PROPOSED FINAL

PROGRAM ENVIRONMENTAL IMPACT REPORT

ON

Gravel Removal from the Lower Mad River

BOARD OF SUPERVISORS HEARING COPY

SCH # 92083049

MAY, 1994

Prepared for:

Humboldt County Planning and Building Department
Planning Division
3015 H Street
Eureka, CA 95501

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ON

GRAVEL REMOVAL FROM THE LOWER MAD RIVER

Humboldt County, California
SCH #92083049

Humboldt County
Board of Supervisors

Stan Dixon .... District 1
Roy Heider .... District 2
Julie Fulkerson .... District 3
Bonnie Neely .... District 4
Anna Sparks .... District 5

Prepared as Required by the Mad River MOA
Under the Direction of the Humboldt County Board of Supervisors
through the Assistance of Douglas Jager, PhD.

Prepared for: **Humboldt County Planning & Building Department**
Thomas D. Conlon, Director
3015 H Street Eureka, CA 95501
(707) 445-7541 FAX(707) 445-7446

Contributors: Sidnie Olson and Melissa Martel-Accetta, County Planning Staff
Robert Brown
John Henry Groby
G. Mathias Kondolf
Andre Lehre
Ron LeValley
James Roscoe
Michael Scalici
Karen Theiss
Bill Trush
Susie VanKirk

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0.1 PEIR PROLOGUE

The first draft of this PEIR on Gravel Removal from the Lower Mad River was submitted to the State Clearing House in April 1993 (SCH No. 92083049). That document consisted of two parts. Volume I was the draft. Volume II was a set of appendices (A through N).

In September 1993 a Proposed Final PEIR was circulated. The proposed Final PEIR had three attachments.

Attachment 1 was titled Aggregate Resources Management Plan.
Attachment 2 is Lower Mad River Annual Gravel Replenishment and Harvest Models 1962-1993.
Attachment 3 is titled: 1993 MOA Extension Reports; Scientific Committee Gravel Extraction Recommendation Report; and a final wildlife report, Wildlife Report for Lower Mad River, Humboldt County prepared by Mad River Biologists and dated September 2, 1993.

The changes brought about by the responses to the Proposed Final PEIR led to a recirculated Draft PEIR, submitted to the State Clearing House in February 1994.

Attachment 1 was not incorporated. To the extent that the previous appendices and Attachments 2 and 3 are not inconsistent with this PEIR they are incorporated herein. They are referenced herein as Appendices A through N and as Attachments one through three.

Mr. William Davis, attorney for the gravel operators has collected a package of letters describing the economic benefits of Mad River aggregate resources. These letters were attached to the recirculated draft as Appendix O.

Pursuant to CEQA 15132, this proposed final PEIR contains the following:

1. Revisions to the recirculated draft PEIR.
2. Comments and responses to the recirculated draft PEIR.

This proposed final PEIR, without revision marks and strikeouts has been prepared for the Board of Supervisors for certification. After certification, additional copies without revisions and strikeouts will be printed for distribution and sale.

Comments regarding this document should be submitted to the Humboldt County Planning and Building Department, Thomas D. Conlon, Director, 3015 H Street, Eureka, CA 95501. Phone: (707)445-7541. FAX: (707)445-7446.

1.0 PROJECT DESCRIPTION

1.1 Type of Document

This Environmental Impact Report (EIR) is being prepared pursuant to the California Environmental Quality Act (CEQA [Public Resources Code Section 21000 et. seq.]) and the State CEQA Guidelines (14 California Administrative Code Section 15000 et. seq.). This EIR is a Program EIR (PEIR) pursuant to Section 15168 of the CEQA Guidelines and will evaluate the cumulative impacts of gravel extraction and of channel degradation, whatever the cause, on the natural resources, public utilities, and structures in and along the lower Mad River. This EIR also presents and evaluates several project alternatives including a preferred alternative. The preferred alternative is a plan to develop, implement, and monitor flexible, comprehensive, environmentally-sound mining strategies and reclamation standards that will provide a moderate rate of recovery from past degradation at critical sites while attempting to provide for continued commercial extraction of Mad River riverrun sand and gravel and while protecting significant riverine resource values. The preferred alternative is introduced in Section 1.4 and described more thoroughly in Section 6.

A PEIR is a public document used to: analyze the environmental effects of a proposed project; ascertain ways to reduce or avoid possible environmental degradation; and identify alternatives to the project which would reduce or avoid the significant adverse effects of the proposed project. The Draft PEIR must also disclose significant adverse environmental impacts that cannot be avoided, growth-inducing impacts, effects not found to be significant, and significant cumulative impacts of all past, present and reasonably anticipated future projects.

Because this PEIR is structured around a cumulative analysis, cumulative impacts are discussed within each subsection of Section 5.0, Impacts and Mitigation Measures. Therefore, there is no separate "Cumulative Impacts" section as described in the CEQA Guidelines, Section 15130.

1.2 PEIR Purpose and Scope

The preparation of this PEIR is the result of a 1992 Memorandum of Agreement (MOA) between the following Mad River gravel operators: Eureka Sand & Gravel; Mad River Sand & Gravel; and Redwood Empire Aggregates, and the following agencies: Humboldt County Board of Supervisors; California Resources Agency; Board of Mining and Geology; Department of Conservation; Department of Fish and Game; and State Lands Commission. See Appendix K and Attachment 3 for the MOA and related documents.

According to the MOA "The County shall prepare, or cause to be prepared under contract to it, a programmatic EIR to evaluate the cumulative effects of gravel extraction operations on the natural resources of the Mad River from Swasey [Sic] Dam downstream to the railroad bridge which is downstream of the Highway 101 Bridge." From this we further interpreted that the initial purpose of the PEIR was to evaluate the cumulative effects of instream gravel extraction operations and channel degradation, regardless of the causes, on the natural resources, public utilities and structures of the lower Mad River.

Mitigation measures and feasible alternatives as a means of minimizing or avoiding potential adverse effects of the project are also addressed. Cumulative impacts are discussed within each subsection of Section 5, Impacts and Mitigation Measures.

1.3 Intended Use of this PEIR

This PEIR will identify the known and anticipated significant adverse environmental impacts on the riverine environment that have resulted from Mad River channel degradation and Mad River gravel extraction operations. It will also identify certain cumulative effects that are the result of gravel extraction in combination with other activities.

The project is the development of an enforceable instream mining regulatory program that will operate under the authority of SMARA and any existing or future County procedures and ordinances. The purpose of the project is to enhance and protect the aggregate extraction-related environmental riverine resources of the Mad River corridor.

The preferred project alternative is the development and implementation of a flexible Mad River aggregate management program, monitoring program, and reclamation plan that will use coordinated extraction prescriptions and reclamation standards which will allow a moderate rate of recovery (aggradation) at critical sites while protecting or enhancing other river resource values. The environmental effects of implementing the preferred project alternative are also evaluated.

The PEIR will review and evaluate the potential environmental impacts of the preferred alternative project which includes:

1. The development of a coordinated adaptive mining and management plan to limit the potential adverse impacts of gravel extraction
2. The development of an adaptive river resource monitoring program to monitor the impacts of gravel extraction under the adaptive management plan
3. The development of a process to annually review compliance and enforce instream mining reclamation plans
4. The development of proposed mitigation measures to limit the potential adverse impacts of the preferred project alternative
5. The establishment of a Mad River Scientific Design and Review Committee (SDRC) which will act as an agent for the County. The duties of the SDRC are described in Section 6.
6. The development of a procedure to review and guide the management program and the activities of the SDRC. Some people believe this should be the role of the Humboldt County Board of Supervisors. Others believe that a separate committee should be established.

The PEIR will serve as a reference for Humboldt County, the SDRC, the California Department of Fish and Game, and others, as described in Section 3.1 and Appendix I.

The PEIR may serve as a foundation for future environmental documents necessary for the review and approval of County, State, or Federal permits regarding current, future, new, or expanded, mining operations. This PEIR does not address all of the issues that an application for a conditional use would raise. Such operations that are currently not permitted will have to submit site-specific supplemental EIRs or other appropriate environmental documents.

The PEIR and preferred project alternative are limited in scope as described in Sections 1.2 and 1.8. Minor annual changes in appropriate adaptive mining, monitoring, and reclamation plans as considered herein will be made to provide adequate environmental protection and as authorized in the adaptive mining plan and in SMARA, will not require annual CEQA reviews. Significant changes in the above may require CEQA review. The preferred project alternative will be implemented during the 1994 extraction season. After the fifth extraction season under this project (1998), the entire project will be thoroughly evaluated by the SDRC. The five-year findings of the SDRC shall be reviewed at a public hearing during which, recommendations for modifying the management plan, monitoring program and reclamation plan review process will be considered.

1.4 The Project

Because most of the historical extraction sites on the lower Mad River have approved reclamation plans and are operating under either conditional use permits or vested rights there was some initial confusion among planning staff and other participants as to what the "project" was. The question: "What is the project?" was repeated many times while this PEIR was in its early stages. Initially there was no clear answer. As the evaluation progressed it became clear that significant adverse impacts had occurred in the project reach and that there was the potential for additional impacts if the gravel industry followed its historical pattern of extracting more gravel than was being recruited in the lower Mad River.

After examining a series of alternatives the project eventually became the development of an enforceable instream mining regulatory program that will operate under the authority of SMARA and any existing or future County procedures and ordinances.

The preferred alternative includes continuing the commercial extraction of riverrun sand and gravel, in limited quantities, from up to 10 specific sites located along the lower Mad River between the Blue Lake hatchery weir and the U.S. Highway 101 bridges in a manner that will provide a moderate rate of recovery for the past adverse impacts of channel degradation and will eliminate or minimize the adverse impacts of future mining activities. The preferred project alternative includes the formation of a Scientific Design and Review Committee (SDRC) and a flexible, site specific adaptive management and resource monitoring and protection plan which develops, implements, and monitors comprehensive environmentally-sound mining strategies and reclamation standards for limited commercial extraction of riverrun materials from the lower Mad River. The preferred project alternative includes a continuing relative-resource monitoring program from which adaptations to the management plan and reclamation plans can be made as needed.

The adaptive management plan, flexible mining strategies, and reclamation standards require monitoring of the project area, including the gravel bars and related resources in their environs, as needed, to estimate sand and gravel recruitment and replenishment, to monitor related river resource conditions and trends, to verify compliance, to determine the impact of past mining, and to evaluate future proposed annual mining strategies. The combined monitoring, and annual evaluations will lead to appropriate, coordinated, annual, flexible, environmentally-sound, adaptive mining and reclamation strategies which may vary from year to year and site to site. Under this alternative and existing permits the location, method, and level of extraction will be developed annually and approved through a consultative process between the operators, and a Scientific Design and Review Committee (SDRC), acting as an agent for the lead agency (County). A mechanism for review of the SDRC management prescriptions and activities by responsible state and federal trustee agencies and the public is included.

The preferred project alternative is limited in scope. It applies only to the 10 specific sites described herein, to the extraction of river-run sand and gravel, and the direct and indirect impacts of the same. No new or expanded processing sites are included.

This alternative is not an overall Aggregate Resource Management Plan. Such a project should be a County-wide project of much greater scope. This preferred project alternative is not a River Corridor Management Plan. If projects such as these are proposed in the future, tiered, supplemental, or other appropriate environmental documents will be required.

There are up to ten sites considered under this PEIR, which are authorized (or proposed) to extract gravel; see Table 1.4-1. Two sites operate under authorization of Conditional Use Permits, six sites have recognized vested rights, and two sites are unauthorized. The two non-permitted sites are not a part of this project. They are considered here because CEQA requires that the PEIR consider the possibility of future related projects. It is anticipated that agents for the two unauthorized sites will seek to confirm vested rights or obtain conditional use permits. However, this PEIR does not address all of the issues that an application for a conditional use might. raise.

The preferred project alternative will be implemented by developing an adaptive management plan, an adaptive monitoring program, and, as needed, revised reclamation plans for those eight project sites that are currently permitted and have approved reclamation plans. Project sites that do not currently have approved entitlement or reclamation plans will be required to comply with these project standards as a condition of gaining approval of any existing or future applications for vested rights, conditional use permits, or approval of reclamation plans.

The Mad River and its environs are a dynamic system, constantly changing. Changes in the river ecosystem will continue and the processes of aggradation and degradation will continue to occur and reoccur whether gravel extraction continues or not. Because of the dynamic nature of the river system, it is not possible to forecast with precision how the river environment will change. This precludes the possibility of a fixed formula-based management and monitoring program. An objective of this preferred alternative management plan is to develop over time a dynamic set of adaptive mining and reclamation strategies that will respond to changes in the environment and in our understanding of the environment, and to changes in technology.

The impacts and mitigation measures identified in this PEIR will be the basis for establishing site-specific appropriate adaptive mining strategies during State-mandated annual SMARA reviews of project reclamation plans and during other reviews of the project by the SDRC. The SMARA reclamation plan reviews and other reviews are necessary to assure that the prescribed scope, method, type and intensity of mining operations for each year have been and remain appropriate for the actual riverine resource conditions and trends observed in the Mad River environment. The SDRC will modify the adaptive mining strategy, monitoring program and reclamation plans as needed in order to monitor and protect the riverine environmental resources of the lower Mad River while attempting to sustain a viable Mad River gravel industry.

Table 1.4-1 Sites under Review

Operator and Name of bar	Site No.	Max. c.y	Authorization (Date approved)
Mad River Sand & Gravel Guynup bar	1	200,000	Conditional Use Permit (12/30/76) Reclamation plan approved for 200,000 (11/18/88)
Hum County Public Works Emmerson bar	2	2,000*	Conditional Use Permit and reclamation plan for 2,000 (4/4/88)
Redwood Empire Aggregates Emmerson bar	2	50,000	Vested right for 50,000 (6/19/92) Reclamation plan for 50,000 (7/28/92)
Redwood Empire Aggregates Blue Lake bar	3	100,000*	Vested right for 50,000 (6/16/92) Reclamation plan for 100,000 (7/29/92)
Eureka Sand & Gravel Christie bar	4	150,000*	Conditional Use Permit and reclamation plan for 50,000 (3/7/86) Application on file for additional 100,000 c.y.
Redwood Empire Aggregates Johnson bar	5	30,000	Vested right for 30,000 (4/15/93) Reclamation plan for 30,000 (7/29/92)
Mercer Fraser Essex bar	6	40,000	Vested right and reclamation plan for 40,000 (11/3/88)
Arcata ReadiMix Johnson-Spini bar	7	80,000	Vested right and reclamation plan for 80,000 (5/18/89)
Redwood Empire Aggregates Graham bar	8	100,000*	Vested right for 95,000 (4/15/93) Reclamation plan for 100,000 (7/29/92)
Zabel Trucking Simpson-Zabel bar	9	40,000*	unauthorized
Simpson Timber Company upper Simpson bar	10	25,000*	unauthorized
Total		**817,000 c.y.**	

*Note: these volumes are different from those in the Notice of Preparation. The volumes in Table 1.4-1 represent the maximum anticipated entitlement and not the reasonably anticipated future extraction project. Actual annual extraction will be determined from recruitment, replenishment, condition, and trend monitoring data. See Sections 1.5 and 1.6 for discussion on production and entitlement.

Table 1.4-2. Distribution of "extraction sites" and "open space" in the project reach. Distances are in river miles. a/

Reach of River	"Open Space"	Extraction Sites	Total Miles	Percent "Open"
Mouth to Boat Ramp	3.2	.0	3.2	100
Boat Ramp to Hwy. 101	2.4	.0	2.4	100
Hwy. 101 to Graham Bar	0.5	.0	0.5	100
Graham Bar to Hwy. 299	.0	1.7	1.7	0
Hwy. 299 to Essex Bar	.8	.0	.8	100
Essex Bar	.0	.4	.4	0
Essex Bar to Railroad Br	.8	.0	.8	100
Railroad Br to Blue Lake Br	.6	2.4	3.0	20
Blue Lake Br to Hatchery Weir	.1	1.6	1.7	6
Sub-Total Miles	8.4	6.1	14.5	
Sub-Total Percentages	*58*	*42*	*100*	58
Hatchery Weir to Sweasey Dam	5.1	.0	5.1	100
Total Miles	**13.5**	**6.1**	**19.6**	
Total Percentages	***69***	***31***	***100***	**69**

a/ An extraction site reach is a reach with one or more bank attached to an extraction site. An open reach is a reach where neither bank is attached to an extraction site. Refer to Table 4.6-1 for location of structures in project reach.

The process of adopting annual adaptive management strategies includes periodic and annual reviews that will evaluate the success of previous extraction prescriptions; monitor the dynamic character (condition and trend) of Mad River resources, and restrict the scope, method, type and intensity of annual extraction operations, as needed, to protect river resources. The term river resources is understood to include related community infrastructure as well as related physical and biological resources.

1.5 Past Project Aggregate Production

According to the Mad River sand and gravel operators past Mad River production levels varied in response to local construction needs as well as to major highway construction projects which required road base, asphalt paving, concrete bridges, interchanges, overpasses, and related items. Large projects occurring between the 1950's and 1970's include the Highway 101 Arcata-Eureka freeway (8 miles built in the 1950's) and Arcata to Big Lagoon freeway (27 miles built in the 1960's); Highway 299 freeway from Highway 101 to Berry Summit (35 miles built in the late 1960's, early 1970's) and Highway 255 (Samoa Boulevard) from Arcata to the Coast Guard Station (11 miles built in the 1960's).

Other projects that required substantial amounts of Mad River material include the Arcata Airport (1940's, approximately 300,000 cubic yards), and base and paving material for most mill yards in the Arcata-Eureka area. For example, the Simpson Samoa Pulp Mill required 90,000 cubic yards of material for base and concrete in the 60's. Most of the concrete buildings in Eureka built in the 60's obtained materials from the Mad River. The County Courthouse, alone, required 40,000 cubic yards of concrete. The development of Humboldt State University's concrete buildings, base and paving utilized material from the Mad River. In 1972, 5,000 dolos were constructed for the jetties. Half of the 212,000 tons of material came from the Mad River.

