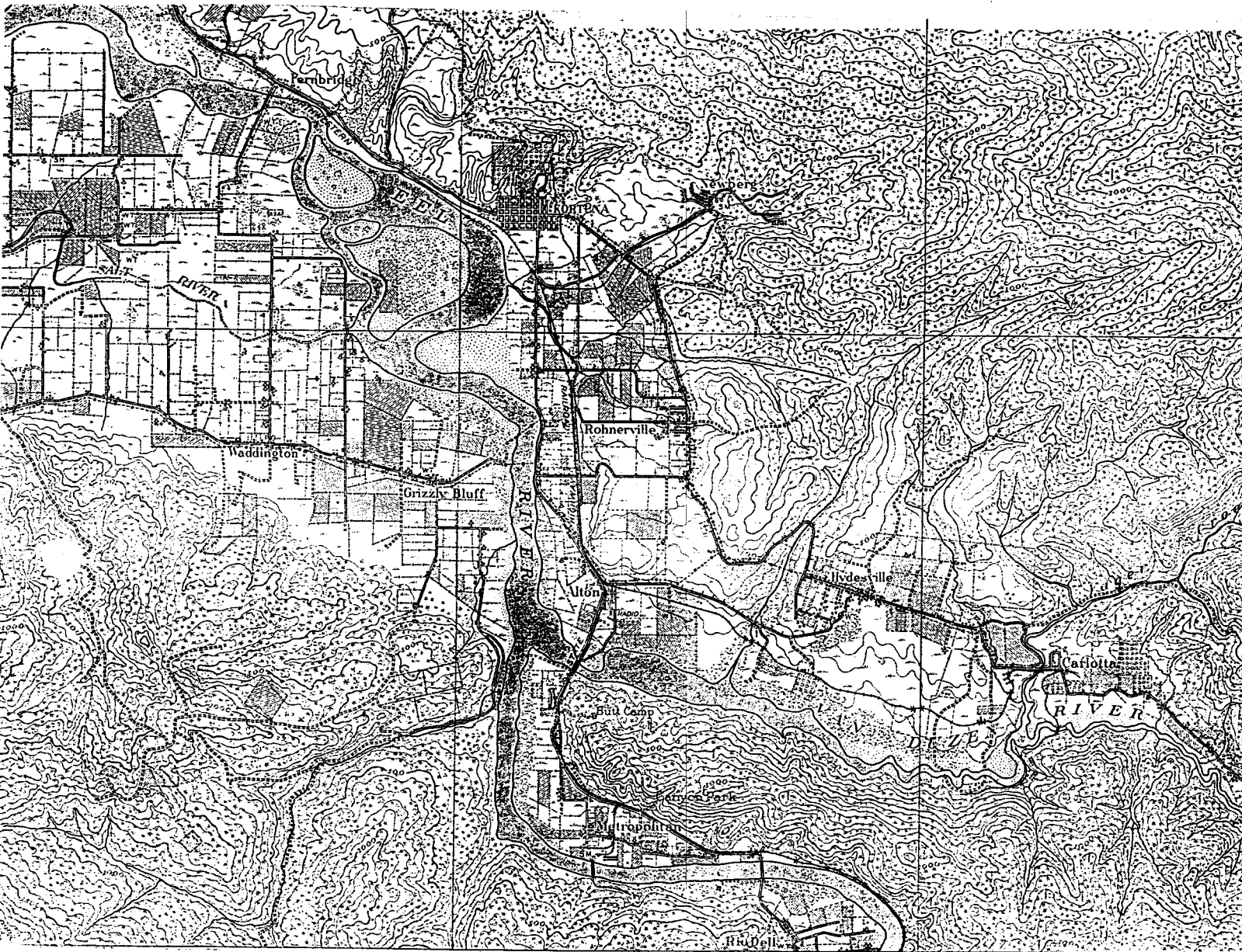


Appendix B

G. Mathias Kondolf
Consultants Report

AGGREGATE EXTRACTION FROM THE EEL AND
MAD RIVERS, HUMBOLDT COUNTY:

GEOMORPHIC AND ENVIRONMENTAL PLANNING CONSIDERATIONS



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5 April 1993

Aggregate Extraction, Mad and Eel Rivers

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HUMBOLDT COUNTY:
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a report submitted to the
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Aggregate Extraction, Mad and Eel Rivers

