Dry Perpendicular Trenches
Noble	66,000	16,930	26	Outboard Skim
Bess	19,800	18,150	92	Outboard Skim
Totals For Reach	175,130	123,030	70	

Table 8 - continued

Middle Reach of Eel River				
	Approved	Actual	Actual	
Bar/Site	Extraction	Extraction	Percent	Method of Extraction
Scotia Dam	17,730	14,630	83	Outboard Skim
Truck Shop Skim	14,940	13,850	93	Wet Trench
Truck Shop Trench	12,200	10,340	85	Outboard Skim
Dinner Creek Area 2	24,320	13,960	57	Outboard Skim
Dinner Creek Area 1	4,840	1,280	26	Inboard Skim
Three Mile	0	0		No Extraction
Elinor	0	0		No Extraction
South Fork	0	0		No Extraction
Bowlby	0	0		No Extraction
Vroman	0	0		No Extraction
Maynard	0	0		No Extraction
Totals For Reach	74,030	54,060	73	
South Fork of Eel River				
	Approved	Actual	Actual	
Bar/Site	Extraction	Extraction	Percent	Method of Extraction
Wallan Area 1	5,190	2,660	51	Outboard Skim
Wallan Area 2	4,820	2,840	59	Inboard Skim
Randall Area 1	5,010	4,220	84	Inboard Skim
Randall Area 2	5,430	2,240	41	Outboard Skim
Randall Area 3	27,100	15,660	58	Outboard Skim
Cooks Valley MC Area 1	5,010	3,400	68	Inboard Skim
Cooks Valley MC Area 2	14,540	10,740	74	Wet Trench
Cooks Valley HC Area 3	6,810	4,670	69	Inboard Skim
Cooks Valley HC Area 4	6,860	3,880	57	Dry Trench
Cooks Valley HC Area 5	2,000	2,180	109	Outboard Skim
Cooks Valley HC Area 6	4,290	2,170	51	Inboard Skim
Totals For Reach	87,060	54,660	63	
Trinity River				
	Approved	Actual	Actual	
Bar/Site	Extraction	Extraction	Percent	Method of Extraction
Rowland	20,000	18,090	90	Outboard Skim
Willow Creek Area 1	14,600	0	0	Outboard Skim
Willow Creek Area 2	31,610	25,710	81	Wet Trench
McKnight	10,000	5,590	56	Outboard Skim
Totals For Reach	76,210	49,390	65	

Table 9. Humboldt County 2003 Gravel Extraction with CHERT Comments

MAD RIVER					
	Approved	Actual	Actual		
Bar/Site	Extraction	Extraction	Percent	Method of Extraction	Comments on Post Extraction Cross Sections
O'Neill	8,150	8,020	98	Outboard Bench Skim	OK
Miller-Almquist	5,680	3,200	56	Outboard Bench Skim	Outboard edge of extraction too low at all cross sections.
Johnson-Spini	30,930	31,630	102	Outboard Crown Skim	OK
Essex	2,850	2,500	88	Outboard Bench Skim	Too wide at XS 2.7E Potential drainage problem at 2.7E
Johnson	23,720	23,370	99	Inboard Skim	OK
Christie	28,830	27,440	95	Overflow Channel Skim	OK
Blue Lake Area 1	5,450	5,490	101	Inboard Skim	Too wide at XS 6
Blue Lake Area 2	3,830	4,040	105	Wetland Pit	OK
Blue Lake Area 3	12,220	12,340	101	Outboard Bench Skim	Excavation surface well below Q35% level Too wide and too low on inside at XS 5
Emmerson	0	0		No Extraction	No Extraction
Guynup Area 1	13,470	9,130	68	Inboard Skim	Ten feet too wide at XS 6
Guynup Area 2	4,800	3,500	73	Dry Perpendicular Trenches	OK
Guynup Area 3	10,460	6,130	59	Inboard Skim	OK
Totals For Reach	150,390	136,790	91		
LOWER EEL RIVER					
	Approved	Actual	Actual		
Bar/Site	Extraction	Extraction	Percent	Method of Extraction	Comments on Post Extraction Cross Sections
Singley	0	0		No Extraction	No Extraction
Worswick	0	0		No Extraction	No Extraction
Drake	0	0		No Extraction	No Extraction
Sandy Prairie B Area 1	40,500	27,070	67	Inboard Skim	OK
Sandy Prairie B Area 2	62,370	29,210	47	Overflow Channel Skim	Mostly too low at XS 12.6 Too low on inside at XS13.3 Mostly 0.5 feet too low at XS13.6 Mostly 0.5 feet too low at XS 14.5