Gravel extraction practices during those times included the use of a dragline during winter months. As material was removed, it was replenished by winter flows, allowing for large stockpiles to be developed in winter for summer construction projects. This practice ceased in the early 1970's when the California Department of Fish & Game restricted gravel extraction to other methods. Production levels were decreased and, at the same time, most of the large highway construction projects were completed. Local construction needs of Mad River aggregate remained high through the 1970's and into the 1980's. Several large floods contributed gravel recruitment and replenishment to meet the demands during that time. The recent droughts in the mid 1970-s and late 1980's caused a significant reduction in gravel recruitment. The combined effects of high extraction and low recruitment produced localized channel degradation problems throughout much of the lower Mad River extraction area and may have contributed to the northward migration of the river mouth (Borgeld et al., 1993). Other factors are also suspected of contributing to the northward migration of the river mouth (Borgeld et al., 1993).

Theoretically, the presently permitted and proposed operations could potentially extract up to 817,000 cubic yards per year (Table 1.4-1). However, that level of extraction could not be sustained without serious environmental consequences and recent extraction has been much less than this. The best available data (Lehre, Klein, and Trush, 1993) documents the 41-year period from 1952 through 1992. Excluding 1992 when the extraction level was limited by prescriptions provided by the Scientific Design and Review Committee, the lowest annual extraction rate was approximately 161,000 cubic yards (1953); the highest was approximately 771,000 cubic yards (1970); and, the average was approximately 358,000 cubic yards. During the last 33 years (1960-1992) the approximate average annual extraction level was 425,000 cubic yards. During the last 10 years (1982-1991) the approximate average annual extraction rate was 286,000 cubic yards. In 1992, the Scientific Design and Review Committee prescribed approximately 153,000 cubic yards. The 1993 Scientific Design and Review Committee prescribed approximately 122,000 cubic yards of extraction. As of this writing the actual 1993 extraction has not been verified.

Table 1.5-1 Examples of average annual sand and gravel extraction volumes from the lower Mad River.

Period	Number of years	Approximate Average annual extraction (cubic yards)
1952 - 1991	41	358,000
1960 - 1992	33	425,000
1982 - 1991	10	286,000
1992	1	153,000
1993	1	122,000

1.6 Project Entitlement versus Future Extraction Levels

There has been some concern that the industry will remain unregulated and attempt to extract the full 817,000 cubic yards found in the various existing and proposed entitlement; and that such a level of extraction would lead to serious environmental consequences. Under current river conditions an average annual extraction level of 817,000 cubic yards is clearly unacceptable. During the 10-year 1982 through 1991 period the average annual extraction level was 286,000 cubic yards. In 1992 and 1993 the extraction levels dropped due to the prescriptions of a scientific committee, operating under the memorandum of agreement which is described elsewhere in this PEIR. Refer to Appendix K and Attachment 3 for the MOA.

The preferred project alternative expands on the MOA and provides a flexible environmental review and adaptive management strategy which will limit future levels of extraction in an attempt to both protect the environment and sustain the industry. Under this program large entitlement will not be extracted unless the SDRC prescribes them.

Although the sum total of the entitlement is large, the large individual entitlement provide river management flexibility and reduce the possibility that a site-specific, scientifically derived, environmentally sound river management decision to extract gravel will be limited by a lack of entitlement. Large entitlement also increase project flexibility should conditions change and channel aggradation becomes a problem throughout the project reach or at specific sites within the project reach.

1.7 Methods of Extraction

This PEIR focus on instream gravel mining. Gravel that is in terraces outside the banks of the river is not instream gravel. The extraction of gravel in terraces, beyond the banks of the river is called terrace mining. Terrace mining is an alternative to instream mining and is considered as an alternative elsewhere in this PEIR. See the section on alternatives to the project.

Instream gravel is gravel that is located between the banks of a river. Channel confinement, bar morphology, and discharge level determines how much of the instream gravel is above or below the water level at any one point of time. During the low-flow summer months the maximum amount of gravel bar is exposed and dry for the longest period of time.

The effects of instream gravel extraction vary with the season of operation, the length of operation, the location in the project reach, the location on the gravel bar, the extraction methodology, the amount of gravel removed, the amount vegetation that is destroyed, the shape of the residual bar, and the skill of the operator.

A variety of methods have been used to extract gravel from the Mad River. The primary methods of gravel extraction used in the last 40 years include:

1 excavation of pits spanning the entire channel width, sometimes to elevations well below the river's thalweg,

2 excavation of pits occupying most of the active channel width to below the elevation of the groundwater table, while leaving or constructing a berm separating the low-flow channel from the pit,

3 skimming of bar surfaces adjacent to the low-flow channel down to the elevation of the groundwater table,

4 excavation of a deep trench adjacent to the low-flow channel but separated from the low-flow channel by a residual berm,

5 skimming of bar surfaces to elevations above the groundwater table at various slop gradients sloping toward the low-flow channel edge, and

6 excavation of a pit to elevations either above or below the groundwater table on the outer areas of bar or low terrace surfaces well away from the low flow channel.

Of these methods, only the last three have been used in recent years. Several types of heavy equipment have been used to extract gravel, depending on the type of excavation. Dragline cranes were best suited to excavation of pits which were dug to below the water surface over large areas. Skimming is usually accomplished with scrapers, bulldozers, or front-end loaders. Trenching is accomplished using a large backhoe or excavator.

There have been no studies done to document specific geomorphic effects of instream gravel mining on the Mad River. However, the response of the river to the various types of extraction can be generalized in terms of the basic conceptual models of river behavior. For a more extensive discussion of effects of instream mining, the reader is referred to Collins and Dunne (1990). They present an overview of the spectrum of effects instream mining may have on a river channel, methods to assess those effects, and several case studies. Here, we discuss several of the most prevalent effects likely to have occurred on the lower Mad River.

Pits within the active channel: Pits encompassing or adjacent to the low flow channel which are excavated to depths below the thalweg elevation are likely to have the most profound effects on channel processes and form. This configuration creates a large basin which causes abrupt decreases in water velocity, not unlike a reservoir behind a dam when viewed in the short term. When flows sufficient to transport sediment from upstream reaches occur, these pits are likely to be completely inundated. They will function as very efficient traps for virtually all bedload transported until gravel deposition in the pit restores the bed to a high enough elevation to allow transport past the pit to downstream reaches.

In addition to trapping bedload sediment which is transported from upstream reaches, pits within the active channel cause rapid scour of the bed through upstream migration of the knickpoint created by the upstream lip of the pit. A knickpoint may migrate a long distance upstream of a deep pit, depending on river slope, sediment supply, flood magnitude, and other factors. This process may also occur downstream of the pit, but probably to a lesser degree. Excessive bed scour presents a danger to nearby bridges, levees, and other facilities having foundations within the active channel. It also adversely affects aquatic habitat by altering hydraulic geometry and destabilizing riffles and other bedforms. In the Mad River, pit excavations occurring in some years were sufficiently numerous and near each other that it is very likely bed scour propagating upstream from one reached up to and combined with bed scour migrating downstream from another. This represents one type of cumulative effect on river morphology when the combined effects from multiple operations exceed some threshold.

As the pit refills with new sediment, it may exhibit a morphology which is discontinuous with adjacent channel bedforms. During the intermediate stages of refilling with gravel, transitional bedforms such as mid-channel bars may be deposited, or a lateral or point bar may develop which is out of phase with similar features up- and downstream of the pit.

Trenches within the active channel: Trenching adjacent to the low-flow channel is likely to have effects similar to those resulting from pits. They function as very efficient bedload traps and promote bed scour, even in low-flow years. Trenches tend to capture the thalweg, thereby realigning segments of the river and producing a geomorphically discontinuous planform. Incomplete capture of the thalweg results in multiple channels, or braiding.

Typically, trenches were dug just to the inside of the low-flow channel (which includes the thalweg) on meander bends. Being so close to the thalweg, they readily capture the thalweg during moderate stormflows. This results in an artificial shortening of the channel length, decreased radius of curvature, and increased slope of the thalweg relative to the unaltered planform. Consequently, the channel is temporarily destabilized while it adjusts to the new conditions.

If trenches are excavated on the outer (away from the low-flow channel) edges of bars and are sufficiently close to the head of the bar, there can be a high risk of a meander being cutoff during a high flow event if the knickpoint at the upstream end of the trench migrates headward and captures the thalweg at the upstream end of the bar.

Bar skimming: Bar skimming down to the groundwater elevation on a level, planar surface virtually eliminates the confining effect which bars have on the inner channel. As with trenching and pit excavation, this method of gravel extraction can result in bed scour, braiding, and channel realignment. A more recent method of bar skimming is to slope bar surfaces at even or compound gradients toward the low-flow channel edge. Excavated grades are above the groundwater elevation, and so pose a lesser risk of creating an undesirable hydraulic geometry by maintaining a higher degree of confinement of the inner channel. Low-flow channel confinement can be further enhanced by maintaining a vertical buffer between the skimmed surface and the water surface.

Off-channel pits: During the 1992 extraction season, two relatively small pits were excavated on high bar/low terrace surfaces which were judged to be inundated about once every five years on average. The rationale for selecting this type of feature was that it would be far enough removed from geomorphically active areas in low to moderate flow years to have little effect on the already impacted areas in the river corridor, but with the occurrence of flows of sufficient magnitude to cause widespread geomorphic changes, the effects of these pits would be obliterated as the channel reworks the bar surface features.

These pits were several acres in size and were located away from the upper end of the bar to avoid the risk of knickpoint migration causing development of a meander cutoff. Design of these pits incorporated features to enhance their value to the riparian ecosystem. Pit bottom depths were below the groundwater table and sideslopes were very gentle (as low as 10%) so that a spectrum of terrestrial and aquatic plants could colonize the pit margins. The planform of the pits was designed to follow existing vegetation patterns, resulting in an irregular shape bounded by existing vegetation. Consequently, for the life-span of these pits (5-25 years, most likely), they will be less detrimental to the riparian ecosystem than extractions closer to the low-flow thalweg, and less detrimental to the landscape than pits excavated on higher terraces, which would become relatively permanent features.

In a river reach such as the lower Mad, which has all the appearances of a sediment-deprived system, pits located on high bar/low terrace areas may provide a relatively low impact means of sustaining a gravel industry through times of low recruitment. It must be stressed, however, that there is a limit to the extent to which these pits may be utilized. Although presently undefined and perhaps undefinable, this limit may be indexed in a gross sense as some percentage of the surface area of an individual feature which can be safely mined without elevating the risk of meander cutoff during low to moderate flood flows, or creating a large bedload trap which might deprive downstream areas of gravel in a moderate to large flood event.

For the lower Mad River as a whole, historic air photos clearly show that geomorphic continuity has been chronically disrupted for many years. The more intrusive types of mining methods (1-4, above) led to the development of a haphazard, chaotic morphology which is evident in the air photo record for many years and is likely to persist until large floods rework the active channel.

1.8 Project Location and Geographic Scope

The project is located in Humboldt County on the north coast of California approximately 275 miles north of San Francisco, California and 75 miles south of Crescent City, California. The mouth of the Mad River (river mile 0), is located at about latitude 40°58'30" North, longitude 124°07'30" West (approximately the same latitude as Salt Lake City, Utah; Lincoln, Nebraska; and New York City, New York).

The lower end of the project is located between the City of Arcata and the community of McKinleyville, approximately 10 miles north of the City of Eureka, the County Seat. The middle reach is just south of the City of Blue Lake. The upper reach, near the former Sweasey Dam, is privately-owned timber land. Other communities that are near the project area are: Korbel, Glendale, and the West End Road area. See Maps 1.2-3 and 1.2-4 and Appendix A, Individual Site Details for specific locations of the mining operations covered under this PEIR.

The geographic scope of the project is bank to bank along the Mad River from the former Sweasey Dam site, river mile 19.6, to the Hammond Trail Bridge, river mile 3.6. Those portions and percentages of the project reach that are "occupied by extraction sites" are shown in Table 1.4-2. As defined in Table 1.4-2, 69 percent of the project reach is "open space" and 31 percent has at least one bank in an extraction site. The PEIR and management plan assume no extraction sites upstream from the Mad River Hatchery weir nor downstream from Highway 101. The upper project area from the Sweasey Dam site to the hatchery weir is of interest as it is the major immediate source of aggregate recruitment for the lower project extraction area, located between the hatchery weir and the Highway 101 Bridge. The lower project area between the Highway 101 bridge and Hammond Trail bridge, and the reach downstream of the Hammond Bridge are of interest because some project impacts can be expected to migrate downstream. Bank to bank is understood to refer to bank-full channel capacity and is understood to be a dynamic channel feature which will change location over time. The project also includes the adjacent upland aggregate processing sites but considers no expansion of these sites. See Maps 1.2-1 and 1.2-2.

1.9 Economic Benefits of the Project

The County retained Dr. John Grobey to gather and analyze information on the economic benefits of gravel mining in Humboldt County. The following paragraph is adapted from Dr. Grobey's report. See Appendix M for Dr. Grobey's complete report.

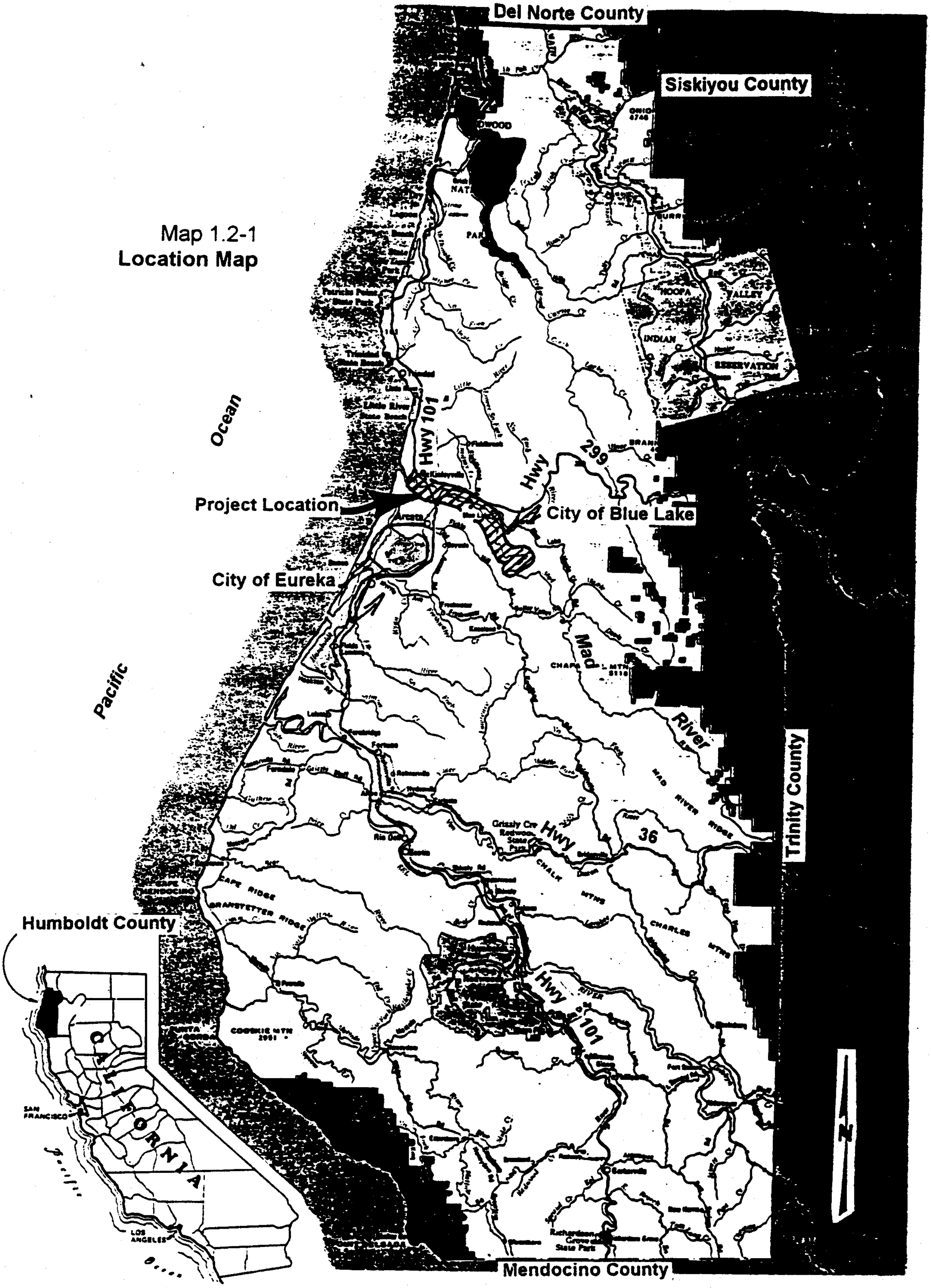
Gravel mining operations have had, and will continue to have substantial effects on the Humboldt County economy. Mining provides an input of vital and perhaps indispensable importance to a number of key activities in the construction industry. Construction sand and gravel provide the necessary ingredient in foundation construction and other stabilization requirements in road construction, maintenance, and repair. Concrete blocks and bricks, asphaltic concrete aggregates and other bituminous mixtures cannot be prepared without these inputs. Other important uses include fill materials, snow and ice control, and railroad-grade ballast. The importance of these uses is out of proportion to the modest market values and regional cash flows generated by this sector of the economy. Questions about the economic significance of this industry may be addressed by asking what would happen to the economy if gravel mining were brought to a complete halt. It is hard to imagine what substitute material might be used, or where it could be obtained as cheaply. Many economic activities would simply cease. Refer to Appendix O, incorporated herein, for additional information on the economic benefits of gravel extraction operations.