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CONCLUSIONS AND RECOMMENDATIONS

- 1) By interrupting the continuity of sediment transport through the river system, instream gravel extraction can induce incision and other morphological changes, which can propagate miles upstream and downstream of gravel pits. Incision can occur both downstream and upstream of the gravel pit: downstream due to deprivation of sediment load, upstream from knickpoint migration.
- 2) The complexity of sediment transport and channel change in natural rivers is such that prediction of river behavior is plagued with a significant degree of uncertainty.
- 3) Computer models of sediment transport are simplifications of complex natural processes. The National Research Council (1983) concluded that the performance of all such models was so poor that their use could not be justified in flood insurance studies.
- 4) A thorough historical study of channel change and a sediment budget analysis should be undertaken on the Mad and Eel Rivers as a basis for understanding and predicting impacts in these channels.
- 5) Changes in river channel form and bed elevation should be monitored using cross sections surveyed to a common datum using standard procedures. Cross sections should be surveyed not only in extraction areas but in intervening reaches as well to provide longitudinal continuity.
- 6) The County should consider establishment of minimum thalweg elevations (redline) to protect bridge crossings and other resources. Incision of the thalweg below the redline would trigger a restriction or halt in extraction and any other activities that could be inducing incision under further studies indicate that extraction can be safely resumed.
- 7) Upland sources of aggregate (quarry and terrace gravels) should be inventoried and evaluated throughout the region.
- 8) Based on historical information, sediment budget analysis, and inventory of alternative sources, the County should develop a comprehensive aggregate resource management plan. A key component of the plan should be matching aggregate quality with end use requirements.
- 9) Although an excellent start has been made with historical and sediment budget studies completed for the EIR, the information base necessary to prepare a comprehensive aggregate resource management plan cannot be developed by June 1, so a preliminary EIR should be prepared to satisfy regulatory requirements this year. The preliminary EIR should describe the studies underway and the process by which a regional aggregate management plan will be developed and an EIR done on it in 1994.
- 10) The problems related to aggregate management in Humboldt County cannot be solved piecemeal. Comprehensive environmental planning is needed to examine all alternative sources and their environmental impacts, and to develop a coherent strategy to supply the county's aggregate needs while minimizing environmental impacts of extraction.

PURPOSE AND SCOPE

The purpose of this report is to provide guidance concerning geomorphic issues related to extraction of sand and gravel from the active channel beds of the Mad and Eel Rivers. Recommendations include consideration of regional approaches to management of all types of aggregate resources and methods of comparing the environmental impacts associated with extraction of each type. This guidance is presented from the perspective of an outside expert familiar with the geomorphic impacts of instream gravel mining and regulation of the activity in the State of California, the gravel requirements of spawning salmonids, and the geomorphic character of rivers of northern California in general, although not previously knowledgeable about particulars of the Mad and Eel Rivers.

This report is a written version (with citations and technical support) of the presentation made in Eureka on 17 December 1992 to a group composed of staff of the Humboldt County Planning and Public Works Departments, members of the Fish and Game Advisory Commission, staff of California Department of Fish and Game, gravel extractors, the local operators association, members of the Technical Committee, a member of the Board of Supervisors, and representatives of environmental organizations. This report applies principles of geomorphology and environmental planning, along with the author's experience with impacts of instream gravel mining elsewhere, to the situation in Humboldt County. However, specific recommendations of quantities extractable, extraction methods, location, and timing, and detailed protocols for monitoring and assessment of environmental factors in Humboldt County is beyond the scope of this report.

Since the site visit and writing of the draft version of this report, considerable historical and sediment budget analysis have been completed and reported by Andre Lehre, Randy Klein, and others as technical input to the EIR. Although I have not had an opportunity to review this material, it appears that these researchers have already completed some of the studies recommended here, although there are outstanding issues remaining that require further study (Randy Klein, personal communication 1993).

This report is organized as follows. An overview of the problem is followed by a review of river processes relevant to understanding the geomorphic issues related to instream aggregate extraction. The concept of sediment budget construction and the limitations of the existing science are reviewed, followed by a discussion of monitoring and management strategies for in-channel projects. The need for a broader, regional approach to management of aggregate demand and sources is considered, along with recommendations for the near-term strategy for Humboldt County in preparation of an EIR for extraction on the Mad River in 1993.