Table 9 – continued.					
Sandy Prairie B Area 3	16,800	9,010	54	Overflow Channel Skim	OK
Sandy Prairie B Area 4	67,280	3,990	6	Overflow Channel Skim	OK
Sandy Prairie A Area 1	29,600	26,720	90	Outboard Skim	OK
Sandy Prairie A Area 2	38,940	39,210	101	Outboard Skim	One foot low on inside and 10 feet wide at XS 9
Hansen	50,000	28,720	57	Inboard Skim	OK
Hauck Area 1	9,910	0	0	Inboard Skim	No Extraction
Hauck Area 2	2,940	0	0	Inboard Skim	No Extraction
Totals For Reach	318,340	163,930	51		
VAN DUZEN RIVER					
	Approved	Actual	Actual		
Bar/Site	Extraction	Extraction	Percent	Method of Extraction	Comments on Post Extraction Cross Sections
Rock Area 1	70,720	68,440	97	Inboard Skim	Excavation is shifted 110 feet to left, is 0.6 feet too low and 30 feet too wide at XS 9
Rock Area 2	8,170	8,520	104	Outboard Skim	Vertical and horizontal XS scales are incorrect Approximately 10 feet too wide at XS 25 XS 25 has a 200 foot plotting error Thirty feet too wide XS 26 & 27
Rock Area 3	10,440	10,990	105	Dry Perpendicular Trenches	OK
Noble	66,000	16,930	26	Outboard Skim	OK
Bess	19,800	18,150	92	Outboard Skim	OK
Totals For Reach	175,130	123,030	70		
MIDDLE REACH OF EEL RIVER					
	Approved	Actual	Actual		
Bar/Site	Extraction	Extraction	Percent	Method of Extraction	Comments on Post Extraction Cross Sections
Scotia Dam	17,730	14,630	83	Outboard Skim	OK
Truck Shop Skim	14,940	13,850	93	Outboard Skim	OK
Truck Shop Trench	12,200	10,340	85	Lineal Wet Trench	OK
Dinner Creek Area 2	24,320	13,960	57	Inboard Skim	OK
Dinner Creek Area 1	4,840	1,280	26	Outboard Skim	OK
Three Mile	0	0		No Extraction	No Extraction
Elinor	0	0		No Extraction	No Extraction

Table 9 - continued					
South Fork	0	0		No Extraction	No Extraction
Bowlby	0	0		No Extraction	No Extraction
Vroman	0	0		No Extraction	No Extraction
Maynard	0	0		No Extraction	No Extraction
Totals For Reach	74,030	54,060	73		
SOUTH FORK OF EEL RIVER					
	Approved	Actual	Actual		
Bar/Site	Extraction	Extraction	Percent	Method of Extraction	Comments on Post Extraction Cross Sections
Wallan Area 1	5,190	2,660	51	Outboard Skim	OK
Wallan Area 2	4,820	2,840	59	Inboard Skim	OK
Randall Area 1 (County Bar)	5,010	4,220	84	Inboard Skim	OK
Randall Area 2 (Twooby Park)	5,430	2,240	41	Outboard Skim	Too wide at XS 4
Randall Area 3 (Home Bar)	27,100	15,660	58	Outboard Skim	OK
Cooks Valley MC Area 1	5,010	3,400	68	Inboard Skim	OK
Cooks Valley MC Area 2	14,540	10,740	74	Wet Trench	Portion of XS 7 is too deep
Cooks Valley HC Area 3	6,810	4,670	69	Inboard Skim	Ten feet too wide at XS 10.3E
Cooks Valley HC Area 4	6,860	3,880	57	Dry Trench	OK
Cooks Valley HC Area 5	2,000	2,180	109	Outboard Skim	Thirty feet too wide at top of XS 13.1E
Cooks Valley HC Area 6	4,290	2,170	51	Inboard Skim	OK
Totals For Reach	87,060	54,660	63		
TRINITY RIVER					
	Approved	Actual	Actual		
Bar/Site	Extraction	Extraction	Percent	Method of Extraction	Comments on Post Extraction Cross Sections
Rowland	20,000	18,090	90	Outboard Skim	Thirty to 40 feet too wide & 1 foot too low at XS 3 One foot too low at XS 7E One foot berm present at XS3 and XS 7E
Willow Creek Area 1	14,600	0	0	Outboard Skim	No Extraction
Willow Creek Area 2	31,610	25,710	81	Wet Trench	Trench shifted 10 to 20 feet to left at XS 10
McKnight	10,000	5,590	56	Outboard Skim	OK
Totals For Reach	76,210	49,390	65		

VI FISH STRANDING ISSUES:

The Humboldt County gravel extraction program usually avoids adult salmon stranding. However, during 2003 notable adult salmon stranding was observed at two extraction sites. The operators followed approved extraction designs and were not at fault. The stranding is reported here so the program can adapt and avoid similar occurrences in the future. Specifically, reviewing agencies should be more involved when alternative extraction strategies are implemented, particularly during the excavation phases.

Cooks Valley on the South Fork of the Eel: Adult stranding in the trench at site A-2 occurred during the fall of 2003. This occurred when migrating adults entered the trench rather than staying in the adjacent main channel. When the flow receded the adults were unable to cross over a shallow riffle separating the main channel from the upstream end of the trench. Some mortality occurred. Upon investigating the site CHERT and NOAA Fisheries requested the operator to excavate a narrow shallow passage across the riffle at the head of the trench. No further stranding was reported here after the improved passage was constructed.