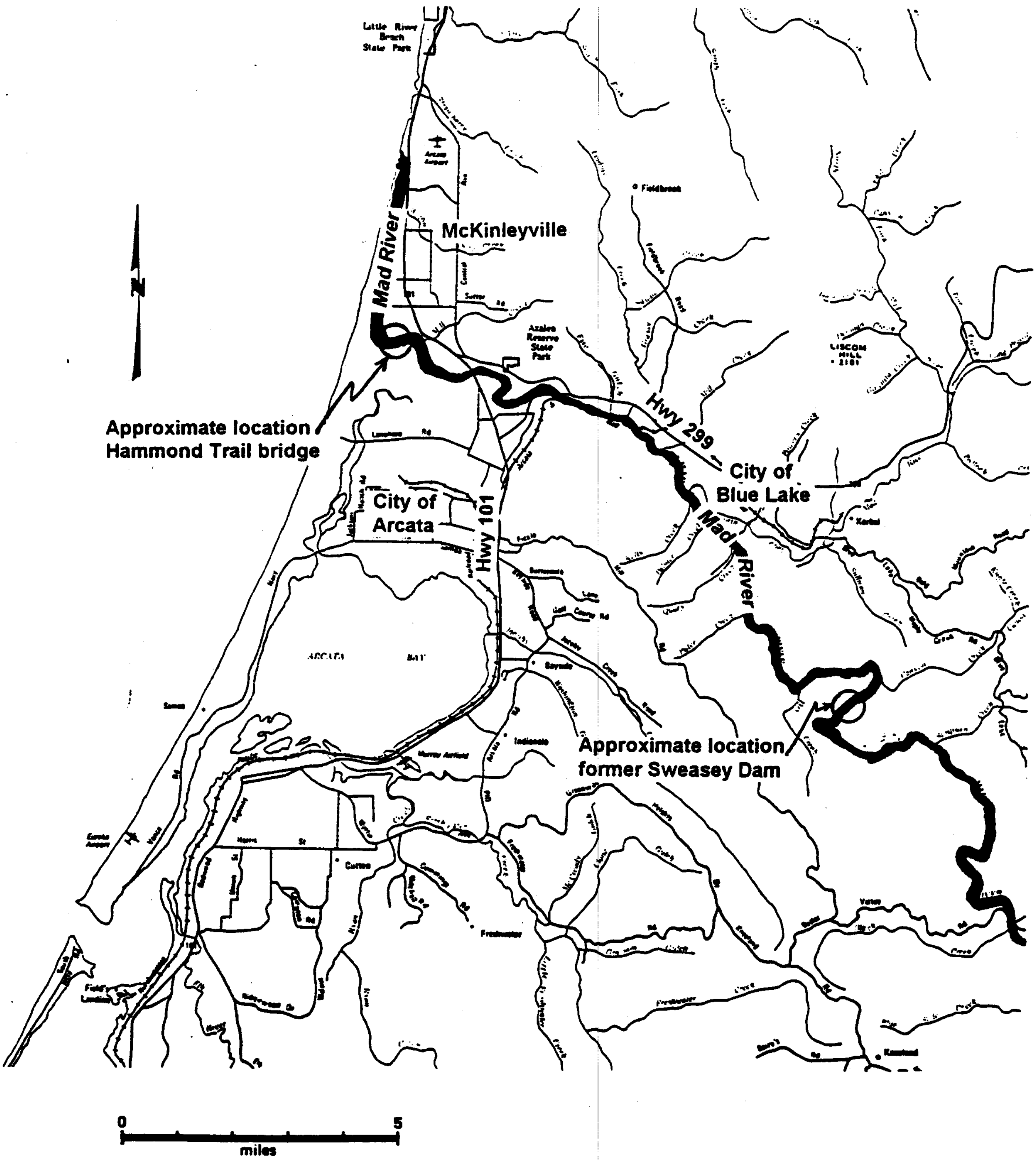
1.10 Other Projects and Related Factors in the Extraction Area

The lower Mad River is a complex dynamic ecosystem. In addition to gravel extraction and processing, there are a variety of other projects and related factors influencing the resources of the lower Mad River area. Some of these are included in the public structures list (Table 4.6-1). The PEIR recognizes that the impacts of these projects and factors continue and that they are varied and cumulative. A few examples are listed below. Concentrations of sea lions and seals at the mouth of the river, the rock cascade located just upstream from Highway 299, anglers and poachers, and the weir at the fish hatchery all impede the migration of anadromous fish. Structures in the river, such as bridge piers and Ranney wells increase local channel scour. Levees and rip-rap alter channel scour patterns, limit the extent of riparian vegetation, and redirect the hydraulic forces of the river towards other banks. Highways; HBMWD facilities; streambank protection rip rap; bridges; and adjacent residential, industrial, and agricultural areas impact river esthetic qualities. Sewage effluent and other organic matter sources influence river dissolved oxygen concentrations. Water diversions reduce streamflow and produce indirect effects on stream temperature and dissolved oxygen concentrations.

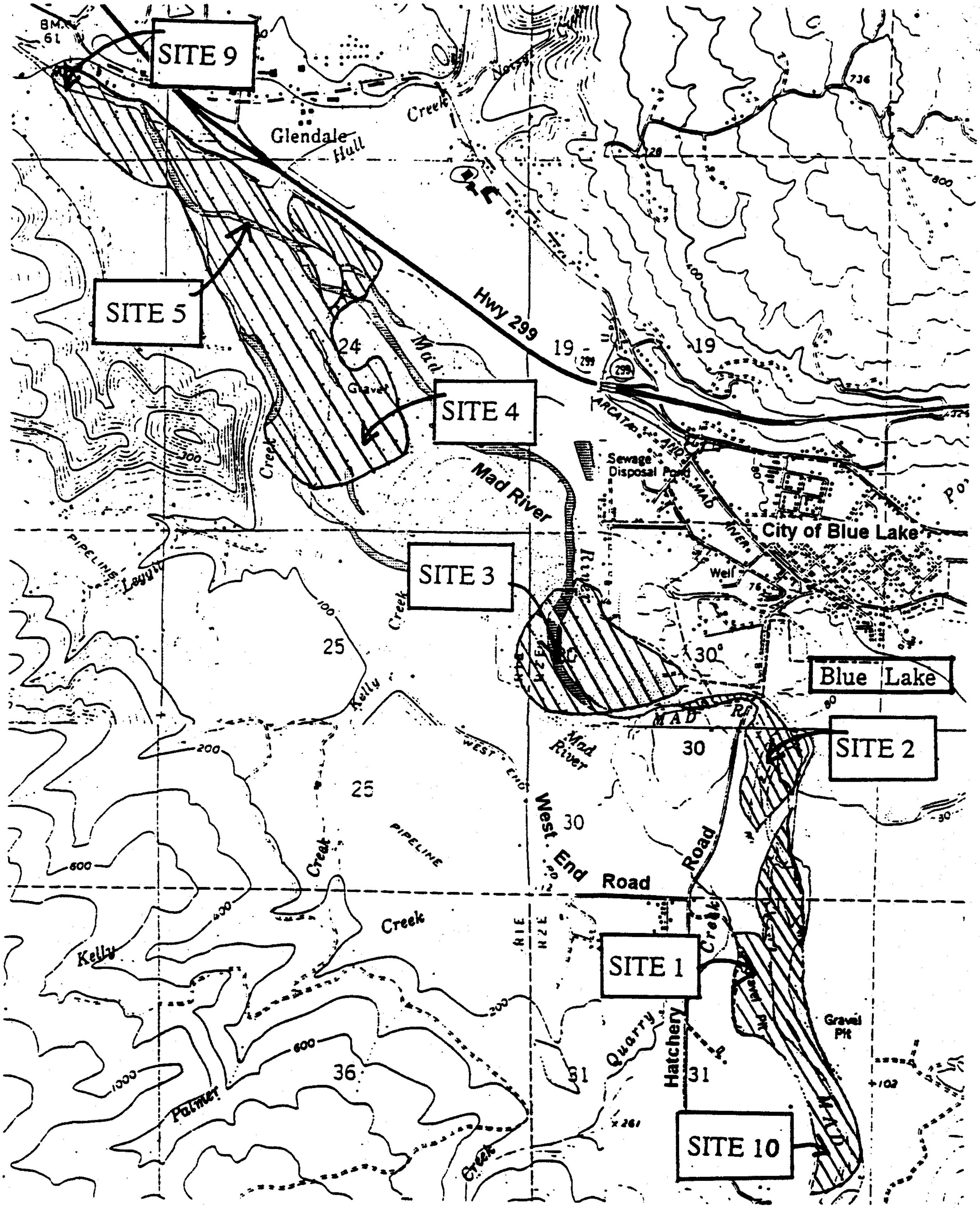
These projects and related factors and others cumulatively influence various Mad River resources, many of which are also influenced by gravel extraction and processing in the lower Mad River area.

Map 1.2-1
Location Map



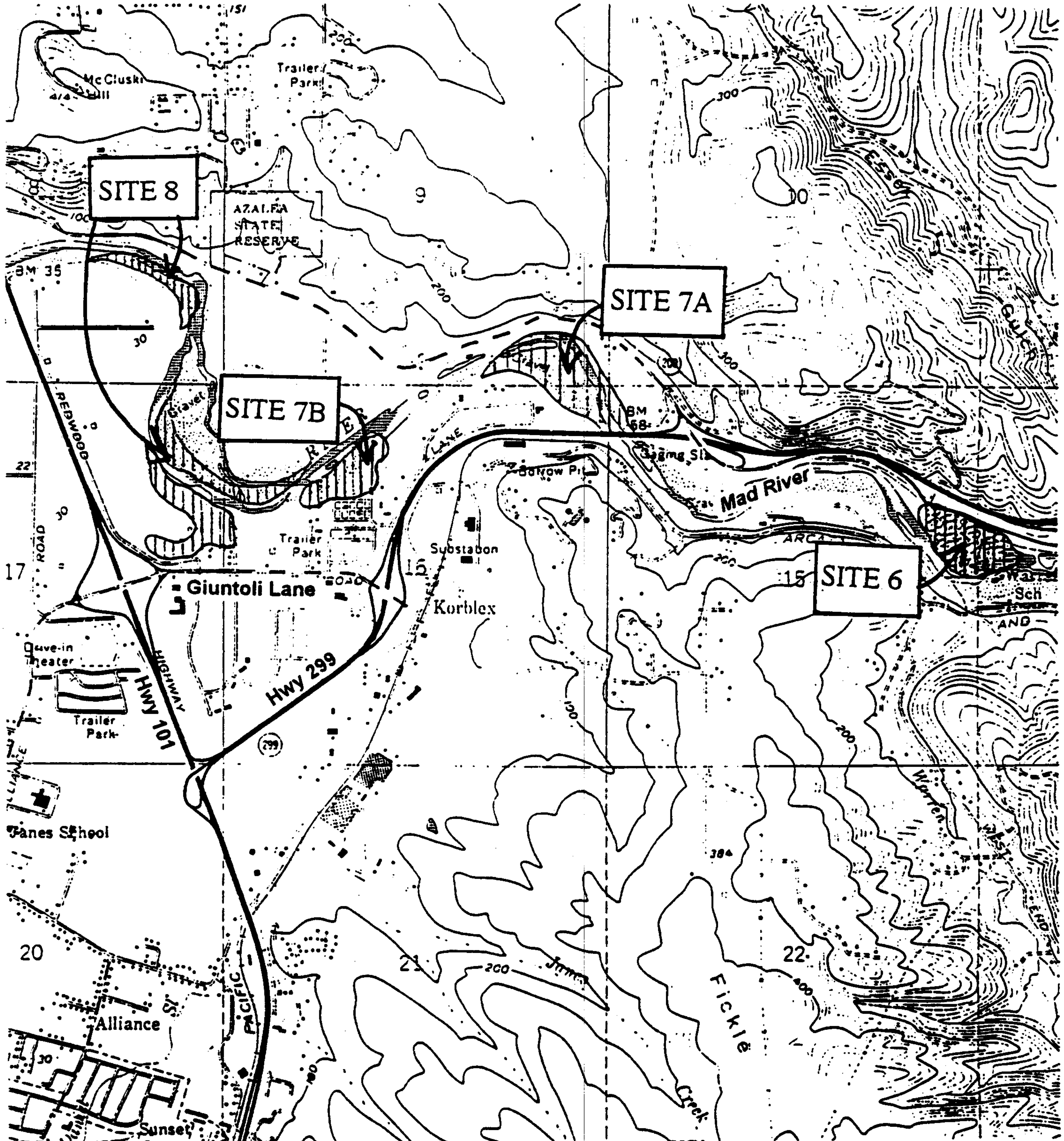


Map 1.2-2
Regional Map



Map 1.2-3
Vicinity Map
1 of 2

(adapted from: James Roscoe Consultants Report, Appendix G)



(adapted from: James Roscoe Consultants Report, Appendix G)

Map 1.2-4
Vicinity Map
2 of 2

2.0 SUMMARY

2.1 Identified Potential Significant Effects

For the purposes of CEQA, impacts identified herein are either 'significant'(S), 'significant and unavoidable' (SU), 'less than significant' (LS), or 'potentially significant' (PS). No differentiation has been made as to the degree of significance or insignificance.

Although Planners do distinguish degrees of significance and/or insignificance when evaluating land use decisions, CEQA does not require such a comparison, therefore this PEIR does not identify the scale of relative significance or insignificance of an identified impact.

Table 2.1-1 summarizes the effects and identifies the related mitigation measures. A more detailed list of the effects is found in Section 2.2. A detailed list of mitigation measures is shown in Section 2.3. Refer to Section 5 for a more complete discussion of both effects and mitigation measures.

Note in Table 2.1-1 that certain significant adverse impacts are mentioned more than once. For example Morph-1 includes those significant effects found under the Public Utility and Structures listing (PU&S). Likewise, Noise-10 and Rec-3 are similar, if not identical.

Impacts resulting from excessive bed degradation in certain reaches of the lower Mad River are one of the principal adverse effects caused by excessive gravel extraction. Other factors also contribute to bed degradation and these include low rainfall and runoff, reduced rates of erosion, and localized channel scour to name a few. However, managing and limiting gravel extraction is the most direct means of reducing most of the channel degradation in the lower Mad River.

It is understood that gravel extraction in excess of net recruitment, causes degradation and the greater this excess is the greater the potential resulting impacts will be and/or the sooner they will occur. If extraction is below net recruitment, aggradation will reduce or eliminate the impacts caused by excessive degradation.

Regardless of the volume extracted, gravel extraction methods can produce adverse impacts on channel morphology and on the aquatic and adjacent environments. However, these impacts can usually be mitigated during the annual extraction design and review phases.

Table 2.1-1 - Summary of Environmental Effects.

Impacts	Signif w/o mitigat.	Mitigation Measures	Signif after mitigat.
Morph-1 Bed degradation, impact on structures (See PU&S impacts)	S	Mit 1, 2	S
Morph-2 Bed degradation, impact on aquatic habitat	PS	Mit 1	LS
Morph-3 Bed degradation, impact on groundwater	PS	Mit 1, 3	LS
Morph-4 Bed degradation, impact on bank stability	PS	Mit 1, 3	LS
Morph-5 Bed degradation, impact on channel capacity	LS	Mit 1	LS

Morph-6 Extraction impacts on river resources	PS	Mit 1	LS
H2OQlty-1 Turbidity during high flows	LS	None required	LS
H2OQlty-2 Summer bridge placement, impact turbidity	LS	Mit 4	LS
H2OQlty-3 Skimming reduces channel confinement	PS	Mit 1	LS
H2OQlty-4 Petroleum product leaks	PS	Mit 5	LS
GndH2O-1 Aggradation raises water table	PS	Mit 1	LS
GndH2O-2 Degradation lowers water table	PS	Mit 1	LS
GndH2O-3 Degradation impacts HBMWD reach	PS	Mit 1	LS
Fish-1 Extraction reduces channel confinement, may create low water barrier	PS	Mit 1	LS
Fish-2 Degradation impacts migration at tributaries	PS	Mit 1	LS
Fish-3 Extraction may impact spawning	PS	Mit 1, 6	LS
Fish-4 Summer bridge may impact juvenile migration	PS	Mit 4	LS
Fish-5 Trenching impact on riffles	PS	Mit 1	LS
Fish-6 Extraction impact on woody debris and diversity	PS	Mit 1	LS
Wild-1 Loss of wildlife habitat	S	Mit 1, 7, 8, 9	S
Wild-2 Noise on wildlife	PS	Mit 1, 7, 10	PS
Wild-3 Dust coating vegetation	PS	Mit 1, 7, 11, 12	LS
Wild-4 Habitat of various species of concern	PS	Mit 1,7	LS
Wild-5 Northern Red-legged frog	PS	Mit 1, 7	LS
Wild-6 Yellow-legged frog	PS	Mit 1, 7	LS
Wild-7 Northwestern Pond Turtle	PS	Mit 1, 7	LS
Veg-1 Cumulative impacts on riparian vegetation	S	Mit 1, 8, 9	S
Veg-2 Loss of vegetation may impact bank stability	PS	Mit 1, 3, 8, 9	LS
Veg-3 Cumulative impacts on successional development of gravel bars, terraces and vegetation	S	Mit 1	S
Air-1 Exhaust emissions	LS	None required	LS
Air-2 Generation of dust	PS	Mit 11, 12	LS
View-1 Cumulative visual impacts near Blue Lake and Hatchery Road	S	Mit-24	S
View-2 West End Road visual impacts	LS	None required	LS
View-3 Cumulative visual impacts near Highway 299 & Giuntoli Lane	S	Mit 24	S
View-4 Cumulative visual impacts along Highway 299 between Arcata and Blue Lake	S	Mit 24	S
View-5 Visual impacts along North Bank Road	LS	None required	LS
View-6 Cumulative visual impacts along river	SU	Mit 13, 24	SU
Traffic-1 City of Blue Lake	PS	Mit 14, 15	PS
Noise-1 Mad River Sand & Gravel	LS	None required	LS
Noise-2 Emmerson Bar	LS	None required	LS

Noise-3 Blue Lake Bar	LS	None required	LS
Noise-4 Eureka Sand & Gravel processing site & Christie Bar	LS	None required	LS
Noise-5 Johnson-Zabel Bar	LS	None required	LS
Noise-6 Essex Bar	LS	None required	LS
Noise-7 Arcata ReadiMix processing site	SU	Mit 10	SU
Noise-8 REA processing site	SU	Mit 10	SU
Noise-9 Eureka Ready Mix impact on Glendale Trailer Park	LS	None required	LS
Noise-10 Impact on river users	SU	Mit 10, 16	SU
PU&S-1 Degradation impact at Mad River Fish Hatchery weir	PS	Mit 1, 2	LS
PU&S-2 Degradation impacts at RSP adjacent to fish hatchery	PS	Mit 1, 2	LS
PU&S-3 Blue Lake bridge	PS	Mit 1, 2	LS
PU&S-4 Blue Lake right bank levee	PS	Mit 1, 2	LS
PU&S-5 Blue Lake sewage treatment ponds & levee	PS	Mit 1, 2	LS
PU&S-6 Highway 299 Mill Creek bridge	PS	Mit 1, 2	LS
PU&S-7 North Coast Railroad Authority bridge	PS	Mit 1, 2	PS
PU&S-8 Glendale Drive bridge at Lindsay Creek	PS	Mit 1, 2	LS
PU&S-9 Highway 299 bridge at Lindsay Creek	PS	Mit 1, 2	LS
PU&S-10 Railroad trestle at Warren Creek	PS	Mit 1, 2	LS
PU&S-11 Warren Creek road bridge	PS	Mit 1, 2	LS
PU&S-12 Structures in the HBMWD reach	PS	Mit 1, 2	LS
PU&S-13 Upper HBMWD pipe crossing	PS	Mit 1, 2	LS
PU&S-14 Lower HBMWD pipe crossing	PS	Mit 1, 2	LS
PU&S-15 U.S. Geological stream gaging station	LS	None required	LS
PU&S-16 Highway 299 bridges	S	Mit 1, 2	S
PU&S-17 PG&E upper gas line crossing attached to Highway 299 bridge	S	Mit 1, Mit 2	S
PU&S-18 Degradation impacts on Highway 101 bridges	PS	Mit 1, 2	LS
PU&S-19 Degradation impacts on Hammond Trail bridge	PS	Mit 1, 2	LS
PU&S-20 Degradation impacts on Mad River Beach Road RSP and boat ramp	PS	Mit 1, 2	LS
PU&S-21 Degradation impacts on Clam Beach Mad River RSP	PS	Mit 1, 2	LS
Arch-1 Archaeological sites	PS	Mit 17, 18	LS
Rec-1 Trench hazards	PS	Mit 19, 20, 21	PS
Rec-2 Summer bridge- portaging	LS	None required	LS
Rec-3 Summer bridge boating hazards	PS	Mit 22, 23	PS
Rec-4 Noise impacts on river users (See Noise-10)	SU	Mit 10, 16	SU

2.2 List of Effects

See Section 5 for more detailed discussion on effects.

