

N9-2

NATIONAL HERITAGE STEWARDSHIP PROGRAM
PROJECT STATUS REPORT

Project Title: Big Sur River Restoration
Unit Name: Andrew Molera State Park
Prepared By: Steve Zembsch
Reference Number: 224-491-08-01
Fiscal Year: 1989/90

PREPARED 12/90

INTRODUCTION

The Big Sur River is the major drainage through Andrew Molera State Park (Fig. 1). At least eighty years of flood control efforts, agriculture, road building, water diversions and general watershed development have tipped the hydrologic scale in favor of aggradation. The increase in sediment load has further destabilized the river and intensified vegetative disturbances initiated by agriculture (including irrigation) and flood control (levee construction, channel dredging and straightening). The first phase of this project was to restore the proper hydraulic geometry relationships (width, depth and velocity as a function of discharge) to a section of the river adjacent to the parking lot (Fig. 2, Plate 1). This phase necessarily resulted in a temporary disturbance to riparian vegetation and aquatic habitat. The long-term stability rendered by the project results in an overall increase in aquatic habitat and a more structurally diverse, stable riparian habitat.

METHODS AND MATERIALS

USGS hydrologic data was analyzed to determine the "bankfull" (channel forming) discharge. Cross-sections and a longitudinal profile were surveyed to determine the existing channel condition (Fig. 3). The idealized dimensions were determined based on the discharge analysis in conjunction with other important watershed characteristics such as slope, sediment supply, basin size, sediment size and rainfall intensity. The final design was forged after constraints such as cost, existing facilities, historical features and sensitive habitat were factored in.

The following permits/regulations were obtained/complied with:

- Army Corps of Engineers Section 404; project was determined to be exempt
- Coastal Development Permit granted by the Coastal Commission
- Department of Fish and Game Streambed Alteration "Agreement" (1601)
- California Environmental Quality Act, Categorically Exempt (1:15301 (h))

Eucalyptus trees adjacent to the Cooper cabin that were killed by the August 1989 fire were removed and their rootwads were saved for use in the bank. The district accomplished this phase with a D7 bulldozer. The excavator then went into the grove and removed the rest of the stumps and cleaned up the site.

Construction began in the middle of July, 1990. A condition of the DFG 1601 was the diversion of the river around the project site. This involved the construction of a 250 foot channel where the floodplain meets the terrace known as Creamery meadow. An existing overflow channel was

used to minimize disturbance to the aquatic resources and the riparian habitat (Plate 2). Fish were removed from the channel by electroshocking. Three passes were made, removing most, but not all of the fish. The river was dammed and directed into the diversion channel.

Once in the diversion channel, the river immediately disappeared into its gravels. Four years of drought and an "aggressive" groundwater pumping operation (3,000 gallons an hour during a protracted drought) a half a mile downstream converted this stretch of the Big Sur River into a "net losing reach". It took the better part of a day for the river to reach the end of the diversion channel. By that time, the downstream reach had also sunk into its gravels (Plate 3), euphemistically leaving the gill-dependent resources in an overly dry environment. The downstream reach, a long, straight riffle-run, remained dry for the rest of the project. There were diurnal fluctuations in the length of the dry reach, but it averaged about 600 feet.

The new channel was constructed using a Caterpillar D7 bulldozer and a Komatsu 220 excavator (Plate 4). Down trees were located in the floodplain and were skidded to areas accessible by a 10 yard end dump, which transported them to the project site (Plates 5,11). The root wads were saved and the trees bucked into 25-35 foot logs. These were placed into the eroding bank in an interlocking fashion along with large (1 ton) rock and poorly sorted stream gravels (roughly 6 inch minus).

The rest of the bank was counter-buttressed with stream gravels, providing free-draining ballast (plate 6). The root wads were oriented such that the plane of the fan was perpendicular to the flow vectors and the bole pointed downstream (plates 7, 10). This creates excellent localized fish habitat and provides a very stable, natural appearing bank protection (plate 8).

Willows were buried in the gravels of the floodplain to increase their chances of resprouting. Many showed signs of vigorous resprouting as of early December. Willow sprigs will be placed in January. The floodplain was recontoured to create a positive grade to the thalweg. This was accomplished with a minimum disturbance to the coastal riparian scrub by leaving the vegetation on a pedestal (plate 13). Seeds from Sycamore (Platanus racemosa) and California big-leaf maple (Acer macrophyllum) were collected for propagation and later planting.

Large boulders (1 ton+) were placed in the active channel immediately upstream from the meander to act as convergence structures. Placed in a parabolic orientation with the apex pointing upstream, these structures increase point velocities in the thalweg and direct flow to the thalweg. They are placed about 1/4 to 1/2 a diameter apart.

RESULTS, EVALUATIONS, CONCLUSIONS

The necessity of a diversion channel for this type of work is questionable. For a net losing reach, such a channel undoubtedly results in more disruption than it prevents. The amount of disturbance to instream resources is minimal during low flows and aquatic resources are completely adapted to these elevated sediment levels. The DFG warden insisted that a diversion channel be used as a condition of the

"agreement" (1601). The unexpected loss of the surface flow downstream from the project was a major impact that was avoidable. This situation was exacerbated by the groundwater pumping downstream.

The elimination of overflow channels across the floodplain will restore stability to this critical riparian area. A more structurally diverse riparian community such as a Sycamore-cottonwood riparian forest will replace the riparian scrub that now exists. This will be facilitated by active revegetation.

A single, defined channel with proper width-depth ratio has been created in place of a braided, shallow, migrating channel (plates 12, 14). Fish habitat has been increased, particularly for salmonids. The stabilization of the bank has reduced downstream sedimentation and protected a very large coast live oak (Quercus agrifolia) and the trail to the campground.

RECOMMENDATIONS

The next phase of this project should be accomplished in the live stream. Fish can be removed from the project site and then the reach can be netted off to prevent migration during the construction phase. The disturbed floodplains and areas where bank protection materials were collected should be revegetated as specified in the resource management plan. The cross-sections and profile should be resurveyed every spring for at least three years. Monitoring of the revegetated areas could be accomplished in conjunction with this survey.

The adjacent landowner should be encouraged, legally if need be, to leave the water in the river during periods of low flow. Groundwater extraction so close to the river is tantamount to sucking it right out of the channel. Cows can go without water longer than fish can.

COSTS

Salary and Wages, Assoc. Resource Ecologist.	\$3,000.00
Contract, Wildland Hydrology Consultants (design).	2,000.00
Contract, Kim Younger Construction (heavy equipment rental). . .	8,000.00
TBA District (Eucalyptus Removal).	2,000.00
Future TBA District (Bulldozer Rental)	<u>4,000.00</u>
Total.	\$15,000.00

REFERENCES AND CONTACT

California Department of Parks and Recreation, 1989, Biotic Survey, IPU Facility, Andrew Molera State Park.

California Department of Parks and Recreation, 1989, Cultural Resource Inventory, Andrew Molera State Park, Davis, et al.

California Department of Parks and Recreation. Natural Resource Inventory, Andrew Molera State Park, 1989. Animal Life. Comrack, Lyann.