Guynup Bar on the Mad River: Shallow perpendicular trenches were installed across the upper bar. Nearby, a broad shallow pit was also excavated. During preplanning onsite discussions there was some debate about connecting the perpendicular trenches to an adjacent overflow channel. We decided to make the connections. During fall migration water flowed from the river into one or more of the perpendicular trenches and then into the adjacent overflow channel. From the overflow channel it entered the shallow pit and then back into the river. Fish entered the shallow pit and became stranded when the water receded. This process was repeated several times during higher flows. The Department of Fish and Game periodically moved the stranded fish back into the main channel. Some mortality occurred to returning hatchery-raised steelhead. CHERT and NOAA concluded that if perpendicular trenches are used in the future they should not connect to adjacent overflow channels and they should not divert flow away from the main channel.

In summary, CHERT feels that more care must be taken to avoid creating a new problem in an attempt to fix an old one. While the stranding problems were not catastrophic, they serve as a caution to abrupt changes in mining strategies from more traditional methods to newer, relatively untested ones. Alternative extraction strategies are important to consider in avoiding potential impacts from traditional skims, but in some cases, this may be the least impacting method of gravel extraction. We look on the experiences of the past season as a necessary part of the adaptive management process, one that will continue to evolve

VII LITERATURE CITED

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APPENDIX A
Extraction Volume Over Time Sorted by River Reach

Table A-1
Mad River Extraction Volumes 1992-2003

Note: In 1992 and 1994 not all sites provided post extraction volumes; in those cases, we assumed extraction volume equaled recommended volume.			
	Recommended	Extracted	
	Volume	Volume	Percent
Year	(cy)	(cy)	Extracted
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
Totals	2,260,512	2,036,362	90
Averages	188,376	169,697	90

Table A-2
Lower Eel River Extraction Volumes 1997-2003

	Recommended	Extracted	
	Volume	Volume	Percent
Year	(cy)	(cy)	Extracted
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
Totals	2,819,000	1,601,800	57
Averages	402,714	228,829	57

Table A-3
Van Duzen River Extraction Volumes 1997-2003

	Recommended	Extracted	
	Volume	Volume	Percent
Year	(cy)	(cy)	Extracted
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
Totals	1,133,100	791,400	70
Averages	161,871	113,057	70

Table A-4
Middle Reach of Eel River Extraction Volumes 1996-2003

	Recommended	Extracted	
	Volume	Volume	Percent
Year	(cy)	(cy)	Extracted
1996	?	66,300	?
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
Totals	923,097	746,168	?
Averages	131,871	93,271	?

Table A-5
South Fork of Eel River Extraction Volumes 1997-2003

	Recommended	Extracted	
	Volume	Volume	Percent
Year	(cy)	(cy)	Extracted
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
Totals	515,423	420,282	82
Averages	73,632	60,040	82

Table A-6
Trinity River Extraction Volumes 1997-2003
Includes Rowland Bar, but does not include Hoopa Tribal Extractions

	Recommended	Extracted	
	Volume	Volume	Percent
Year	(cy)	(cy)	Extracted
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
Totals	325,755	241,084	74
Averages	46,536	34,441	74

APPENDIX B
Extraction Volume Over Time at Isolated Sites

Table B-1
Extraction Volumes 1997-2003
Branstetter Bar on Bear River

	Recommended	Extracted	
	Volume	Volume	Percent
Year	(cy)	(cy)	Extracted
1997	0	0	
1998	0	0	
1999	0	0	
2000	0	0	
2001	0	0	
2002	0	0	
2003	0	0	
Totals	0	0	
Averages	0	0	

Table B-2
Extraction Volumes 1997-2003
Cook Bar on the North Fork of the Mattole

	Recommended	Extracted	
	Volume	Volume	Percent
Year	(cy)	(cy)	Extracted
1997	0	0	
1998	0	0	
1999	30,100	19,000	63
2000	0	0	
2001	0	0	
2002	0	0	
2003	0	0	
Totals	30,100	19,000	63
Averages	4,300	2,714	63

Table B-3
Extraction Volumes 1996-2003
Charles Bar on Larabee Creek

	Recommended	Extracted	
	Volume	Volume	Percent
Year	(cy)	(cy)	Extracted
1996	None	3,300	?
1997	0	0	
1998	22,800	23,300	102
1999	0	0	
2000	0	0	
2001	0	0	
2002	0	0	
2003	0	0	
Totals	22,800	26,600	?
Averages	3,257	3,325	102

Table B-4
Extraction Volumes 1996-2003
PL Bar on the Van Duzen River

	Recommended	Extracted	
	Volume	Volume	Percent
Year	(cy)	(cy)	Extracted
1996	None	3,400	?
1997	0	0	
1998	0	0	
1999	0	0	
2000	0	0	
2001	0	0	
2002	0	0	
2003	0	0	
Totals	0	3,400	?
Averages	0	425	?

Table B-5
Extraction Volumes 1997-2003
Satterlee Bar on the Eel River

	Recommended	Extracted	
	Volume	Volume	Percent
Year	(cy)	(cy)	Extracted
1997	5,000	4,200	84
1998	0	0	
1999	0	0	
2000	43,200	22,900	53
2001	0	0	
2002	0	0	
2003	0	0	
Totals	48,200	27,100	56
Averages	6,886	3,871	56