Morph-1: Gravel extraction, droughts, streambank levees, bridge piers, other instream structures, and other factors cumulatively contribute to channel degradation. The primary Mad River channel morphology concerns at this time are associated with channel degradation and the effects that cumulative channel degradation has had on certain structures. However, excessive channel aggradation has created a host of river management problems in the past and these problems could reoccur in the future. Extraction rates in excess of average net recruitment will encourage the riverbed to continue degrading. Bed degradation can expose or undermine bridge supports, pipe lines and other structures jeopardizing structural integrity. Caltrans has indicated that the Highway 299 bridge supports have been weakened by degradation and that modifications have been tentatively scheduled for 1995-96. Said changes should strengthen the integrity of the Highway 299 bridge supports and help reduce the significance of channel degradation at this location. See Section 5.12 for more information on public utilities and structures.

No extraction or extraction rates below average net recruitment can lead to channel aggradation. Channel aggradation at Caltrans bridge sites and at other specific sites is needed to reduce the cumulative effects of past degradation and would be beneficial. However, excessive channel aggradation can create significant localized adverse effects. (S/S)

Morph-2: Excessive channel aggradation and degradation produce various negative impacts on the aquatic habitat. Gravel extraction in excess of replenishment causes the bed to degrade at the extraction site and upstream and downstream of the extraction site, and can produce significant negative impacts on the aquatic habitat. Gravel replenishment is presently needed at some sites to restore degraded conditions. However, excessive gravel aggradation will lead to adverse impacts on the aquatic habitat. See Section 5.5 for additional information on the aquatic habitat. (PS/LS)

Morph-3: Excessive channel aggradation and degradation produce various negative impacts on the groundwater regime which can lead to other impacts, both beneficial and adverse. Gravel extraction in excess of replenishment causes the bed to degrade at the extraction site and upstream and downstream of the extraction site, and can produce a significant lowering of the water table in the vicinity of the channel. Lowering the water table can improve drainage, reduce aquifer storage capacity, increase the depth to groundwater, and drain wet sites resulting in a change of riparian or wetland vegetation habitat. The changes in riparian or wetland vegetation habitat, could be significant and could lead to changes in channel morphology through bank erosion. See Section 5.4 for more information on groundwater. See Section 5.7 for more information on vegetation. (PS/LS)

Morph-4: Excessive channel aggradation and degradation produce various negative impacts on channel bank stability. Excessive aggradation creates a shallow, wide channel which can increase bank erosion and cause the channel to encroach on adjacent properties. Gravel extraction in excess of replenishment can reduce aggradation rates and cause the bed to degrade at the extraction site and upstream and downstream of the extraction site and reduce the adverse impacts of excessive aggradation. Rapid excess bed degradation can induce bank collapse and erosion by increasing the heights of banks, and by reducing the water table, which in turn reduces bank stabilizing vegetation. Bank erosion brought on by excessive channel aggradation and degradation has the potential to be significant. (PS/LS)

Morph-5: Excessive channel aggradation produces negative impacts on channel flood carrying capacity. Channel aggradation reduces channel capacity and increases the risk of overbank flooding. Bed degradation, what ever the cause, has the potential of increasing the channel flood carrying capacity and reduces the risk of overbank flooding. Gravel extraction in excess of replenishment causes the bed to degrade at the extraction site and upstream and downstream of the extraction site. Increased flood capacity is a beneficial result of bed degradation, whatever the cause. Decreased flood capacity is an adverse effect of channel aggradation. Channel aggradation is not currently a problem. Therefore, impacts on flood carrying capacity are not currently significant. (LS/LS)

Morph-6: Regardless of the rate of extraction, relative to bedload recruitment and replenishment, site-specific variables in extraction location and methodology can produce adverse impacts on channel morphology and related river resources. (PS/LS)

H20Qlty-1: During extraction, mining equipment inadvertently pulverizes gravel bar surface materials and leaves a fine dust residue on some heavily disturbed gravel bars. When the river rises in the fall, the fine dust particles, along with other sediment are picked up by the river. Depending upon flow conditions this may, or may not, produce a short term measurable increase in turbidity. High flows on the Mad River are already quite turbid before they enter the project area and the added turbidity, when present, is not likely to be noticed and is considered less than significant. (LS/LS)

H20Qlty-2: Placement and removal of summer bridges or other summer crossings can cause a short term increase in turbidity, at a time when the river is generally free of turbidity. Because the potential increase in turbidity is slight, short lived, and isolated the impact is insignificant. (LS/LS)

H20Qlty-3: Skimming as an extraction method has the potential to create a broad, shallow channel increasing the surface area of the flowing river, and potentially increasing channel braiding and water temperatures. Generally the native fish species of the Mad River prefer cool water. Increased water temperatures could potentially have a significant adverse effect on these native fish species. (PS/LS)

H20Qlty-4: During gravel extraction petroleum products may spill or leak on to the gravel bar. When the river rises these contaminants could adversely impact water quality. (PS/LS)

GndH2O-1: When extraction volumes are below net recruitment channel aggradation can occur. Aggradation raises the water table. A higher water table means less depth or opportunity for percolation of leach fields and percolation ponds. Aggradation has the potential to significantly impact the effectiveness of septic tank leach fields and the Blue Lake Sewage Treatment percolation ponds. (PS/LS)

GndH2O-2: If extraction volumes exceed the recruitment rate channel degradation could occur through the Blue Lake Valley reach. This, in turn, would cause the water table in the Blue Lake aquifer to drop, and produce changes in dependent riparian plant communities located on adjacent upper level terraces and in adjacent riparian forests, phreatophytic vegetation and wetland habitat. The drop in the water table has the potential to be a significant adverse environmental impact within the Blue Lake valley reach. See Section 5.7 for more discussion on vegetation. (PS/LS)

GndH2O-3: The water reaching the HBMWD intakes is naturally filtered by passing through the sand and gravel of the riverbed. Deeper sand and gravel means more filtration. If extraction volumes exceed net recruitment channel degradation will continue in the HBMWD Gorge. Channel bed degradation produces a concurrent reduction in natural filtration. In the absence of widespread channel degradation, localized scour around the mid-channel Ranney wells will produce similar results. Reduced natural filtration forces the HBMWD to incur additional water treatment costs. This has a potentially significant economic impact. See Section 5.12 for more information on HBMWD water supplies. (PS/LS)

Fish-1: Certain extraction methods and standards have the potential to create a broad, shallow channel. If the channel is too shallow, adult and juvenile fish migration through the excavated area may be adversely impacted during semi-low flows (PS/LS)

Fish-2: Channel degradation has the potential to create physical topographic barriers at the mouths of tributaries and adversely influence fish migration into and out of these tributaries, particularly when flows are low to marginal. Barriers to anadromous fish migration into and out of tributaries could be a significant impact. (PS/LS)

Fish-3: Gravel extraction has the potential to adversely alter the morphology of spawning sites and the composition of spawning gravel in the Mad River extraction area. There is debate on this issue and it could be a significant impact. However, the CDFG has stated that they believe that gravel extraction can continue without impacting spawning habitat. (PS/LS)

Fish-4: The installation and removal of summer bridges or other summer crossings has the potential to significantly impact juvenile fish migration. (PS/LS)

Fish-5: Trenches can be strategically located in a variety of sites. Trenches can also be deep or shallow, wide or narrow, and short or long. The effects of trenches can vary. Trenching has the potential for improving fish passage in aggraded reaches. This is a beneficial impact of trenching. Trenching also has the potential to reduce or eliminate riffles which are important for rearing juvenile steelhead and as habitat for benthic macroinvertebrates. This loss or reduction of riffles has a potential to be significant. (PS/LS)

Fish-6: Gravel mining can reduce aquatic habitat diversity and the retention of large woody debris, both of which are necessary in order to maintain quality summer rearing habitat and holding areas for migrating adult and juvenile fish. The loss of habitat diversity and woody debris can be a significant impact. (PS/LS)

Wild-1: Gravel extraction, aggregate stockpile and processing sites, industrial development, agricultural development, residential development, highway development, and streambank levees have cumulatively reduced the Mad River riparian corridor wildlife habitat to a fraction of what it once was. Gravel extraction operations and gravel stockpiles can significantly reduce or modify the habitat of certain wildlife species. These potential changes could be significant adverse impacts. The preferred alternative will not increase this loss of wildlife habitat. On the contrary certain vegetation mitigation measures may actually increase the availability of significant wildlife habitat. Regardless, the cumulative adverse impacts on wildlife habitat will remain significant. (S/S)

Wild-2: Wildlife can be affected by excessive noise resulting from mechanical equipment. Operational noise can be reduced if the exhaust systems of all internal combustion engines owned or maintained by the operators are kept in good repair and as manufactured. While many species can become acclimatized to predictable and/or constant noise, others will be displaced, at least temporarily. When operations cease, the wildlife can return. This may be considered a short term effect and less than significant. However, if rare or threatened species are displaced by excessive noise the effect would be significant. Monitoring for noise-reduction compliance and for the presence of rare, threatened, or endangered species subject to noise disturbance is needed. For more information on noise see Section 5.11. (PS/PS)

Wild-3: Dust resulting from the project can coat riparian vegetation inhibiting both plant growth and insect use of plants, both of which consequently affect wildlife use of the habitat. This has a potential of being a significant impact. (PS/LS)

Wild-4: Gravel extraction operations could impact the habitat of various bird and mammal Species of Special Concern, Threatened species, or Endangered species. These impacts could be significant. (PS/LS)

Wild-5: Gravel extraction operations could impact the Northern Red-legged Frog, a Species of Special Concern in California and a Category 2 Candidate for Federal Listing. Disturbance of breeding or habitat areas could be significant. (PS/LS)

Wild-6: Gravel extraction operations could impact the Foothill Yellow-legged Frog, a Species of Special Concern in California and a Category 2 Candidate for Federal Listing. Disturbance of breeding or habitat areas could be significant. (PS/LS)

Wild-7: Northwestern Pond Turtles were not observed in the project areas during the 1993 wildlife survey. However, gravel extraction operations could impact the Northwestern Pond Turtle, a Species of Special Concern in California and a Category 2 Candidate for Federal Listing. Disturbance of breeding or habitat areas could be significant. (PS/LS)

Veg-1: Consultants to this project have stated time and again that protecting all stages of riparian forests is the single most important element in ensuring good wildlife populations in the project area. Much of the natural riparian habitat originally present in the Mad River corridor has already been destroyed by agricultural conversion, the construction of levees, the development of roads, highways residential areas, and industrial areas and other causes. This loss of riparian habitat is cumulative and has been significant. Any further removal of significant riparian habitat, whether for gravel extraction or other purposes, has the potential to produce additional significant adverse impacts, primarily due to the potential loss of wildlife habitat. (S/S)

Veg-2: The indiscriminate removal of riparian vegetation, whether for gravel extraction or other purposes has the potential to produce significant adverse impacts due to the loss of bank stability. Loss of bank stability has both favorable and unfavorable impacts. If banks are unstable the river may tend to meander. When a river meanders it recruits sediment from terraces and produces less downcutting. (PS/LS)

Veg-3: The repeated removal of gravel in certain locations will alter the successional development of gravel bars, terraces, and vegetation at those locations. Continued excavation in any one area precludes the natural evolution of terraces and subsequent development of riparian vegetation. The low-lying herbaceous and early scrub habitats would be the most affected. The localized long-term effects would include: A) the loss of early stage scrub; B) the maturation of the later stage scrub and forest; C) a decline in vegetative diversity; D) a decline in wildlife habitat values; and E) a likely decline in wildlife diversity. These impacts are cumulative and significant. (S/S)

Air-1: Gravel extraction operations involve the use of gasoline or diesel-powered equipment that emit exhaust emissions. The air emissions are regulated by the NCUAQMD. There is no evidence that exhaust emission resulting from the project cause significant impacts. (LS/LS)

Air-2: The project may involve the generation of dust. Dust emissions are regulated by the NCUAQMD. Some operations coupled with dry weather and heavy winds can emit fugitive dust in excess of adopted standards. This would be a significant impact. (PS/LS)

View-1: In the vicinity of Hatchery Road Bridge there are a variety of industrial-type land uses that may be perceived as adverse visual impacts. The primary access to the river at Blue Lake is via the Hatchery Road bridge and levee. Both the Emmerson bar (Site No. 2) and Blue Lake bar (Site No. 3) extraction areas are visible from the bridge and levee. No other views of the river are available along Hatchery Road. Further south along Hatchery Road, the Mad River Sand & Gravel processing site (Site No. 1) can be seen in the distance, approximately 650 feet off the road. With the exception of the stockpiles and processing site this is primarily a rural agricultural setting and some people may feel that the processing site is in conflict with the setting. The reclamation plan and use permit allow for additional processing facilities at this site. With the exception of the processing plant and site the visual impacts resulting from the project in this view setting will be less than significant. However, the cumulative visual impact of this processing site, in combination with other aggregate processing sites and other industrial uses in the Mad River corridor is a significant adverse impact (S/S)

View-2: From Blue Lake to Arcata along West End Road, views are mostly screened by dense stands of riparian vegetation. Blue Lake and Christie bar (Site No. 3 and 4) stockpiles and extraction activity can be seen along a limited stretch of the road directly opposite the operations.

West End Road closely parallels the river. When the summer foliage has fallen from the trees, Essex bar (Site No. 6) can be viewed. Along West End Road, between the Water District buildings and Highway 299 the river can be viewed through the trees. These visual impacts are considered less than significant.

The project will create no significant change in visual effects at this view location. Therefore these visual impacts will remain less than significant. (LS/LS)

View-3: No views of the river are available from Giuntoli Lane. However, the Redwood Empire Aggregates processing site (Site No. 8) is highly visible from both Giuntoli Lane and Highway

101. The Arcata ReadiMix processing plant and stockpiles (Site No. 7B) are visible from Giuntoli Lane, Boyd Road, and Highway 299. These sites, along with other industrial uses in the area are considered individually and cumulatively significant adverse visual impacts. These two aggregate processing sites are zoned and planned for industrial use and visual effects are existing. The project will create no additional adverse visual effects at this view location. However, the cumulative visual impact of these processing sites, in combination with other industrial uses in the Mad River corridor is a significant adverse impact. Therefore the visual impacts resulting will remain significant. (S/S)

View-4: While driving westbound on Highway 299 down the Lord Ellis Summit there are distant views of the Mad River and the Blue Lake, Christie and Johnson bars (Site No. 3, 4 and 5).

Further west along Highway 299, Eureka Sand & Gravel's (Site No. 4) processing and stockpile yard is highly visible. Some evergreen plantings occur within the Caltrans right-of-way, but most of the processing and stockpile yard is exposed.

The Glendale Road underpass offers a view of the upstream end of Johnson bar (Site No. 5) and the Eureka Sand & Gravel's Christie bar (Site No. 4).

Eastbound Highway 299 passes several pump stations, the Water District buildings and utility yard, and Mercer Fraser's Essex bar, processing and stockpile yard (Site No. 6) are visible. Only short glimpses of the river are possible along this stretch. The streambank is lined with cottonwoods, willows and alders with conifer trees planted both within the Caltrans right-of-way and growing naturally on adjacent land. Adjacent to the Essex Lane underpass, the railroad bridge and the river can be seen. The river is then hidden by the adjacent streambank and dense vegetation.

The only other view of the river is from the Highway 299 bridge. The Water District buildings or the Johnson-Spini bar (Site No. 7A) can be seen from the bridge, depending on the direction one is driving. Gravel extraction is visible from westbound 299 when it occurs on the Johnson-Spini bar (Site No. 7A).