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Lane, E.W., 1955, Design of Stable Channels: American Society of Civil Engineers, Transcripts, v. 120, pp. 1234-1279.

Leopold, L.B., Wolman, M.G., and Miller, J.P., 1964, Fluvial Processes in Geomorphology, W.H. Freeman and Co., San Francisco, 522 pp.

Pasquinelli, R., 1989, Plans and Specifications for Revegetation of the Bull Creek Channel, unpublished.

Prunuske, L., 1987, Groundwork, Marin County Resource Conservation District, 60 ppg.

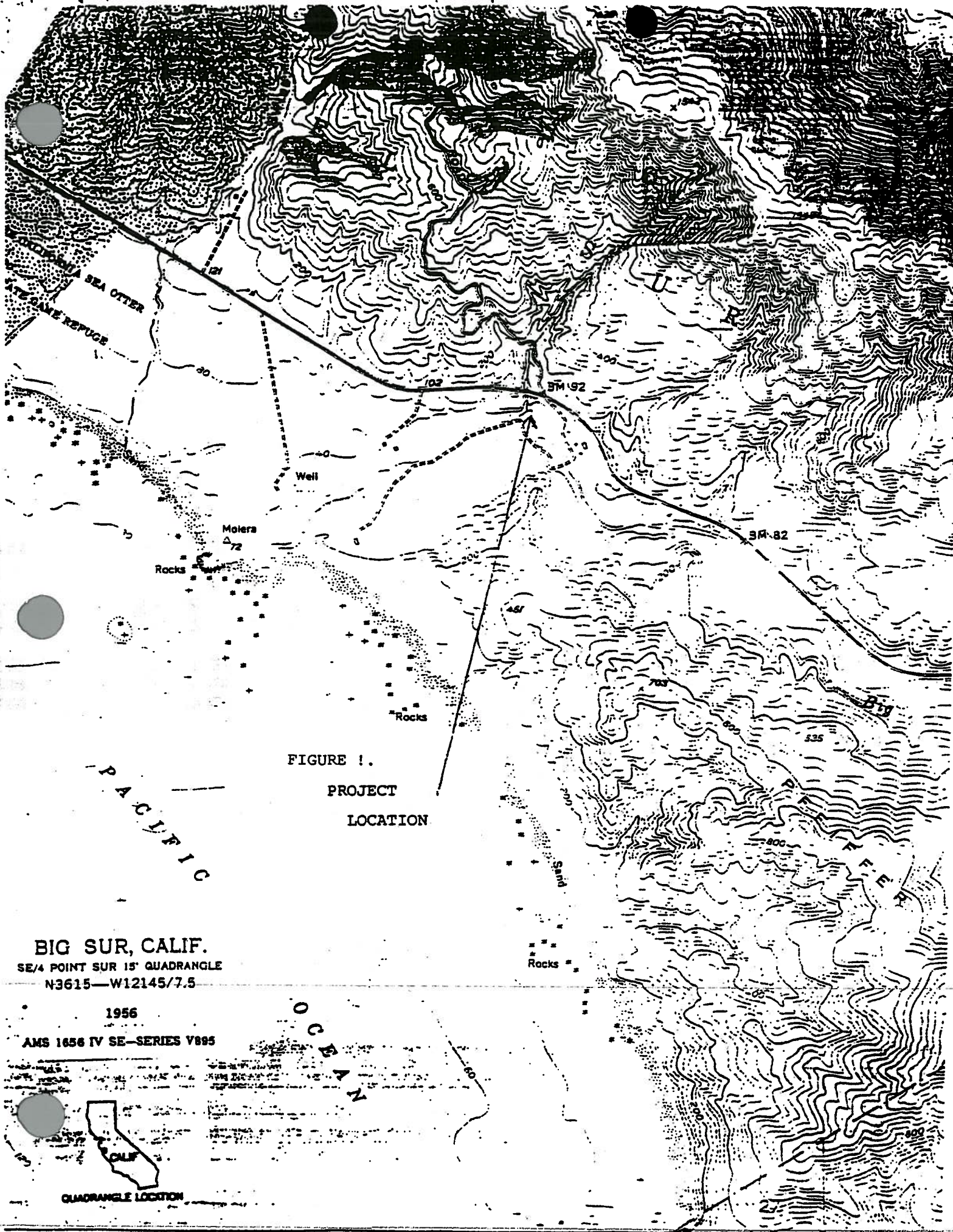
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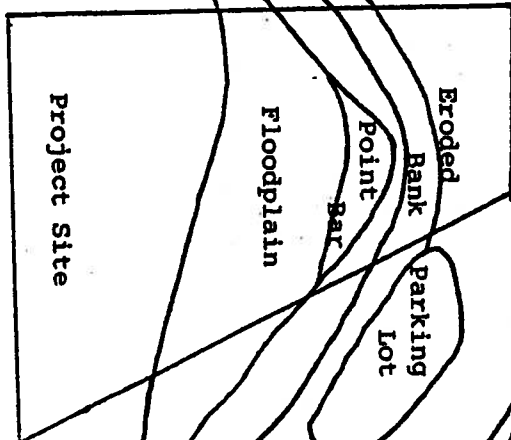
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U.S. Geological Survey, 1990, Open files; discharge notes, hydrographs, miscellaneous hydrologic data for the Big Sur River; Salinas Field Station, Salinas, CA.

Zembsch, Steven J., Big Sur River Management Plan, January 1990, California Department of Parks and Recreation.



Flood
Terrace
(Creamery Meadow)