Along the length of Hwy. 299 views from the highway are diverse, and range from natural landscapes to heavy industrial use. Hwy. 299 also passes through the Cities of Arcata and Redding. Diverse views are normal and expected. Visual effects of gravel operations in this description are existing and vary from slight to highly visible and offensive to some individuals. The Eureka Ready Mix processing site is highly visible from Highway 299 and contributes to the cumulative adverse visual impacts of this project. The project will create no additional adverse visual effects in this view shed. However, the cumulative visual impact of this processing site, in combination with other industrial uses in the Mad River corridor is a significant adverse impact. Therefore the visual impacts resulting from the project will remain significant. (S/S)

View-5: As Northbank Road passes the Johnson-Spini and Arcata ReadiMix bars, and the Graham bar (Site Nos. 7A, 7B and 8), the gravel extraction operations are hardly noticeable because of the curvature and narrowness of North Bank Road. The Johnson-Spini bar (Site No. 7A) and Highway 299 bridge are visible from pull-offs along Northbank Road

The visual effects in this description are existing and would likely be considered as minor by most individuals. The project will create no significant change in the visual effects described here. Therefore the visual impacts will less than significant. (LS/LS)

View-6: Gravel extraction and processing activity can be viewed from the river and river bars. The cumulative viewshed impacts resulting from extraction include extraction sites, summer bridge crossings, haul roads, processing sites and stockpiles. These impacts will vary with the season and throughout the river. Some of these cumulative visual impacts may be considered significant and unavoidable. (SU/SU)

Traffic-1: Extraction operations use the existing Truck Route through the City of Blue Lake. The City of Blue Lake responded to the Notice of Preparation that the City has concerns that the project will add to an existing traffic, access, maintenance and safety problem within the City of Blue Lake.

The truck route through the City of Blue Lake is developed to acceptable industrial road standards. Traffic generated by the project is only a small portion of the total traffic using the Blue Lake truck route. The extraction/processing projects are ongoing and the preferred alternative does not significantly increase the level of truck traffic within the City. However, the cumulative impact of the project traffic in combination with other traffic that may be increasing could potentially be significant. If so, it is unavoidable. (PS/PS)

Noise-1: The closest residence to the Mad River Sand & Gravel processing operation (Site No. 1) is a house owned by the operator approximately 650' southwest of the processing plant which would be subjected to exterior noise levels of 66 dBA. This noise level is Normally Unacceptable for low density residential and normally acceptable for industrial and agriculture (Table 5.11-1). Because the house is located in an agricultural and industrial setting the noise is considered normally acceptable and insignificant.

Residences directly west of the processing site are approximately 900' from the processing plant. During operations, these residences would receive exterior noise levels of approximately 63 to 65 dBA. These levels are considered Conditionally Acceptable for low density residential (Table 5.11-1). Conventional construction, with closed windows will normally suffice. Both the operation and the residences are existing and owned by the operator.

The existing noise levels are judged insignificant with respect to the residences. The project will not increase existing noise impacts. Therefore the impact at this location is less than significant. (LS/LS)

Noise-2: The closest residences to the Emmerson bar (Site No. 2) are located approximately 1,100' to the northwest and 1,200' to the south. There are also approximately 20 houses off West End Road within 2,000' of the extraction and stockpiling area. The noise levels received at these residences from extraction activities and gravel transport would be less than 55 dBA. This level is Clearly Acceptable (Table 5.11-1) and is considered less than significant.

The project will not increase existing noise impacts at this site. Therefore the impact at this location is less than significant. (LS/LS)

Noise-3: The closest residences to the Blue Lake bar (Site No. 3) are two houses owned by REA, 100' and 400' from the truck yard and 800' to 1,000' from the gravel bar. These residences would receive noise levels of 54 dBA and 55 dBA from extraction activities (Clearly Acceptable). Processing does not occur at this site; but, if it did these two residences would receive 62 dBA (Conditionally Acceptable) and 74 dBA (Clearly Unacceptable) from processing.

The project will not increase existing noise impacts at this site. Therefore the impact at this location is less than significant. (LS/LS)

Noise-4: The closest residence to the Eureka Sand and Gravel processing site (Site No. 4) is approximately 1,600' to the north, and would be affected by traffic on Highway 299, as well as the processing plant. The noise levels received by residences from processing would be less than 60 dBA and Normally Acceptable for low density residential (Table 5.11-1).

The project will not increase existing noise impacts at this site. Therefore the impact at this location remains less than significant. (LS/LS)

Noise-5: Extraction equipment at Johnson bar (Site No. 5), would produce noise levels of less than 55 dBA at Warren Creek Road residences, approximately 1,200'-1,800' southwest of the site. This is Clearly Acceptable (Table 5.11-1) and less than significant.

The project will not increase the current existing noise impacts at this site. Therefore the impact at this location is less than significant. (LS/LS)

Noise-6: The nearest occupied structure to Essex bar (Site No. 6), is approximately 450' to the south; it would receive exterior noise levels of 62-65 dBA. This is Conditionally Acceptable for low density residential (Table 5.11-1). Conventional Construction with closed windows will normally suffice.

The project will not increase existing noise impacts at this site. Therefore the impact at this location is less than significant. (LS/LS)

Noise-7: The Arcata ReadiMix (Site No. 7) site has processing equipment, a cement batch plant, front end loaders, dump trucks and mixers. Developed in 1951, the site is located within an industrial area. It is also located adjacent to and directly north of the Town and Country Trailer Park, built in 1955. In previous years, there were some complaints about noise generated by early morning operations.

Noise levels, measured adjacent to the trailer park range from 55 dBA (Clearly Acceptable), with no equipment running, to 80 dBA (Clearly Unacceptable for high density residential and Conditionally Acceptable to Normally Unacceptable for industrial areas), when a gravel truck passes within 75 feet. The average noise level measured at the trailer park, for a one hour period is 63 dBA (Conditionally Acceptable for high density residential and Clearly Acceptable for industrial). When the cement batch plant operates (10 minutes for one load), noise levels increase to 73.5 dBA (Clearly Unacceptable for high density residential and Normally Acceptable for industrial). Noise levels generated by this operation could be considered an unavoidable significant effect of an existing use, particularly with reference to the adjacent high-density residential use.

The project will not increase the existing noise impacts at this site. However, the existing noise at this site is significant and unavoidable. (SU/SU)

Noise-8: The existing facility at Graham bar is located in an industrial and commercial area. The nearest occupied structure to Graham bar (Site No. 8), is a residence, approximately 200'-300' south of the processing equipment. Noise levels at the residence would be 65 dBA (Conditionally Acceptable for high density residential) for the processing plant, and 67-74 dBA (Normally Acceptable for industrial) for Giuntoli Lane traffic. The nearest residence to the east is approximately 500' away, receiving noise levels of 67 dBA (Conditionally Acceptable for high density residential and Normally Acceptable for industrial).

Residences west and north were 1,400' and 1,800' respectively; noise levels would be reduced to less than 55 dBA at each residence (Clearly Acceptable for low density residential).

The noises generated by Highway 101 and Giuntoli Lane at this site are high but Normally Acceptable for industrial areas (Table 5.11-1). The combined highway and processing noises are at least conditionally acceptable for this zoning and therefore not significant. The project will not increase existing noise impacts at this site. Therefore, the noise impact at this location would be less than significant. (LS/LS)

Noise-9: Glendale Trailer Park, approximately 400 feet to the north of the Johnson-Zabel bar (Site No. 9), is the nearest residential area with about 35 trailers. These trailers are subjected to noise from Highway 299. Extraction could generate noise levels of 60-62 dBA in the trailer park. This is considered Conditionally Acceptable for both low and high density residential (Table 5.11-1). With conventional construction and closed windows, this is considered acceptable and less than significant.

The project will not increase existing noise impacts. Therefore the impact in this location is less than significant. (LS/LS)

Noise-10: River and river bar users are impacted by noise generated by the existing operations and by noise from adjacent roadways. During extraction, noise levels reach 67-74 dBA at 100'. This is considered Normally Acceptable to Normally Unacceptable for water recreation uses (Table 5.11-1) but may not be acceptable to river recreationists and fishermen.

The primary impact from noise would occur from extraction activities which occur outside the main fishing periods and this will help reduce the significance of the impact. While some people may be intrigued by gravel operations and not mind the noise, others perceive it as a significant impact. With current technology, this impact is unavoidable.

The project will not increase existing noise impacts along the river. However, the existing noise impacts at the river are sometimes significant and unavoidable. (SU/SU)

PU&S-1: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the Mad River Fish Hatchery weir. This could be a significant impact. (PS/LS)

PU&S-2: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the RSP along the left bank, adjacent to the fish hatchery (river mile 14.5). This could be a significant impact. (PS/LS)

PU&S-3: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the Blue Lake bridge (river mile 12.8). This could be a significant impact. (PS/LS)

PU&S-4: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the Blue Lake right bank levee (river mile 12.8-13). This could be a significant impact. (PS/LS)

PU&S-5: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the Blue Lake sewage treatment ponds and levee (river mile 11.7). This could be a significant impact. (PS/LS)

PU&S-6: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the Highway 299 Mill Creek bridge (river mile 10.5). This could be a significant impact. (PS/LS)

PU&S-7: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the North Coast Railroad Authority bridge (river mile 9.8). A 16-inch water line is attached to the railroad bridge. It takes water to the north side of the river to service the community of Fieldbrook and the city of Blue Lake. The loss of this bridge would be a significant impact. (PS/PS)

PU&S-8: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the Glendale Drive bridge over Lindsay Creek (river mile 9.8). This could be a significant impact. (PS/LS)

PU&S-9: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the Highway 299 bridge over Lindsay Creek (river mile 9.8). This could be a significant impact. (PS/LS)

PU&S-10: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the Gravel extraction in volumes exceeding replenishment has the potential to cause bed degradation. Continued bed degradation could jeopardize the integrity of the Railroad trestle over Warren Creek (river mile 9). This could be a significant impact. (PS/LS)

PU&S-11: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the Gravel extraction in volumes exceeding replenishment has the potential to cause bed degradation. Continued bed degradation could jeopardize the integrity of the Warren Creek Road bridge (river mile 9). This could be a significant impact. (PS/LS)

PU&S-12: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the structures in the HBMWD reach (river mile 7.8 - 9.5). This could be a significant impact. (PS/LS)

PU&S-13: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the upper HBMWD water pipe crossing (river mile 8.7). This could be a significant impact. (PS/LS)

PU&S-14: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the lower HBMWD water pipe crossing (river mile 7.8). This could be a significant impact. (PS/LS)

PU&S-15: Changes in bed level require periodic calibration of the U. S. Geological stream gaging station (river mile 7.8). This is not a significant impact. (LS/LS)

PU&S-16: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the Highway 299 bridges (river mile 7.8). This could be a significant impact. (S/S)

PU&S-17: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the Highway 299 bridge. The PG&E upper gas line crossing (river mile 7.8) is connected to this bridge. As long as the bridge integrity is intact, there will be no related impacts to the PG&E pipeline. As discussed in PU&S-16, impacts to Hwy. 299 bridge could be a significant, therefore the impacts to the pipeline could be significant. (S/S)

PU&S-18: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the Highway 101 bridges (river mile 5.6). This could be a significant impact. (PS/LS)

PU&S-19: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the Hammond Trail bridge (river mile 3.9). This could be a significant impact. (PS/LS)

PU&S-20: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the Mad River Beach Road RSP (river mile 3.3 - 3.4). This could be a significant impact. (PS/LS)

PU&S-21: If the average annual gravel extraction rate exceeds average annual net recruitment and replenishment the bed will continue to degrade. Continued bed degradation could jeopardize the integrity of the Clam Beach Mad River RSP (river mile 0). This could be a significant impact. (PS/LS)

Arch-1: Two prehistoric archaeological sites are recorded on river terraces above proposed gravel extraction areas in the project area. The sites have been given the trinomials CA-HUM-930 and CA-HUM-931 by the Sonoma State University, Northwest Regional Information Center. The locations are not being disclosed in order to protect the sites. At least one of these sites may be at risk due to streambank erosion. If bed degradation, or other factors, cause bank failure in the area of the identified archeological resources, these resources could be significantly impacted. (PS/LS)

Rec-1: Trenches can be hazardous to recreational users of the river bars and are considered a potential significant impact. (PS/PS)

Rec-2: Summer bridge crossings could impact recreational users of the river. If the crossings are low, Kayakers and tubers will need to portage. This is considered less than significant. No mitigation is proposed for this. See Rec-3 for a related impact. (LS/LS)

Rec-3: Low summer bridge crossings could present hazards to river users, especially kayakers and inner tubers. These can be especially dangerous if the water rises and is used by boaters before the bridges are removed. (PS/PS)

Rec-4: Noise can have an adverse impact on recreational users. Refer to Noise Impact-10 for discussion of this subject. (SU/SU)

2.3 List of Mitigations

This project has been unusual from the start. Mitigation number one, described below, is no exception. Mitigation number one is actually the implementation of the preferred alternative which is designed to provide mitigation for past and future effects of gravel extraction on the lower Mad River. See Section 5 for more details on mitigation measures.

Mit-1: Implementing the preferred alternative helps to alleviate past aggregate mining impacts and is mitigation number one. This mitigation regulates the Mad River gravel industry in order to substantially reduce or eliminate cumulative and future adverse impacts. The SDRC will review all input, from operators, as well as others and apply information gained to the annual review, planning, and reporting procedures. After reviewing all available data and evaluating river resource reclamation, conditions, and trends the Mad River SDRC will prescribe variable annual site-specific extraction locations, extraction volumes, and extraction methods. The Mad River gravel operators may then extract sand and gravel at these specified locations using these specified standards and volume limitations. Under present conditions the approximate total annual volume prescribed shall be below the approximate average annual net recruitment rate as determined by the Mad River SDRC. In time, this mitigation measure will substantially reduce or eliminate the present cumulative impacts of bed degradation. This mitigation measure may also help sustain a viable Mad River Sand and Gravel industry. Therefore, if localized or extensive channel aggradation becomes a problem in the future, it is possible that this mitigation measure may be able to help reduce the significance of the potential adverse impacts associated with excessive channel aggradation. The potential success of this mitigation measure is dependent upon the combined expertise of the Mad River SDRC, the ability of the SDRC to reasonably monitor, judge, and apply flexible mining strategies to a dynamic river system, and on future hydrologic and geologic processes. This mitigation, Mit-1, will reappear many times throughout this document and shall be used to reduce, minimize, or eliminate many of the actual or potential adverse impacts that are identified in this PEIR.

Mit-2: In order for the SDRC to fully implement the preferred alternative monitoring, information will be needed from other concerned agencies. Caltrans, the California Department of Fish & Game, Humboldt County Public Works Department, the NorthCoast Railroad Authority, Humboldt Bay Municipal Water District, or any other agency responsible for the integrity of structures along the Mad River, shall monitor their facilities and advise the SDRC as to the structural integrity of said facilities and as to potential risks that may be created by changes in channel aggradation and degradation or any other changes in channel morphology. The SDRC will utilize this information while evaluating instream reclamation and while planning future extractions. See Section 5.12 for more information on structures and utilities in the Mad River project area.

Mit-3: The SDRC will monitor river banks in the project area and, where and when feasible will initiate bank-stabilizing revegetation practices at sites where bank erosion is excessive and where revegetation may reduce the erosion rate. This is one form of revegetation that will be used as mitigation for eroding streambanks and when extraction operations disturb significant plant communities.

Mit-4: The SDRC shall consult with operators regarding the best design and placement of summer crossings. All summer bridges and other crossings shall be installed and removed in accordance with adopted regulations of the CDFG and, if required, the USACOE. This mitigation measure assures that installation and removal is executed under authorization of appropriate state and federal agency permits or agreements. These agencies have the capability of requiring conditions of approval on permits or agreements that will maintain water quality impacts, resulting from summer bridge installation and removal, at a level of insignificance.

Mit-5: The CDFG shall incorporate oil and grease clean up requirements in their 1603 agreement. Operators shall inspect their extraction sites daily when extracting and shall immediately remove all petroleum-contaminated gravel from the river bar. This mitigation measure should maintain the identified impact at a level of insignificance.

Mit-6: The Scientific Design and Review Committee and the California Department of Fish & Game will monitor fish spawning activity in the Mad River extraction area in an attempt to determine the significance and success of spawning activity and how that activity might be influenced by gravel extraction. The Scientific Design and Review Committee will meet and confer with the California Department of Fish & Game and with additional experts, as needed to develop annual mining prescriptions that will allow extraction to continue without impacting spawning habitat.

Mit-7: For at least the first five years of this project wildlife monitoring surveys similar to those conducted in the project area and at site specific extraction operations during 1993 will be continued. The SDRC will consider comments from the California Department of Fish and Game, the wildlife surveys, and impacts to wildlife when developing annual mining strategies at affected sites. The need for continuing wildlife surveys after the first five years will be considered during the five-year comprehensive review.

Mit-8: No new haul roads shall be constructed through established riparian forest under this project. Abandoned haul roads, and trails, will be revegetated.

Mit-9: Gravel stockpiles shall be maintained in historic locations in a manner to assure no encroachment into significant wildlife habitat. No new stock pile locations shall be established in riparian forests under this project. Abandoned stockpile sites will be revegetated.

Mit-10: The exhaust systems of all internal combustion engines owned or maintained by the operators shall be kept in good repair and as manufactured.

Mit-11: All non-paved haul roads will be watered at least twice a day when being used during the extraction season. In addition all extraction and processing areas shall be watered as required by the NCUAQMD or as necessary to reduce the level of fugitive dust to acceptable air quality standards.

Mit-12: All operational traffic shall observe a maximum speed limit on unpaved roads of 20 m.p.h. This will reduce dust by approximately 65-80% (RSE, 1993).

Mit-13: In order to improve visual qualities for some recreational river users operators will minimize the amount of time that idle equipment is stored on gravel bars during the extraction season.

Mit-14: The City of Blue Lake will regulate traffic within its boundaries.