Big Sulphur
River

Molera
Ranch Complex

FIGURE 2.
Plan View of Project

BIG SUR RIVER, ANDREW MOLERA SP

CROSS SECTION THROUGH PROJECT SITE

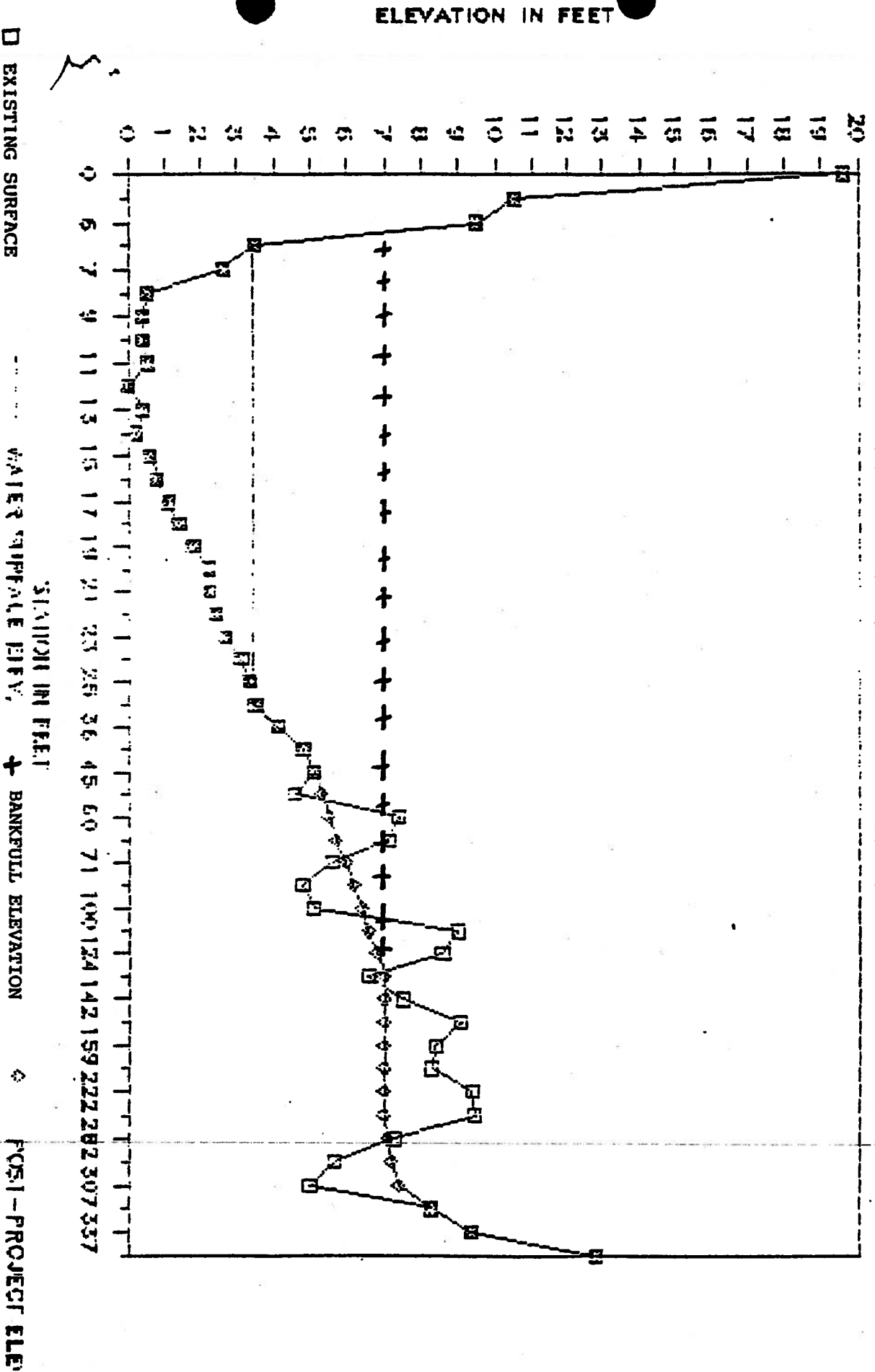




Plate 1. Overall view of the project site. The river has been diverted, it normally occupies the strip to the right and above the excavator. The floodplain is just above the active channel, with the terrace (Creamery meadow) at the top of the photo.

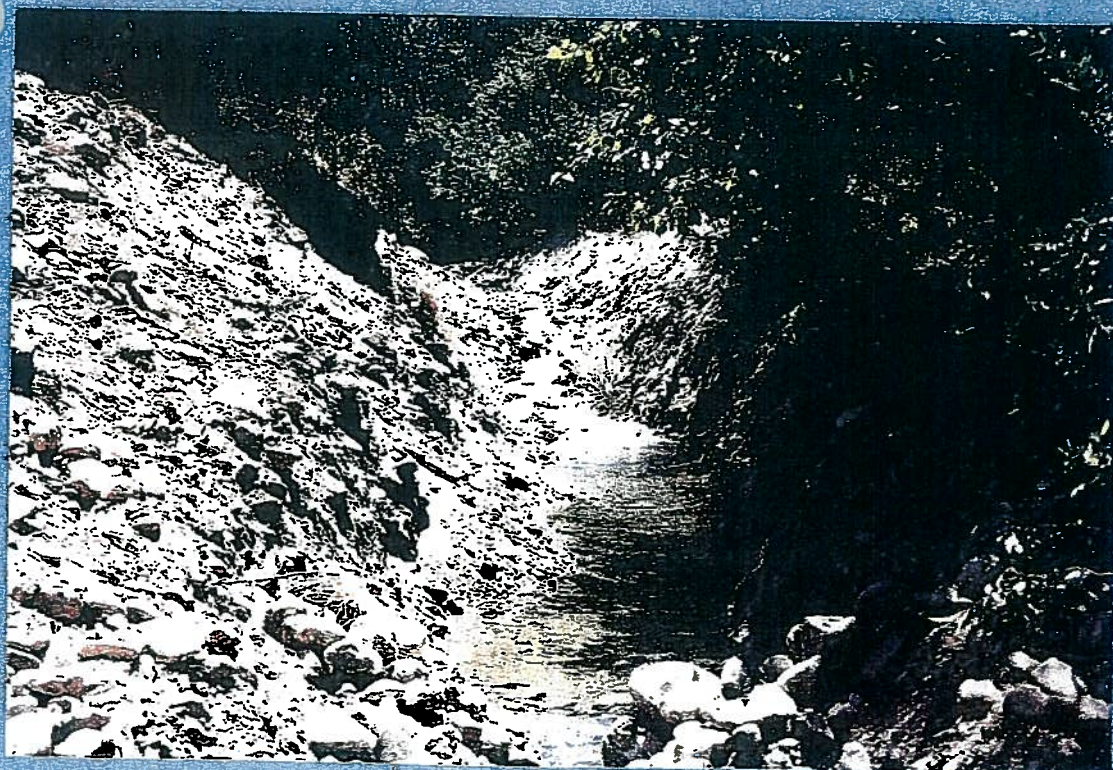


Plate 2. The mighty Big Sur River has been reduced to a trickle after four years of drought, aggressive downstream groundwater extraction and diversion around the project site. This photo shows the outlet of the diversion channel shortly after diversion.



Plate 3. The long riffle-run dried up for about 600 feet just downstream from the diversion. This resulted in the ultimate stress for gill-dependent resources. This section of river did not flow again until the rains started in late November.



Plate 4. The straight reach of the project site has been roughed out. The convergence structures are being placed. The thalweg runs diagonally from left to right in the photo.



Plate 5. The dozer is procuring bank protection materials and skidding them across the river to a location accessible by the excavator and dump truck. The minimum disturbance to natural resources was a paramount concern during this phase.



Plate 6. The excavator is backfilling the bank protection with free-draining channel material. The dozer is "feeding" the excavator to maximize efficiency. This material solves two problems- excess material in the active channel and bank failure from the "drawdown effect". The backfill is excellent for counter-bultrussing the slope.