Mit-15: The City of Blue Lake has asked that gravel operators operating out of Blue Lake Bar, Emmerson Bar, and Guynup Bar to regularly advise and remind their drivers to drive through Blue Lake at reduced speed and in such a manner as to minimize noise and road wear.

Mit-16: Although most approved reclamation plans provide for longer hours of operation, gravel bar extraction operations will normally occur between the hours of 7:30 a.m. and 5:30 p.m. Monday through Friday. This helps reduce conflicts for early morning, and evening anglers, and weekend recreational users. However, if environmental or other circumstances create a shorter than normal extraction season it may sometimes be necessary to extend the operating hours in order to complete the permitted extraction within the allowable time.

Mit-17: There are two recorded archeological sites located near one of the potential operating sites. The SDRC shall examine these sites and become familiar with the potential bank erosion problem during 1994 and at least once per year in following years. If problems exist now the SDRC may be able to propose solutions. The SDRC will also be able to consider related potential impacts during site specific planning if gravel extraction is proposed on nearby gravel bars.

Mit-18: Although only two sites were found, the Mad River basin is known to contain significant archaeological resources, therefore, should concentrations of archaeological materials be encountered during operations, all ground-disturbing work in that vicinity shall be halted. Work near the archaeological finds shall not be resumed until a qualified archaeologist has evaluated the materials and offered recommendations for further action.

Mit-19: A public safety plan, including signs posted adjacent to trench areas, shall be prepared by the operator and submitted to HCPD, for review and approval as part of the annual review process. Extraction design shall consider the length of the trench in relationship to recreational uses and access. This measure will assure that proper warning is given recreational users of the river bar.

Mit-20: Stockpiles adjacent to trenches shall contain breaks between piles to facilitate egress from trenches.

Mit-21: One of the long-walls of the trench shall be graded/excavated at such an angle as to facilitate emergency escape.

Mit-22: A public safety plan, including signs posted warning of summer bridge crossings, shall be prepared by the operator and submitted for review and approval as part of the annual review process.

Mit-23: Summer bridges shall be removed according to schedule and shall not be allowed to remain in channel during high flows.

Mit-24: The revised reclamation plans will recognize the need to mitigate for barren bars. The SDRC will strive to locate reasonable sites where revegetation or other forms of mitigation can be used to compensate for visual, vegetation, and terrace forming qualities that have been lost due to extraction-induced barren bars. Such mitigation can be in the form of revegetation or improved site protection obtainable by restricting inappropriate river bar access.

2.4 Areas of Controversy and Issues to be Resolved

The following areas of controversy and or issues to be resolved were identified at the EIR scoping meeting, through the comments to the NOP, or during the environmental analysis. A summary table of comments received on the NOP is found in Appendix K.

Bed Degradation

The bed of the Mad River has degraded. There are differences of opinion as to the accuracy of some information that was used to document the degradation, the extent and location of degradation, the effects of said degradation, and the influences that gravel extraction has had on bed degradation. Some of these differences remain, even at the conclusion of the EIR process. The SDRC may have to review this material further.

NEPA/DEIS

The Army Corps has responded that if there are enough elements requiring Army Corps Section 404 or Section 10 permits, there may be justification for preparation of a Draft Environmental Impact Statement pursuant to NEPA.

Alternatives
Several respondents expressed that less environmentally damaging alternatives should be analyzed. The EIR does analyze a variety of alternatives in Section 7. Some respondents feel that the analysis of alternatives is incomplete while staff believes it to be adequate.

Habitat Restoration
The project could affect significant flora and fauna habitat. Areas of controversy include the degree of responsibility of surface mining operations to mitigate, enhance, or restore the degraded habitats. Some revegetation mitigations are included in the preferred alternative and this will help with habitat restoration.

Mitigation/Monitoring
Several responses to the NOP requested that the PEIR include a mitigation/monitoring program. An area of controversy was the identification of an agency or agencies to monitor each of the proposed mitigation measures. Monitoring and mitigation monitoring is described in Sections 6.14 and 6.15.

Structural Integrity
Much concern has been expressed regarding the structural integrity of existing bridges, RSP structures and bank slopes. Had the engineers who designed the threatened structures in the Mad River had better understanding of fluvial processes, more funding, and better technology we might be better able to adapt to a degrading river. It is likely that engineers did the best that they could with the resources that they had and it is possible that they knew retrofitting and the cost for retrofitting would occur in the future.

Traffic
Caltrans has requested an analysis of existing traffic conditions, cumulative impacts, access routes, the anticipated number of truck trips per day, and the alternative of rail transport to road transport. The City of Blue Lake expressed concern regarding traffic through the City. These issues have been discussed in the EIR.

Land Use
One respondent requested that all land uses within the project scope be identified and that each land use be followed by a discussion of compatibility with surrounding uses. Staff believes that such an effort would be appropriate for a Mad River Corridor Management Plan but not for this EIR.

Recruitment Rate/Replenishment Rate/Sediment Budget
Controversy exists over the rate of gravel recruitment. Issues to be resolved are the rates of recruitment and replenishment; and the amount of material that should be allowed to be extracted. Sediment transport, gravel recruitment, and gravel replenishment are highly variable processes which require annual monitoring. The preferred alternative will include adequate monitoring to accommodate this variability.

Water
The U.S. Fish and Wildlife Service expressed concern regarding environmental impacts associated with processing water and groundwater pumping. The discharge of processing water is regulated by Water Quality Control. There has been no evidence introduced regarding adverse effects of ground water pumping in this project area.

Sovereign/Trust Lands
The SLC has responded that the project area includes sovereign and trust lands held in fee ownership by the State of California. Issues to be resolved include the actual presence and location of these lands and the State's sovereign interest in the lands.

Public Access/Use
The SLC has expressed concern that the project not affect existing public access or use of the area. It does not appear that existing public access or use of the project area will be limited by this project.

Summer Bridges
The SLC is concerned that all summer bridge crossings be constructed or placed with sufficient clearance above the water elevation to allow safe passage under the structure. This issue is discussed in the EIR.

Groundwater Storage and Recharge
The Department of Conservation has requested an analysis of the potential impacts on groundwater storage and recharge from bed degradation. This issue has been discussed in the EIR.

Reclamation Plans
The Department of Conservation has responded that all reclamation plans for the existing operations should conform to the mitigation measures that are adopted for the project. Reclamation plans will be revised to conform with the mitigation measures that are adopted for this project.

Spawning Area
There is controversy over the quality of spawning habitat in the lower Mad River, particularly from the Mad River Fish Hatchery down to the Blue Lake Bridge. The SDRC will consult and work with the CDFG to resolve this issue.

Annual CEQA reviews
Some individuals believe that the annual planing decisions of the SDRC are discretionary decisions that will require annual CEQA reviews. Others believe that the discretionary powers of the SDRC are very much limited by the controlling parameters of the EIR and management plan and that annual CEQA reviews should not be required. Refer to Section 6.10 and comment 11-3 for further discussion on this issue.

Technical Advisory or Oversight Committee
Some individuals believe that a special committee should be established to review the activity of the SDRC and to perhaps do other things such as appointing committee members and establishing operating budgets. If such a committee were to be established it might include representatives from various state regulatory and trust agencies. Other people believe that an additional committee would be unnecessarily burdensome and that these roles can easily be assumed by the Board of Supervisors or otherwise incorporated into standard County planning channels. This is a policy decision that will have to be determined by the Board of Supervisors.

Consulting Activities of SDRC Members

Some people are concerned that committee members may have a conflict of interest if they consult to the gravel industry outside the umbrella of the SDRC and want to prohibit such activity. Others would allow such activity but recognize the need to monitor it. This latter group believe that reporting gravel industry consulting earnings as was done by members of the MOA scientific committee will suffice. See further discussion on this subject in Section 6.7 and in comment and response number 9-1. This is not a major environmental issue; but it will require a policy decision from the Board of Supervisors.

3.0 AGENCIES/ABBREVIATIONS/GLOSSARY

3.1 Agencies/Approvals

Agency	Approval/Review
Department of Fish and Game	1601/1603 Stream Alteration Agreement
State Lands Commission	Public Trust Issues
Mining and Geology Board	Mineral Resource Policy
Reclamation Program	Reclamation Plan Review
Office of Mine Reporting and Reclamation Compliance	Financial Assurance Review
Humboldt County Planning Department	Permits, Vested Rights Reclamation Plans, exemptions
California Department of Transportation	Encroachment Permit
North Coast Regional Water Quality Control Board	Water Quality Control
California Coastal Commission	Coastal Development permits
U.S. Army Corps of Engineers	404 and Section 10 permits
National Marine Fisheries Service	Fishery issues
U.S. Fish and Wildlife Service	Fishery and wildlife issues
U.S. Environmental Protection Agency	Environmental review of USACOE issued permits
Resources Agency	Mediator

[Note: For a more detailed discussion of Agencies and Permits, see Appendix I]

3.2 Abbreviations and Acronyms

ADT .... Average Daily Traffic
APCD .... Air Pollution Control District
AQMD............ Air Quality Management District
CalTrans........ California Department of Transportation
CARB .... California Air Resources Board
CCR............... California Code of Regulations
CDF .... California Department of Forestry
CDFG .... California Department of Fish and Game
CDMG............ California Division of Mines and Geology
CEC............... California Energy Resources Conservation and Development Commission
CEQA .... California Environmental Quality Act
cfs.................. cubic feet per second
CNPS .... California Natural Plant Society
DEH............... Department of Environmental Health
DO .... Dissolved Oxygen
DWR............. Division of Water Rights

EIR .... Environmental Impact Report
EIS................. Environmental Impact Statement
EPA .... Environmental Protection Agency
F .... Fahrenheit
Fed/OSHA ..... Federal Occupational Safety and Health Administration
FEMA .... Federal Emergency Management Agency
HBMWD .... Humboldt Bay Municipal Water District
HCPD .... Humboldt County Planning and Building Department
HCPWD......... Humboldt County Public Works Department
LCP .... Local Coastal Plan
LOS .... Level of Service
MCSD............ McKinleyville Community Services District
MGD.............. Million Gallons per Day
MSL............... Mean Sea Level
NEPA............. National Environmental Protection Act
NCUAQMD .... North Coast Unified Air Quality Management District
NMFS .... National Marine Fisheries Service
NOP............... Notice of Preparation
NTU .... Nephelometric Turbidity Unit
PEIR .... Program Environmental Impact Report
PG&E .... Pacific Gas & Electric
ppm .... parts per million
psi.................. Pounds per Square Inch
RSE .... Rising Sun Enterprises
RSP .... Rock Slope Protection
RWQCB .... Regional Water Quality Control Board
SDRC .... Scientific Design & Review Committee
SLC .... State Lands Commission
SMARA.......... Surface Mining and Reclamation Act
TSP .... Total suspended particulates
ug .... micrograms
U.S. .... United States
USACOE .... United States Army Corps of Engineers
USFWS .... United States Fish and Wildlife Service
USGS .... United States Geological Survey
VMS............... Visual Management System

Throughout the PEIR, reference may be made to the Blue Lake Bridge, Hatchery Road Bridge or Hatchery Bridge. These are referring to the same bridge structure at river mile 12.8.

Throughout the PEIR, reference may be made to the Railroad Bridge, the Arcata and Mad River Railroad Bridge, the Northcoast Railroad Bridge or the Annie and Mary Railroad Bridge. These all refer to the same bridge structure at river mile 9.8.

Throughout the PEIR, reference is made to Eureka Sand & Gravel; this company is also known as Eureka Ready Mix.

3.3 Glossary

Aggradation - The process of building up a surface by deposition. Aggradation reduces channel capacity by raising the elevation of streambeds and flood plains. Aggradation also restores elevation to previously degraded surfaces. Excessively aggraded rivers tend to braid and have reduced pool habitat.

Anadromous fish - A fish species which matures in the ocean and ascends streams to spawn. Examples are salmon and steelhead.

Baseline conditions/environment - The natural state of the environment before it is disturbed.

Bedload - The sediment in a stream channel that mainly moves by traction or saltation, sliding, or rolling on or very near the bottom of the stream.

Bedload transport volume - The volume of bedload material moving past a given point over some time period.

Braided river - A river containing two or more interconnecting branching and recombining channels separated by unvegetated gravel bars, sparsely vegetated islands, and occasionally, heavily vegetated islands. Shallow braided rivers create poor fish habitat.

Channel - A natural or artificial waterway of perceptible extent which periodically or continuously contains moving water. It has a definite bed and banks which serve to confine water.

Channel morphology - The physical shape, size and characteristics of a stream channel resulting from scour and deposition and produced by hydraulic factors such as velocity, turbulence, flow, and flow frequency.

Degradation - The general lowering or downcutting of the land or channel by erosive processes. Degradation increases channel capacity by removing sediments from the channel system.

Dynamic equilibrium - A dynamic condition where the amount of water and sediment entering a particular reach stream is equal to the amount that leaves the stream by natural processes at the lower end of the reach. The stream and its channel will change in response to changes that take place in the watershed; but the stream will constantly adjust in an attempt to maintain dynamic equilibrium.

Gravel - Fragments of rock larger and coarser than sand, worn by the action of air or water, 2 mm to 64 mm in size.

Groundwater - All subsurface water that is below the water table.

Groundwater recharge - Replenishment of groundwater by precipitation, runoff or by artificial methods.

Headward erosion - Channel bed erosion that develops at a zone of steepened gradient called a "knickpoint" and migrates upstream. In areas of gravel mining, headward erosion often begins where the stream flows into a pit or trench.

Impact - In this report, the unqualified use of the word 'impact' refers to an adverse environmental impact.

In-Stream mining - Excavation of sand and gravel aggregate from stream bed deposits found within the bankfull channel.

Lower Mad River project extraction area- the reach between the hatchery weir and the Highway 101 Bridge.

Monitoring - The collection of environmental, scientific, or engineering data by either continuous or periodic sampling methods.

Net recruitment - Net recruitment is recruitment into the project reach minus bed load transport out of the project reach.

Recruitment - New aggregate bedload material transported into the lower Mad River project extraction area from above the hatchery weir, from tributary sources below the hatchery weir and from upland sources.

Replenishment - The deposition of bedload aggregate material at individual gravel bars in the lower Mad River project extraction area. Replenishment may be the result of recruitment or the redistribution of sediments that were already present in the lower Mad River project extraction area. Sand - Inorganic particles between 0.062 mm and 2.0 mm in diameter.

Scour - The local removal of sediment from streambeds by the action of flowing water.

Significant impact - A substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project.

Spawning - The act of laying and fertilizing eggs by fish, mollusks, and amphibians.

Thalweg - The deepest point or a generally downstream trending line connecting the deepest points of an active stream channel.

Turbidity - Turbidity is an optical property that refers to the amount of light that is scattered or absorbed by a fluid. Turbidity in the Mad River is usually due to the presence of suspended sediment or plankton.

4.0 ENVIRONMENTAL SETTING

4.1 Location

The Mad River drainage basin covers approximately 500 square miles (see Map 4.1-1). The basin is elongate in a northwesterly trend with a length of about 80 miles and an average width of about 6 miles. The Mad River headwaters rise in the southern portion of Trinity County, California in the Six Rivers National Forest and flows northwesterly to the Pacific Ocean just north of Arcata and Humboldt Bay. At the time of early settlement, flood events occurring every 2-5 years would spill over into Humboldt Bay. Subsequently much of the delta region has been diked and converted to agriculture while the channel has been confined within levees. Consequently, spill over into Humboldt Bay occurs much less frequently, perhaps on the average, once every 20 years (Scalici 1993). During recent history the mouth has oscillated North and South throughout approximately 0.9 miles of coastline. Between 1970 and 1992 the mouth migrated northward about 3.4 miles. The northward migration has been checked by a CalTrans rock slope bank protection project near U.S. Highway 101 and the south end of Clam Beach.

4.2 Climate

The climate of the region is mediterranean. Winters are cool and wet with 75 percent of the annual precipitation occurring between November and March. Average annual precipitation varies from around 40 inches near the coast to over 80 inches at the higher elevations with an overall basin average of about 64 inches. Oceanic influences keep the coastal regions cool during the summer and these influences often move inland along the valley bottom. Hot, dry summers typify the upper inland reaches of the basin.

4.3 Vegetation

Vegetation in the basin varies with disturbance, climate, geology, soils, proximity to the coast, elevation, slope angle and slope aspect. On a broad scale some of the more dominate vegetation associations are: coastal redwood forest, mixed conifer forest, true fir forest, oak-woodland, and natural grassland.

The project area is confined to the lower reaches of the Mad River channel and the vegetation habitat types found here are influenced by streamflow and river morphology. Starting from the summertime low-water wetted channel and moving upland there is a "typical" vertical gradient of riparian vegetation which illustrates a progression of successional stages. This progression can be described as follows.

> Low-Water Channel ⇨ Sparse Herbaceous Vegetation ⇨ Low Density Woody Vegetation (early successional scrub) ⇨ Dense Woody Vegetation (late successional scrub) ⇨ Developing Riparian Forest ⇨ Riparian Forest ⇨ Upper Level Terrace

The progression of vegetation is correlated with soil development processes and terrace elevation. Sparse herbaceous vegetation is found on fresh sediment deposits at the lowest elevations, the early successional scrub on the lower (most recently formed) terraces, the late successional scrub on the moderate-elevation terraces, and the developing riparian forest and riparian forest on the higher terraces where the soil development is greatest. Ponds and backwaters are found infrequently within both the scrub and forest vegetation types.

The deposition of silt and fines, which provide a medium for vegetation development is important to the evolution of river terraces. As early vegetation becomes established, the velocity of water is slowed, encouraging the deposition of additional sediment and nutrients to add to the developing soil. This process continues as the terrace evolves, allowing for the establishment of woody scrub species and, eventually, tree species. Remnant channels and backwater areas occur throughout the study area, and interrupt the "typical" vegetative progression. These create linear stands of scrub vegetation of differing ages and, occasionally, young forest vegetation. Some backwaters and ponds persist long enough to allow for the growth of emergent wetland vegetation, which provides a small but notable component of the riparian vegetation complex.