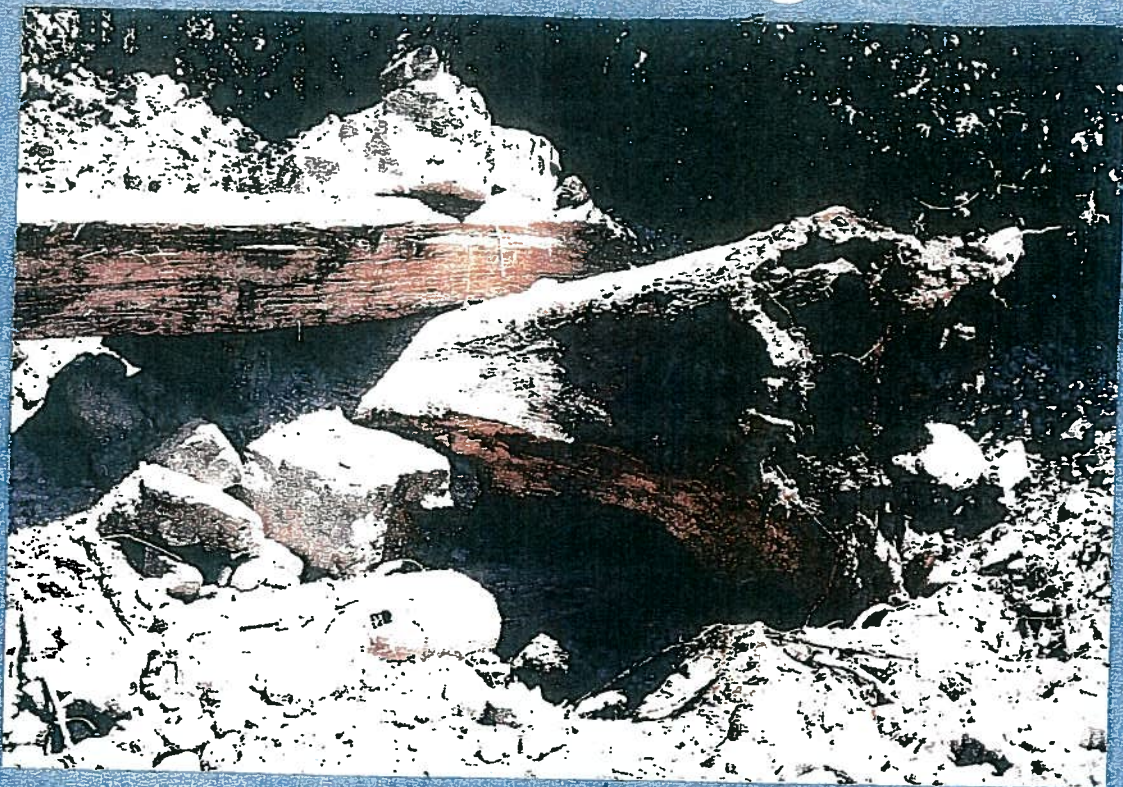


Plate 7. The rootwads are placed on a "footer" log which acts as a foundation. Boulders are used to prevent the winnowing of fines from between the woody material. The entire structure is backfilled to counteract bouancy forces. Stability is also achieved by the interlocking placement and the orientation of the rootwad to flow vectors.



Plate 8. Close-up of rootwad showing the excellent fish habitat (once the river is restored to the site). There is tremendous variance in localized velocity.



Plate 9. The excavator operator inspects his work. Having an excavator operator who understands the principles involved not only expedites the construction, it is essential for properly constructing the bank protection.



Plate 10. Now the site is ready for water. This is looking downstream. Note the orientation of the rootwads and the slope of the point bar. The point bar is the depositional feature on the left side of the photo. It is critical for dissipating the river's energy during high flow. It's shape and slope determine its effectiveness for this task.



Plate 11. Bank protection materials (down trees) were skidded from this site. It will be revegetated, using sycamore, big-leaf maple and cottonwood trees.



Plate 12. The same view as Plate 10, only this photo shows the flowing river. Again note the shape and slopes of the various features.



Plate 13. The recontoured floodplain. Existing native vegetation was preserved by leaving it on pedestals. This site will likely succeed to a Sycamore-cottonwood riparian forest.



Plate 14. This is the meander reach 100 upstream. Meanders form natural pools based on the energy grade of a stable system.

The department has 30 days from date of receipt of a completed application in which to make its recommendations. This time period does not begin until the department receives the appropriate fee (see attached fee schedule).

T.H.P. No. _____

Notification No. _____

Received _____

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF FISH AND GAME

NOTIFICATION OF REMOVAL OF MATERIALS AND/OR ALTERATION
OF LAKE, RIVER, OR STREAMBED BOTTOM, OR MARGIN

A. APPLICANT Pursuant to Sections 1601-1607 of the California Fish and Game Code

I, Steven Zembsch of 2211 Garden Road, Monterey CA 93940
Name of Applicant Mailing Address

Representing California Department of Parks and Recreation
Name and address of Individual, Agency, Company, etc. owning property or doing work

Hereby notify the California Department of Fish and Game of operations to be carried out by or for me

from June 1, 1990 to June 30, 1990 on or affecting
Starting Date Ending Date

Big Sur River of Monterey County, tributary to Pacific Ocean
Name of Stream, River, or Lake Major Water Body

Located 50' downstream from parking lot at Andrew Molera State Park
Distance and Direction to Landmarks

Section 15 Township 19S Range 1E

USGS Map Big Sur 7.5' Co. Assessor's Parcel No. N/A

Property owners name and address (if different from applicant) _____

Steven Zembsch is responsible for operations at the site.
Name of Person to Be Contacted at Site During Operations

He can be reached at 2211 Garden Road, Monterey CA 93940 649-7115
Mailing Address Telephone

B. Description of operation 1. The nature of said operations will be as follows:

Check all squares which apply.

- | | |
|--|---|
| <input checked="" type="checkbox"/> Soil, sand, gravel, and/or boulder removal or displacement | <input type="checkbox"/> Timber harvesting or any related activity required for harvesting timber |
| <input type="checkbox"/> Water diversion or impoundment | <input type="checkbox"/> Temporary, recreational or irrigation dam |
| <input type="checkbox"/> Mining—other than aggregate removal | <input checked="" type="checkbox"/> Fill or spoil in bed, bank, or channel |
| <input type="checkbox"/> Road or bridge construction | <input type="checkbox"/> Other—Describe below |
| <input checked="" type="checkbox"/> Levee or channel construction | |

2. Type of material removed, displaced or added ☐ Soil ☒ Sand ☒ Gravel ☒ Boulders
Volume 500 yard³

3. Equipment to be used in the described site Caterpillar 225 excavator

4. Use of water (i.e., domestic, irrigation, gravel, washing, etc.) 0 Quantity _____

5. Describe type and density of vegetation to be affected, and estimate area involved.

Coyote bush, 20%; bare ground 50%; willows 30%

6. What actions are proposed to protect fish and wildlife resources and/or mitigate for project impacts? This project is a fish habitat enhancement.

7a. Does project have a local or state lead agency or require other permits? ☒ Yes ☐ No Coastal Development & Section

7b. If 7a answer is yes, please attach or identify any available environmental document 404, Army Corp

7c. For state-designated wild and scenic rivers, a determination of the project's consistency with the California Wild and Scenic Rivers Act must be made by the Secretary for Resources. Until the Secretary determines the project is consistent with the Act, the Department cannot issue a valid agreement. A tentative agreement will be issued, conditioned upon a finding of consistency by the Resources Secretary.

7d. THIS AGREEMENT IS NOT INTENDED AS AN APPROVAL OF A PROJECT OR OF SPECIFIC PROJECT FEATURES BY THE DEPARTMENT OF FISH AND GAME. INDEPENDENT REVIEW AND RECOMMENDATIONS WILL BE PROVIDED BY THE DEPARTMENT AS APPROPRIATE ON THOSE PROJECTS WHERE LOCAL, STATE, OR FEDERAL PERMITS OR OTHER ENVIRONMENTAL REPORTS ARE REQUIRED.

8. Briefly describe proposed construction methods. Attach diagram or sketch of the location of your operation to clearly indicate the stream or other water and access and distance from named public road. Indicate locked gates with an "X". Show existing features with a solid line (————) and proposed features with a broken line (-----). Show compass direction. Attach larger scale map if necessary.

APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT

(33 CFR 325)

OMB APPROVAL NO. 0702-0036
Expires 30 June 1989

The Department of the Army permit program is authorized by Section 10 of the River and Harbor Act of 1899, Section 404 of the Clean Water Act and Section 103 of the Marine, Protection, Research and Sanctuaries Act. These laws require permits authorizing activities in or affecting navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters. Information provided on this form will be used in evaluating the application for a permit. Information in this application is made a matter of public record through issuance of a public notice. Disclosure of the information requested is voluntary; however, the data requested are necessary in order to communicate with the applicants and to evaluate the permit application. If necessary information is not provided, the permit application cannot be processed nor can a permit be issued.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

1. APPLICATION NUMBER (To be assigned by Corps) 1.		3. NAME, ADDRESS, AND TITLE OF AUTHORIZED AGENT Steve Zembsch Associate Resource Ecologist 2211 Garden Road Monterey, CA 93940 Telephone no. during business hours A/C: (Residence) A/C: 408 649-7115 (Office)	
2. NAME AND ADDRESS OF APPLICANT Dept. of Parks and Recreation Central Coast Region 2211 Garden Road Monterey, CA 93940 Telephone no. during business hours A/C: (Residence) A/C: 408 649-7115 (Office)		Statement of Authorization: I hereby designate and authorize _____ to act in my behalf as my agent in the processing of this permit application and to furnish, upon request, supplemental information in support of the application. SIGNATURE OF APPLICANT _____ DATE _____	
4. DETAILED DESCRIPTION OF PROPOSED ACTIVITY			
4a. ACTIVITY Logs, rootwads and boulders will be interlocked along a 220' x 12' failing streambank. The pre-disturbance channel dimensions will be restored, further reducing point velocities along the affected stream bank. See attached detail of structure and cross-sections.			
4b. PURPOSE Lateral migration of stream channel threatens public access trail to campground and beach. Work to begin on 6/1/90 and complete by 6/30/90.			
4c. DISCHARGE OF DREDGED OR FILL MATERIAL There will be no net removal or fill of channel materials.			

RECEIVED

MAR 16 1990

5. NAMES AND ADDRESSES OF ADJOINING PROPERTY OWNERS, LESSEES, ETC., WHOSE PROPERTY ALSO ADJOINS THE WATERWAY

One - California Dept. of Parks and Recreation owns both sides of the river from 1/2 miles upstream of the project site all the way to the ocean.

6. WATERBODY AND LOCATION ON WATERBODY WHERE ACTIVITY EXISTS OR IS PROPOSED

Big Sur River (see map)

7. LOCATION ON LAND WHERE ACTIVITY EXISTS OR IS PROPOSED

ADDRESS:

Highway 1, 50 feet downstream from parking lot of Andrew Molera State Park
STREET, ROAD, ROUTE OR OTHER DESCRIPTIVE LOCATION

Monterey CA
COUNTY STATE ZIP CODE

Monterey County Planning Dept. - Coastal Unit
LOCAL GOVERNING BODY WITH JURISDICTION OVER SITE

8. Is any portion of the activity for which authorization is sought now complete? ☐ YES ☒ NO
If answer is "Yes" give reasons, month and year the activity was completed. Indicate the existing work on the drawings.

9. List all approvals or certifications and denials received from other federal, interstate, state or local agencies for any structures, construction, discharges or other activities described in this application.

ISSUING AGENCY	TYPE APPROVAL	IDENTIFICATION NO.	DATE OF APPLICATION	DATE OF APPROVAL	DATE OF DENIAL
CA Dept. of Fish and Game	1603		3/1/90	N/A	N/A
Monterey County Coastal Dev.			2/23/90	N/A	N/A

10. Application is hereby made for a permit or permits to authorize the activities described herein. I certify that I am familiar with the information contained in this application, and that to the best of my knowledge and belief such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities or I am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT

DATE

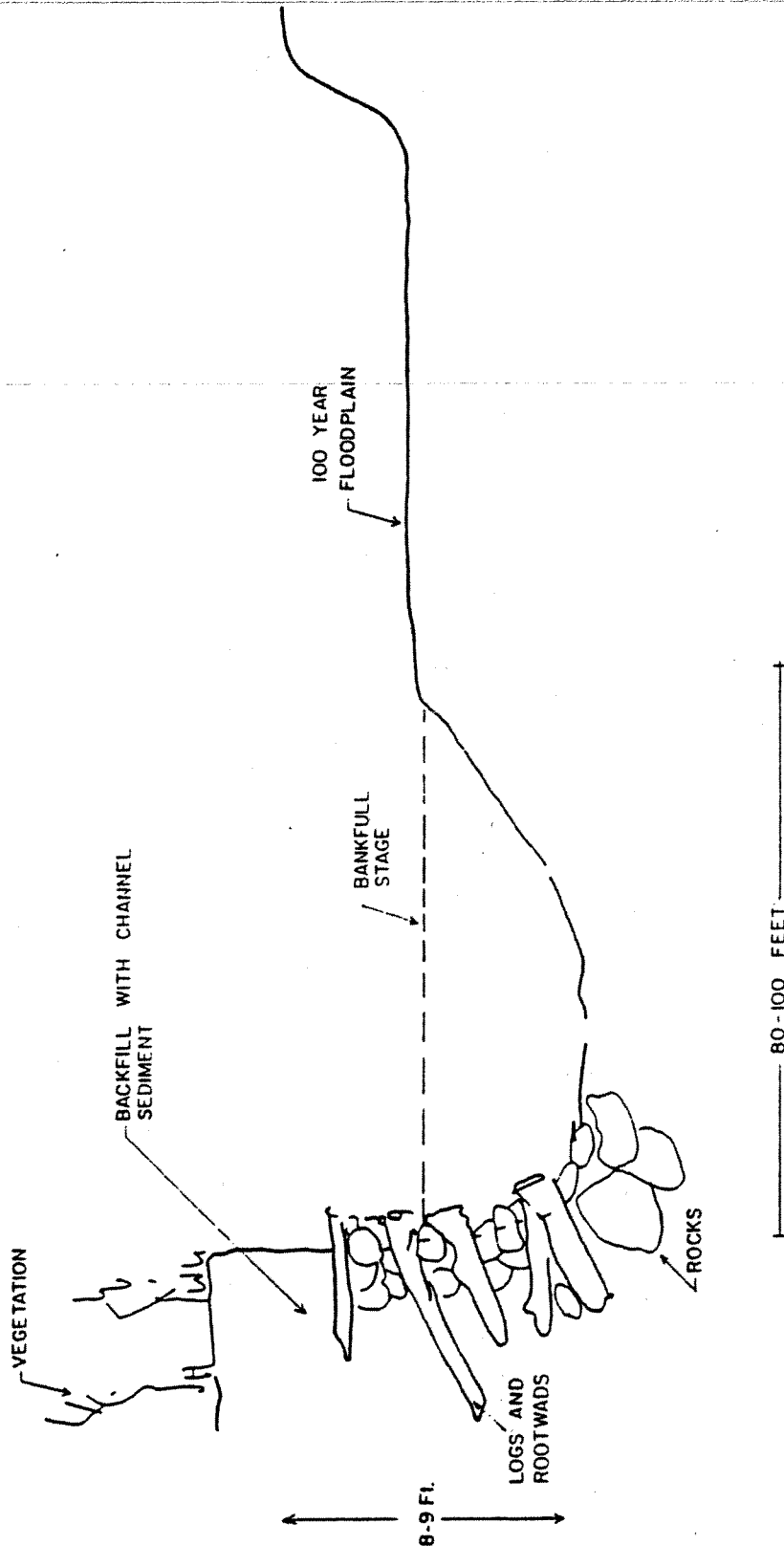
SIGNATURE OF AGENT

DATE

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in Block 3 has been filled out and signed.

U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of The United States knowingly and willfully falsifies, conceals, or covers up by any trick, scheme, or device a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false fictitious or fraudulent statement or entry, shall be fined not more than \$10,000 or imprisoned not more than five years, or both.

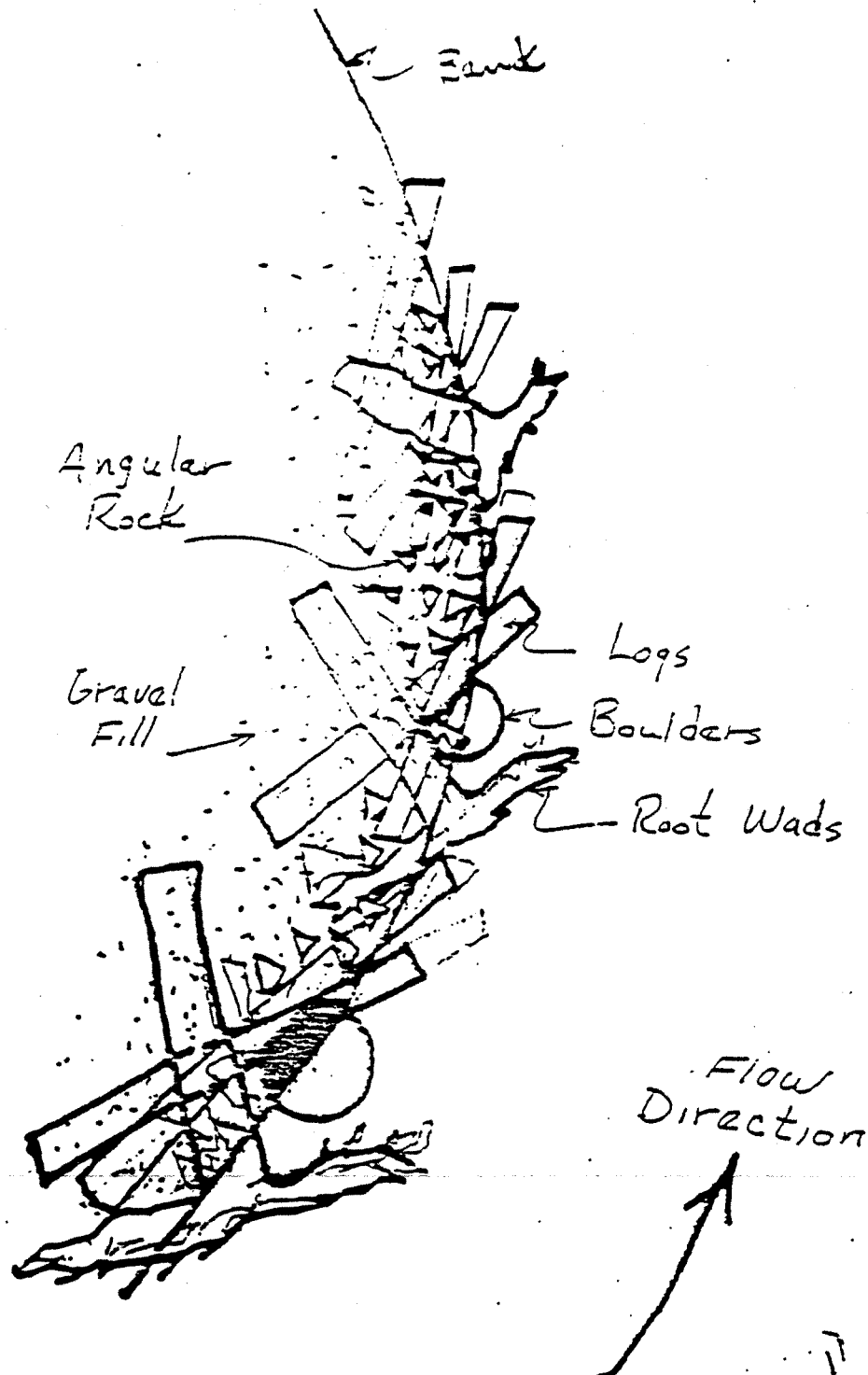
Do not send a permit processing fee with this application. The appropriate fee will be assessed when a permit is issued.



Adapted from drawings
by Wildland Hydrology
Consultants, Ft. Collins, CO.