An inquiry was made to the Natural Diversity Data Base with regard to the presence of rare, threatened and/or endangered plant species within the project area. There are no records of any such species within the study area. Additionally, a review of the Inventory of Rare and Endangered Vascular Plant Species (CNPS, 1988) and the California Department of Fish and Game's Special Plant List (CDF, 1991) did not reveal any species which would be expected within the habitats found in the study area. No rare, threatened and/or endangered plant species have been found in or near the project area. However, the North Coast Chapter of the California Native Plant Society has expressed an interest in having the North Coast Black Cottonwood Riparian Forest listed with the California Natural Diversity Data Base as an endangered habitat type (Keeler-Wolf, 1993).

Riparian vegetation produces a rich and diverse habitat. Riparian vegetation forms a transition zone between aquatic and terrestrial communities and provides habitat values that enrich both.

When European settlers first came to this area the Arcata Bottoms and Blue Lake Valley bottoms contained extensive stands of riparian vegetation and the Arcata Bottoms contained an extensive network of sloughs and associated wetlands. Early settlers cleared timber and brush from the low lying alluvial flats and developed pasture and farm land. The Swamp Land Grant Act encouraged settlers to drain "worthless swamp land" located near the mouth of the Mad River to create pasture and farm land. Settlers filled in sloughs, built levees, dikes, channels, and tide gates to separate the natural flood plain from its river ecosystem in order to protect the developing farmland and community infrastructure from flooding.

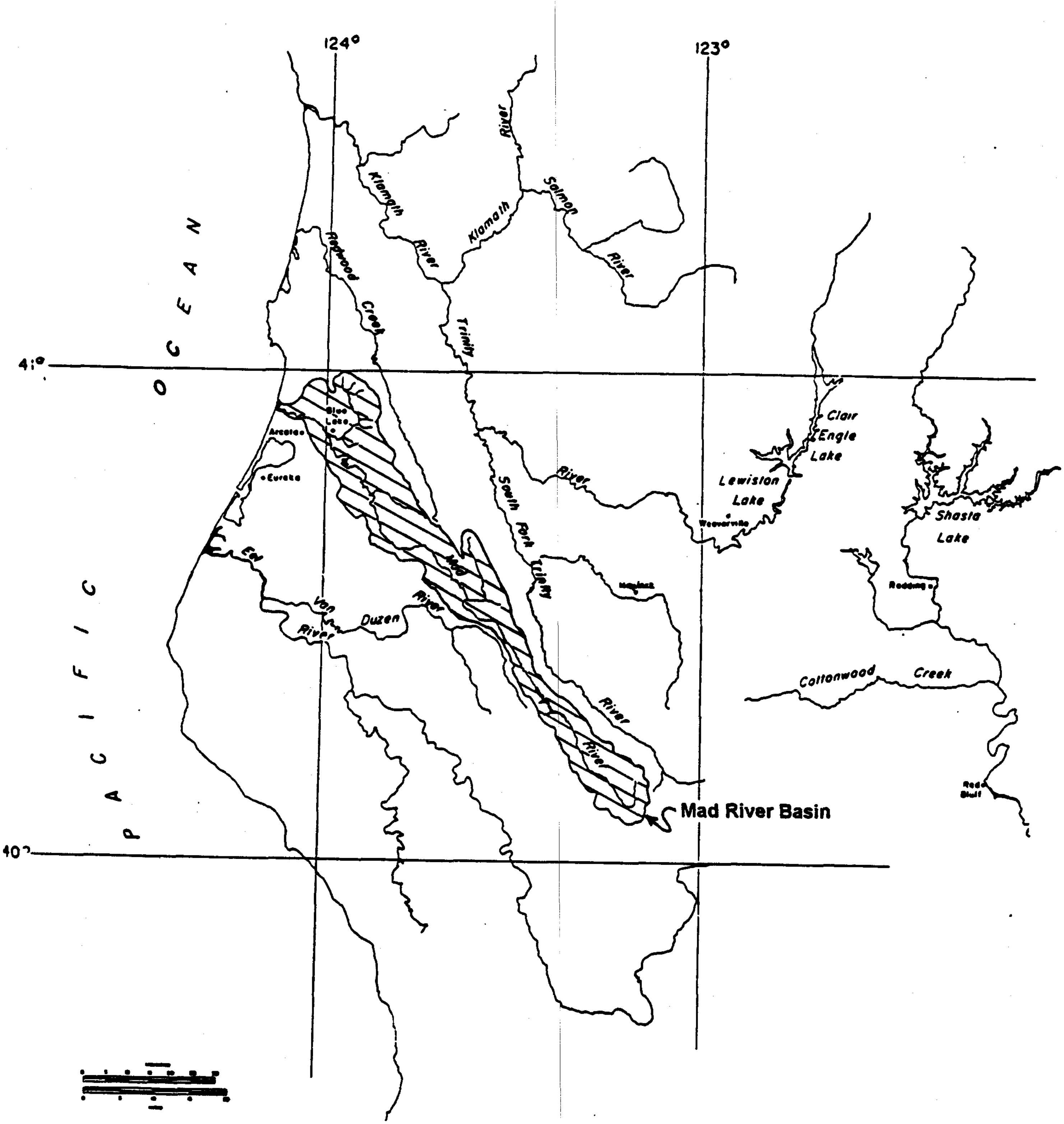
Today much of the remaining riparian vegetation community is confined to a narrow corridor adjacent to the Mad River. A significant portion of this vegetation is found on parcels attached to the 10 extraction sites (Table 4.3-1). For additional discussion on vegetation, see Section 5.7. Additional information on vegetation may be found in Appendix H (Karen Theiss and Associates, 1993) and is incorporated herein by reference.

Table 4.3-1 summarizes the 1993 land use and vegetation classification found on the parcels of the 10 potential lower Mad River gravel extraction sites. Riparian vegetation occupies 42.3 percent of the total parcel area. Approximately 20 percent is used for agriculture. Approximately 25 percent is potential gravel extraction area and approximately 5 percent is dedicated to gravel stockpiles or processing sites.

Table 4.3-1 Land and vegetation classifications of parcels connected to Mad River gravel extraction sites. Interpreted by Rising Sun Enterprises from July 1993 aerial photographs. Area is in acres.

Bar	Total Parcel	Agric uses	Processing or Stockpile	Gravel Bar	River	Scrub Veg	Riparian Veg
Guynup	160	82	10	27	10	13	18
Emmerson	120	0	4	30.5	11.5	20	54
Blue Lake	320	83	4	45	15	99	74
Christie	250	20	10	105	25	30	60
Johnson	39	0	0	14.4	3.3	19.3	2
Essex	17	0	9	3.3	2.2	.3	2.2
Johnson-Spini	97	22.3	11	31.2	13.5	0	19
Graham	140	37	13	22	7	1	60
Zable Simpson	50	3.3	0	16.8	5.3	1.2	23.4
Upper Simpson	40	0	0	9.5	6.5	5.5	18.5
Total acres	1233	247.6	61	304.7	99.3	189.3	331.1
Percent area	100	20.1	4.9	24.7	8.1	15.4	26.9

Table Footnotes:
Emmerson Bar includes parcel area south of flood levee.
Johnson-Spini Bar includes parcel area south of North Bank Road.
Upper Simpson Bar includes parcel area west of right bank.



(adapted from: DWR, June 1982 "Mad River Watershed Erosion Investigation")

Map 4.1-1
Watershed Map
Mad River Basin

4.4 Wildlife and Fisheries

The distribution and density of wildlife within the Mad River watershed basin is diverse, and is closely related to the land use and vegetation pattern in the area. The upper watershed which is sparsely inhabited by humans, has the greatest variety and concentration of species, which can include the mountain lion, black bear, deer, coyote, gray fox, porcupine, possum, rabbit, striped skunk, chipmunk and squirrel. The lower watershed, although more developed and populated, still has a diverse range of wildlife. The species mentioned above may occur in the lower watershed project area, but more rarely. Further discussion of wildlife can be found in Section 5.6. Additional information on wildlife can be found in Appendix D and Attachment 3 (Mad River Biologists, 1993a, 1993b) and incorporated herein by reference.

Fisheries common to the watershed include the cutthroat trout, coho salmon, steelhead trout and chinook salmon (see Table 5.5-1). Further discussion of fisheries can be found in Section 5.5. Additional information on fisheries may be found in Appendix F (Institute for River Ecosystems, 1993) and incorporated herein by reference.

4.5 Highways

There are three major highways within the Mad River watershed. U.S. Highway 101, the main north-south highway along the U.S. Pacific Coast, cuts across the western end of the basin and near the lower end of the project area. State Highway 299 is a west-east route that connects with U.S. 101 near the lower end of the basin and project area. Highway 299 crosses the project area and parallels it for several miles. State Highway 36 is another west-east route which intersects U.S. 101 further south and provides access into the upper reaches of the watershed outside the project area.

4.6 Public Utilities and Structures

The following public utilities and significant structures are located in or near the project area and might possibly be impacted by the project (does not include gravel processing sites). The approximate river mile locations are shown. Additional detail regarding these structures is described in Section 5.12.

4.7 Topography

The Mad River basin is characterized by mature topography in the northern and southern regions, and youthful topography in the middle portion. The coastal delta region and the southern interior valleys are essentially flat. The rest of the basin is rugged topography with steep V-shaped canyons. Elevations in the basin range from sea level to slightly more than 6,000 feet (see Map 4.7-1). From the headwaters the main channel descends with an average gradient of 16 feet per mile for about 40 miles and then drops rapidly at 61 feet per mile for 30 miles before emerging onto the lower valley where the gradient drops to approximately 12 feet per mile for the remaining 55 miles (see Figure 4.7-1).

Table 4.6-1 - Public Structures and Utilities within the Project Area

Structure	River Mile
Former Sweasey Dam Site	19.6
Mad River Fish Hatchery	14.5
Weir	
Left Bank RSP	
Blue Lake Hatchery Road Bridge	12.8
Blue Lake Right Bank Levee and RSP	12.8 - 13
Blue Lake Sewage Treatment Ponds	11.7
Right Bank RSP	
Highway 299 Mill Creek Bridge	10.5
North Coast Railroad Authority Bridge	9.8
Glendale Drive Bridge over Lindsay Creek	9.8
Highway 299 Bridge over Lindsay Creek	9.8
Railroad Trestle over Warren Creek	9
Warren Creek Road Bridge	9
Diversion Structures in the HBMWD Reach	7.8 - 9.5
Five Ranney-Type Wells and Collectors	
One Surface Water Diversion (Pump Station Six)	
Upper HBMWD Water Pipe Crossing	8.7
Lower HBMWD Water Pipe Crossing	7.8
U. S. Geological Survey Stream Gaging Station	7.8
Highway 299 Eastbound (Right) Bridge	7.8
Highway 299 Westbound (Left) Bridge	7.8
PG&E Upper Gas Line Crossing	7.8
Sewage Effluent Pipe Crossing	7.8
MCSD Water Pipe Crossing	7.25
Highway 101 Northbound (Right) Bridge	5.6
Highway 101 Southbound (Left) Bridge	5.6
PG&E Lower Gas Line Crossing	5.6
Hammond Trail Bridge	3.9
McKinleyville Community Sewage Treatment Plant	2.1
Mad River Beach Road Left Bank RSP	3.3 - 3.4
Humboldt County Boat Ramp	3.2
Clam Beach Mad River Mouth RSP Site	0

4.8 Geology

The Mad River Basin lies within the northern coast range province. The geology of the watershed is complex and variable having some areas that are high sediment producers and others that produce much less sediment.

The basin is underlain by three principal rock formations that occur in northwest trending bands and are aligned with the general trend of the river. These formations range in age from pre-Cretaceous (dinosaur era) to Pliocene (early mammal era) in age and are separated by major faults. The rock formations become progressively younger from east to west in the basin. The oldest rocks, Kerr Ranch Schist are exposed in a one to five mile wide zone that borders the extreme east-northeast side of the basin. This zone separates the Klamath Mountains province to the east from the northern coast province on the west.

Most of the basin is underlain by late Jurassic to late Cretaceous rocks of the Franciscan formation. These rocks are predominantly sandstones and shales with lesser amounts of altered volcanic rocks (greenstones), cherts, conglomerates, and serpentine. Of the various rocks in the Franciscan formation, the sandstones and greenstones are the best quality for use as aggregate construction material. The Franciscan complex of rocks can be further divided into a number of subgroups. Generally, these rocks have been strongly folded, faulted, crushed, and sheared during several episodes of crustal disturbances in the geologic past. This intense alteration has produced a variety of rock units that are subject to rapid weathering, slope instability, and other factors that facilitate rapid erosion (see Map 4.8-1). The most erosive rock unit of the Franciscan assemblage is the melange unit which is the major source of sediment transported by the Mad River.

The dominate erosion processes vary between the various subgroups of the Franciscan assemblage. Some of the more important erosion processes observed throughout the Franciscan assemblage in the Mad River include: soil creep, shallow debris slides, fluvial incision, and slump-earthflow. Some landforms creep slowly downslope and continuously feed coarse and fine sediment into the Mad River Channel. Debris slides are common where the river cuts through the toe of oversteepened perennial slide zones. Large active slump-earthflows originating in the Franciscan melange are among the most important erosion processes in the Mad River basin. These large features often originate near the basin perimeter and extend downslope to tributary valleys or to the main channel. Fluvial incision feeds earthflow debris and other slope derived material to the main channel and is clearly an important process. The combined effects of high precipitation and unstable geology place the Mad River basin and other Northcoast rivers among the highest recorded sediment producers per unit area in the world (Table 4.8-1). The high sediment yields produced locally are the product of moderately high sediment concentrations and very high stream flow.

The youngest rocks in the basin are unconsolidated marine sediments belonging to the Falor formation of the recent Pliocene era. These rocks may have formed from deposits accumulating under a shallow sea which extended into an ancestral Mad River Valley. Subsequent uplift and faulting lifted the Falor formation to its present position in the north central portion of the basin. The clays and soft sands in this formation often become saturated and unstable, resulting in rotational slumping.

Late Quaternary fluvial terraces are found along several stretches of the Mad River. These are indicative of major geologic cycles of channel aggradation followed by channel incision and degradation over perhaps 40,000 years. Soil development found in terrace profiles and elevation above the present stream channel help differentiate these deposits from one another and from more recently deposited alluvium.

Recent alluvium contains mixtures of boulders, gravel, sand, silt, and clay that has accumulated in the tributaries and main stem of the Mad River. These alluvial deposits vary in width and depth throughout the basin and the project area. At the hatchery the canyon opens up into a broad alluvial flood plain through which the river flows for about four miles. At moderately low flows of 1,000 to 4,000 cfs these alluvial deposits move readily as the channel shifts course and meanders downstream.

The North Fork of the Mad River enters through this flood plain about two miles downstream from the hatchery. Near Essex the river cuts through a low ridge and enters a narrow canyon. The HBMWD surface water diversion and Ranney wells are located in this canyon. When the river leaves this canyon, it is more or less confined and prevented from meandering greatly through a broad coastal flood plain before reaching the Pacific Ocean. In recent years the river mouth has migrated north and encroached on Clam Beach. In 1992, recognizing that the northward migration of the river was threatening U.S. Highway 101, CalTrans placed a large rock rip rap revetment at the south end of Clam Beach to halt the northward migration and divert the river away from the highway. The northward migration of the river has greatly expanded the volume of the Mad River Estuary.

4.9 Hydrology

The river has a 43-year (through 1990 water year) average annual flow of 1,071,000 acre feet which is equivalent to about 41 inches of runoff which can be compared to a basin-wide average annual precipitation of 64 inches. The range in annual runoff varies from 109,000 acre feet (4 inches), recorded in the 1977 water year to 1,789,000 acre feet (69 inches) recorded in 1983. During the recent 20 year period (1971-1990) the average annual runoff was 951,000 acre feet (37 inches) and during the more recent 10 year period (1981-1990) the average annual runoff dropped to 527,000 acre feet (20 inches) which is about half of the long term average. These recent "drought-like" conditions reduced sediment recruitment into the lower Mad River project extraction area and contributed to channel degradation processes. See Section 5.3 for further discussion on Hydrology and Section 5.4 for discussion on groundwater. Also refer to Appendix F (Institute for River Ecosystems, 1993) incorporated herein by reference.

Table 4.8-1 - Approximate Long-term Average Sediment Yield of Selected Major Watersheds.

Watershed	tons per mi^2 per year
Columbia	15
Potomac	25
North America	40
Mississippi	45
Missouri	70
World-wide average	75
Smith River	450
Eel River (Scotia)	1,000
Mad River (Arcata)	5,000
Mattole	10,000

4.10 Sediment Yield

The combined effects of high precipitation and unstable geology place the Mad River basin and other Northcoast rivers among the highest recorded sediment producers per unit area in the world (Table 4.8-1). The high sediment yields produced locally are the product of moderately high sediment concentrations and very high stream flow. In the Mad River most of the sediment is suspended load rather than bedload. The exact proportion of bedload to suspended load or bedload to total load varies with time and varies throughout the watershed. Generally, the bedload/total load ratio gets smaller as you move downstream. See Section 5.2 for further discussion on bedload recruitment. Also refer to Appendix F (Institute for River Ecosystems, 1993) incorporated herein by reference.

4.11 Project Conformance with General and Local Coastal Plans

General

The general plan is a long-range statement of public policy for the use of public and private lands within the unincorporated areas of Humboldt County. These public policies establish a generalized pattern of land use for a twenty-year period, which is the foundation of more detailed implementation.

As represented by the general plan, the pattern of land use attempts to balance the economic and social needs of the public with the inherent characteristics of the land, plant and animal life, and air and water conditions.

The Humboldt County General Plan is organized into two volumes. Volume I, the Framework Plan, establishes goals, policies and standards for county wide issues, and the development of the rural areas of the County. The plan also establishes the boundaries of the community planning areas. Volume II contains a number of individual plans for specific geographic areas as identified in Volume I. These include the Local Coastal Plans (LCP) for the Coastal Zone, and the Community Plans for the non-coastal areas of the County.

LCPs, in response to Coastal Act requirements, tend to be much more detailed than the Framework or Community Plans. The policies of the LCPs address development and resource protection issues typically not included in the Framework or Community Plans.