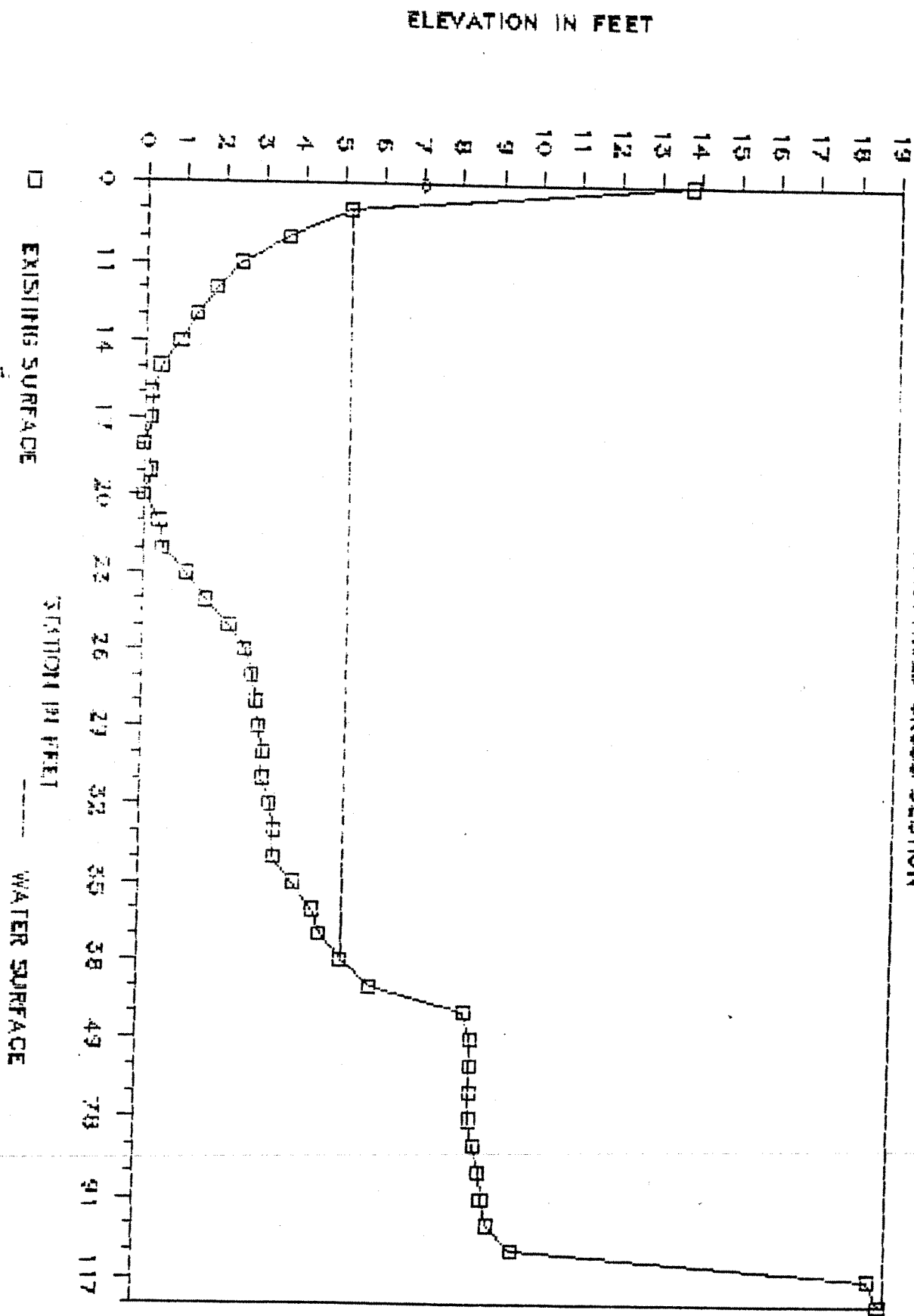
BANK PROTECTION TECHNIQUE

Schematic drawing of orientation and arrangement of native materials for bank stabilization work.