The project area is governed by several LCPs and non-coastal Community Plans. The County has not updated all of the community plans as delineated in Volume I. Therefore, it is sometimes necessary to rely on "old" plans, as is required for a large portion of the project area. When the County is required to utilize old plans or when there is an inconsistency between existing and historic uses with the plan, the Framework Plan, Volume I specifies that the following guidelines be observed: common sense; consideration of existing and historic uses; the physical conditions of the geographic area; and consideration of errors, oversights or omissions.

The land use plans for the project area, from upstream to downstream, are listed below:

Blue Lake Community Plan (Northern Humboldt General Plan
Arcata Community Plan
McKinleyville LCP
Humboldt Bay Area LCP

Blue Lake Community Plan

The Blue Lake Community Plan is part of the old Northern Humboldt County General Plan adopted by the Board of Supervisors in approximately 1967.

The Northern Humboldt Plan's section on mining states:

"Sand and Gravel have been the leading (mineral) products in Humboldt County. Mineral reserves have been largely untapped. Manganese, iron, lime, clay, coal, copper, bornite, chalcolite and chalcopyrite are reported to exist. The dollar value of the output is relatively small at this time, but with new encouragement, this section of the economy can be really developed."

The plan further states that mining is not shown on the land use map "since mining is related to extractions from under the ground". There is very little in the old Northern Humboldt General

Plan regarding mining, therefore, in order to make a conformance finding with the plan, common sense and some reliance on the Framework Plan is required.

The Framework Plan sets *goals* for mineral and energy resources:

1. To assure the long-term availability of adequate supplies of mineral resources, to protect mineral resource areas from incompatible land uses and to minimize adverse environmental impacts.

2. To move toward self-sufficiency in energy use, with maximum reliance on local renewable resources for local energy needs.

The *policies* for mineral and energy resources include:

1. Maintain and update maps of the County's identified mineral deposits.
2. Plan future development such that it will not interfere with the utilization of identified mineral deposits.
3. Ensure that adverse environmental effects are prevented or mitigated to the fullest extent feasible and that mined lands are reclaimed to a usable condition which are readily adaptable for alternative land uses under the General Plan.
4. Encourage the production and conservation of minerals, while preserving to the maximum extent feasible, the values relating to recreation, watershed, wildlife, range and forage, science, and aesthetic enjoyment.
5. Ensure elimination of residual hazards to the public health and safety.
6. Prevent the disruption of community character in siting and planning mineral resource extraction operations.
7. Require mineral haul routes to avoid incompatible areas such as landslides, highly erodible soils, residential areas, and schools, if feasible.
8. Permit conditions for mineral extraction operations should address allowable dust and noise levels, hours of operation, fencing, traffic, access, setbacks and other means to reduce conflicts with adjacent development.
9. Extraction of instream sand and gravel is not to exceed average annual replenishment level (annual bedload), except when the bedload left from a previous flood is greater than the average annual replenishment or if the projects emphasize fishery enhancement, flood control or bank protection.
10. Bank Protection shall be permitted to: 1) maintain necessary public or private roads; 2) protect principal structures in danger from erosion; and 3) protect lands designated Agriculture-Exclusive from erosion.
11. Evaluate significant water diversion projects which would reduce the replenishment rate of gravel in streams as to the impact they would have on local mineral supply in Humboldt County.
12. The operation of borrow pits on Resource Production Lands (timber, agriculture) for non-commercial purposes is considered a principal use necessary to maintain the primary use of the land.
13. The subdivision to create parcels, which are for the primary purpose of providing road and construction materials, shall be consistent with this plan.

Arcata Community Plan

The Arcata Community Plan was adopted by the Board of Supervisors in approximately 1966. The plan apparently has no discussion on mining. Therefore, refer to the previous discussion of the Blue Lake Community Plan.

McKinleyville Local Coastal Plan

The McKinleyville LCP was adopted by the Board of Supervisors on December 16, 1980, and certified by the State Coastal Commission on January 7, 1982. The LCP, Section 3.41(J) states:

"For surface mining projects within the Coastal Zone, the following conditions apply to all operations whether they are covered by the County Surface Mining and Reclamation Ordinance No. 1373 or not:

a. Removal shall be from unvegetated bars.

b. Disturbance of banks shall be avoided or minimized.

c. Excavations shall not leave holes or pits which could adversely affect aquatic life.

d. Sediment settling ponds shall be used for fine silt trapment when a crusher is used at the gravel site.

e. In order to minimize adverse impacts to migrating anadromous fish, the Department of Fish and Game's guideline for removal of gravel only from May to November each year, except for emergency purposes, shall apply.

f. River crossings, or drainage crossing on the gravel bar, should use temporary culverts or removable bridges to minimize impacts to water quality.

g. Sand and gravel projects emphasizing flood control or bank protection shall be encouraged."

Humboldt Bay Area Local Coastal Plan

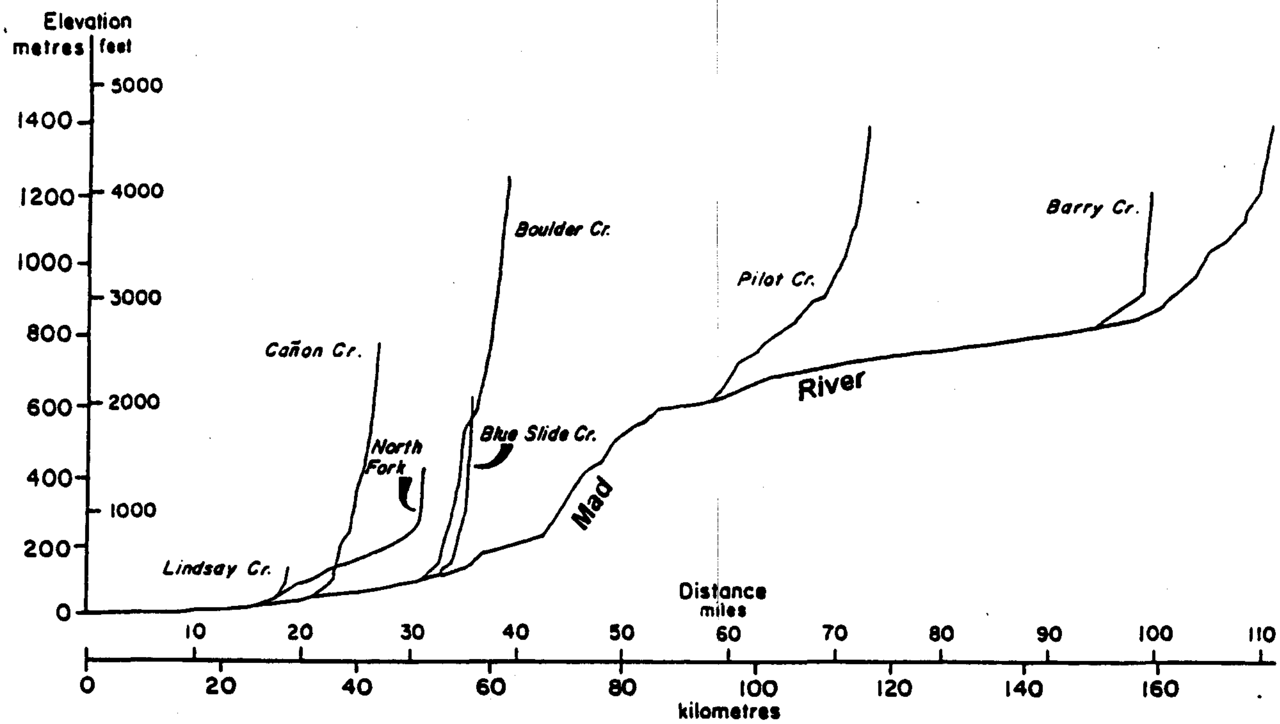
The Humboldt Bay Area LCP was adopted by the Board of Supervisors on November 29, 1983, and certified by the State Coastal Commission on October 14, 1982. The LCP, Section 3.14(B)(10) states:

"For surface mining projects within the Coastal Zone, the following conditions apply to all operations whether they are covered by the County Surface Mining and Reclamation Ordinance No. 1373 or not:

1. Removal shall be from unvegetated dunes which pose a safety hazard or threaten existing development or agricultural, and shall be consistent with Section 3.30B(10) (Beach and Dunes); or shall be from unvegetated river bars, or from industrially designated areas.

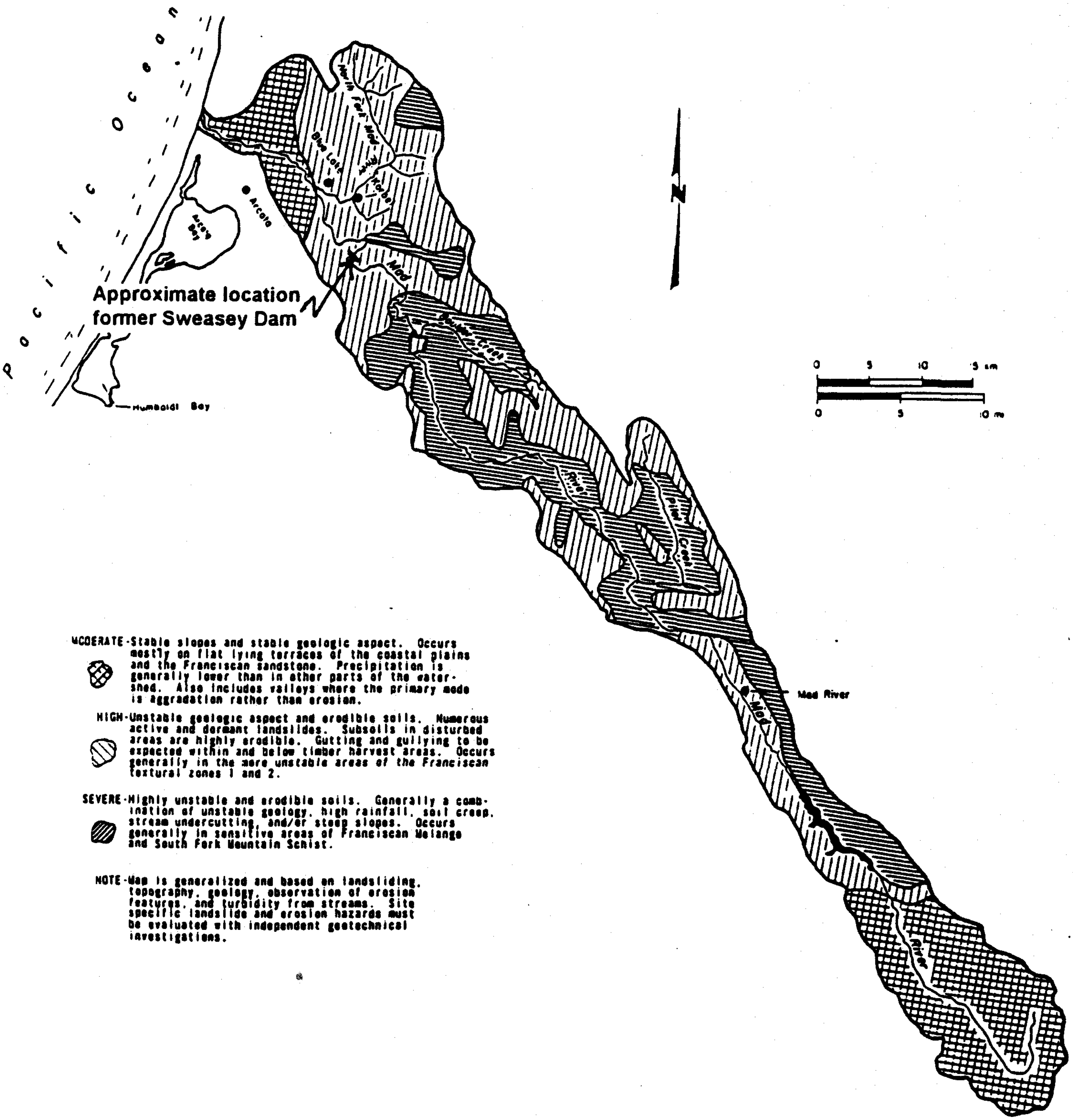
(Note: items 2-7 are the same as items b-g above)

8. Sand and gravel operations shall not remove sediments essential to the maintenance of areas used for public recreation or which protect uplands planned for commercial, residential or industrial use from erosion."



(adapted from: DWR, June 1982 "Mad River Watershed Erosion Investigation")

Figure 4.7-1
Stream Profiles
Mad River Basin



(adapted from: DWR, June 1982 "Mad River Watershed Erosion Investigation")

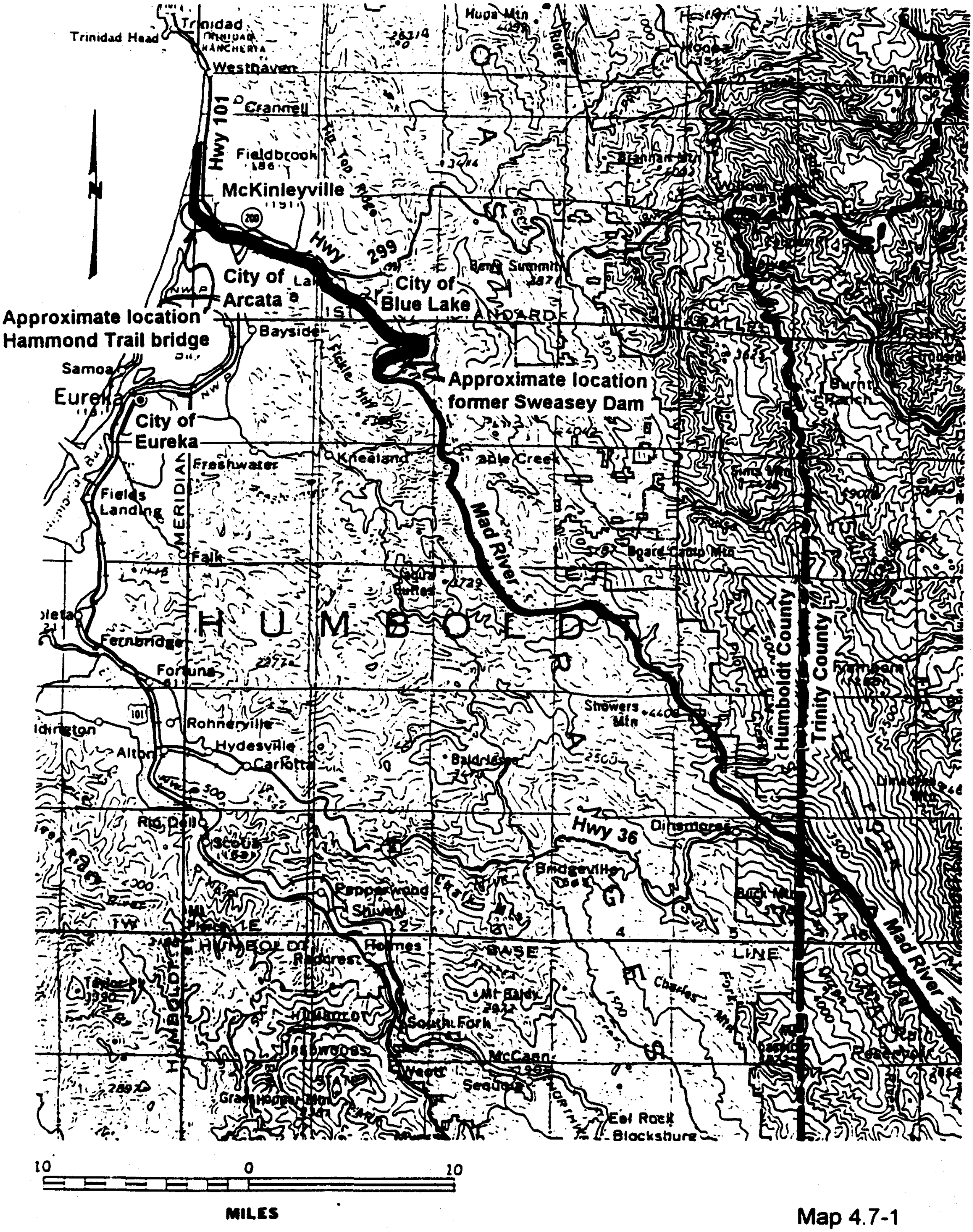
Map 4.8-1
General Stability Map
Mad River Basin

Conclusion

This Program Environmental Impact Report identifies existing and potential significant environmental impacts resulting from channel degradation and the extraction of sand and gravel from the Mad River. The PEIR also recognizes that excessive channel aggradation can cause significant adverse impacts to wildlife habitat and aquatic habitat, and can increase flood hazards by reducing channel capacity. One way to reduce the threat of these impacts is to maintain a viable gravel extraction industry. The recommended alternative and suggested mitigation measures will ensure conformance with the goals of the Framework Plan, i.e. the long-term supply of aggregate mineral resources in the Mad River, protection of Mad River mineral resource areas from incompatible land uses, and minimization of identified significant adverse environmental impacts.

The recommended alternative, an adaptive management plan and monitoring program will ensure conformance with the policies of the Framework Plan, by assuring that future extraction operations will not significantly affect established riparian vegetation or adversely affect aquatic life. The adaptive management plan will limit and design future extraction operations to minimize impacts to migrating anadromous fish, public utilities, and structures. Surface mining in and along the Mad River will be conducted in compliance with all applicable local, state and federal regulations. The placement and use of summer bridge crossings is governed by CDFG 1603 agreements and USACOE permits to reduce the risk that summer channel crossings will adversely affect water quality and other river resource values.

In short, the preferred alternative will ensure that gravel extraction on the Mad River conforms with the intent and purpose of the established goals and polices of the local coastal and general plans. In addition, as a result of this PEIR it is expected that the Board of Supervisors will set site specific goals and policies for surface mining activities within the geographic scope of this PEIR. Without the preferred alternative gravel extraction in the lower Mad River would not be in conformance with the goals and policies of the Framework Plan.



Map 4.7-1

Topographic Map

Mad River Watershed and Vicinity