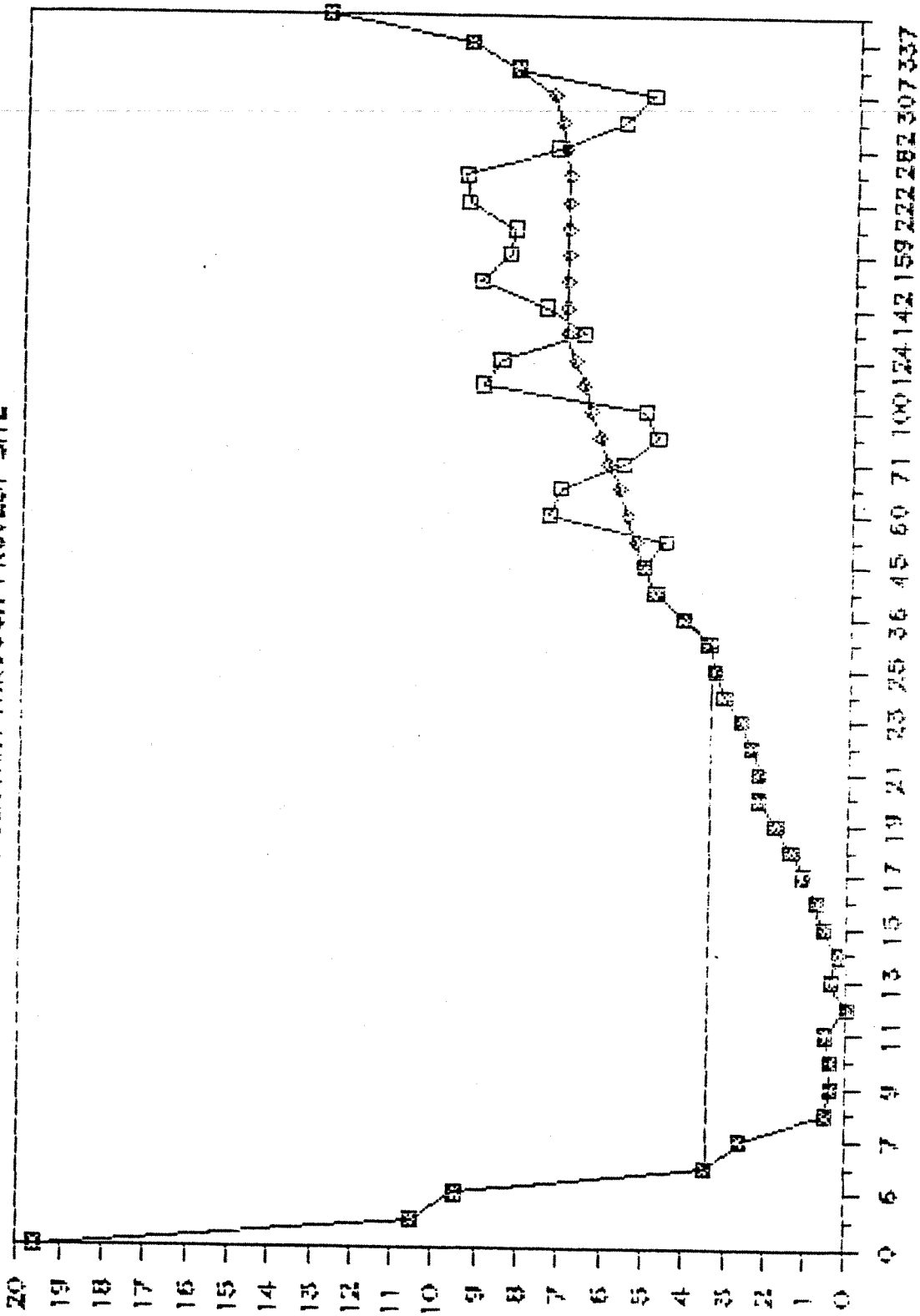
BIG SUR RIVER, ANDREW MOLERA SP

UNDISTURBED CROSS SECTION



BIG SUR RIVER, ANDREW MOLERA SP

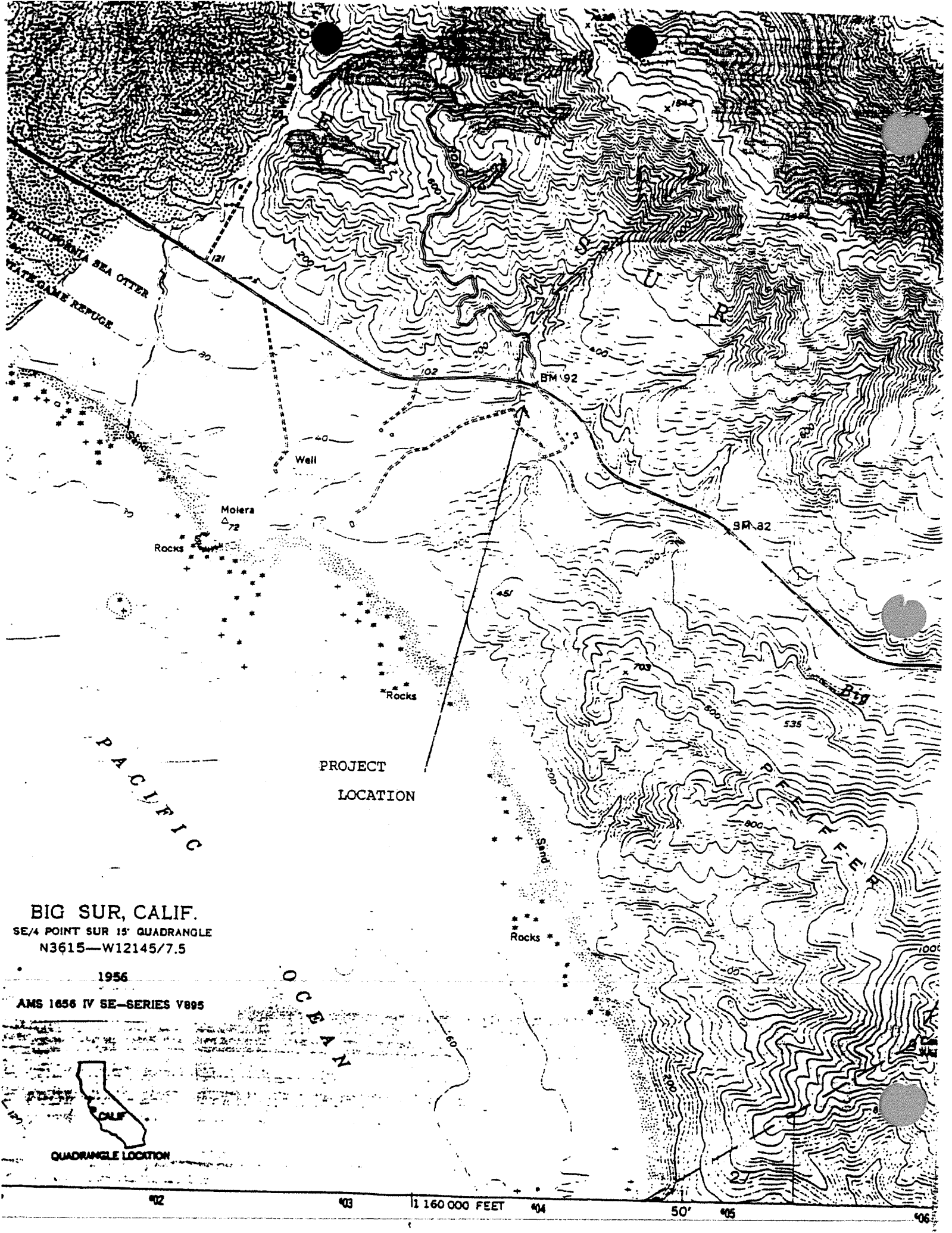
CROSS SECTION THROUGH PROJECT SITE



STATION IN FEET
WATER SURFACE ELEV.

□ EXISTING SURFACE

◇ POST-PROJECT ELE



BIG SUR, CALIF.

SE/4 POINT SUR 15' QUADRANGLE
N3615—W12145/7.5

1956

AMS 1656 IV SE—SERIES V895



QUADRANGLE LOCATION

92

93

1 160 000 FEET

94

50'

95

96

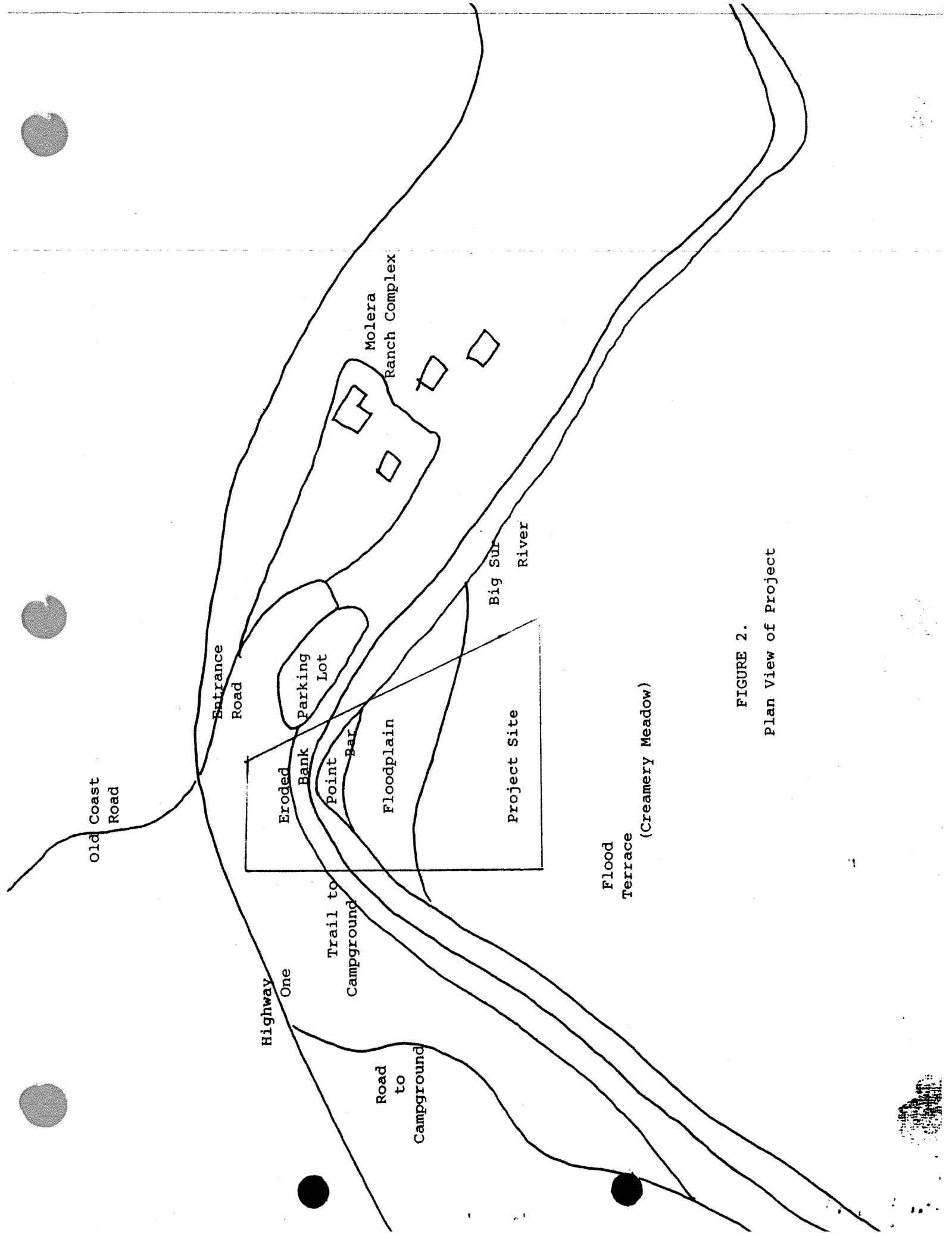


FIGURE 2.
Plan View of Project