

Gualala River
Instream Mining Operation
Application for Permit Renewal
And
Revised Reclamation Plan

Gualala Redwoods, Inc.

June 12, 2007

Table of Contents

1. Introduction	1
2. The History of Gravel Extraction in the Gualala River	6
3. Current Mining Practices	7
4. Assessment of the Natural Environment	8
a. General	8
b. Hydrology and Soils	8
c. Fauna	10
d. Flora	11
5. Assessment of Other Uses	13
6. Appropriate Gravel Extraction Rates	14
7. Gravel Extraction Sites	16
8. Gravel Extraction Methods and Related Operations	18
9. Annual Extraction Plan	21
10. Reclamation	27

Tables

Table 1 Summary of gravel extraction rates in the Gualala River from the 1950's	6
Table 2 Gravel bars proposed for extraction activities.	18
Table 3 Bar names, estimated volumes, minimum baseline elevations by cross section and propose mining approach.	25
Table 4: Annual Reclamation Cost	28
Table 5 Final Reclamation Costs	29

Figures

Figure 1: Vicinity Map	3
Figure 2: Gravel Extraction Bars	4

Appendices

Appendix A Aerial Photos of the Extraction Bars	
Appendix B Typical extraction plans	
Appendix C O'Conner 2003 - Fluvial Geomorphic Assessment of Gravel Mining	
Appendix D Halligan 2003 - Stream Inventory and Assessment	
Appendix E Halligan 2006 – Biological Assessment	
Appendix F Stream Monitoring Reports	
Appendix G Financial Assurance Cost Estimates	

1. Introduction

This document is a permit renewal application for instream mining, monitoring and reclamation in the Gualala River submitted for review by the Sonoma County Planning and Resource Management Department (PRMD). The Sonoma County permit being renewed was issued under Resolution No. 95-0617 for the aggregate mining operation and expires on April 17, 2005. The renewed permit will last for ten years, beginning on the date of approval. At the end of the ten year permit period, another renewal can be applied for. The removal of gravel from the river bars is believed to be sustainable and therefore with annual monitoring, 5-year reviews and 10-year renewals, is expected to continue indefinitely.

Bed Rock, Inc. currently operates the gravel mining and processing plant on the Gualala River near the confluence of the South and Wheatfield Forks in northern Sonoma County (See Figure 1). The offices for Bed Rock are located at 38351 South Highway 1, Gualala, California (P.O. Box 366, Point Arena, CA 95468). The contact person for Bed Rock, Inc. is Mr. William Hay. The property on which the mining and processing occurs is owned by Gualala Redwoods, Inc. (GRI), P.O. Box 197, Gualala, Ca, 95445. The contact person for Gualala Redwoods Inc. is Mr. Henry Alden. The gravel processing area is located at 39900 Annapolis Road. A lease agreement between Gualala Redwoods, Inc. and Bed Rock is in effect for the mining operations.

The current permit allows for extraction of gravel along approximately 1.9 miles of the Mainstem of the Gualala River, 9.5 miles of the South Fork of the Gualala River and 5.5 miles of the Wheatfield Fork of the Gualala River. The proposed permit will focus extraction on 12 bars along 6.9 miles of the South Fork of the Gualala River and 1.4 miles of the Wheatfield Fork of the Gualala River (See Figure 2). This is a significant reduction on the area of the permit. The proposed permit area includes portions of the Gualala River located in APN 121-010-03, 121-020-01, 121-030-01, 121-030-02, 121-030-03, 122-040-02, 122-070-02, 122-070-03, 122-150-04, 122-170-01, 122-170-07, 122-170-16, 122-170-17, 122-210-02 and 122-210-04. There are approximately 152 acres of active channel in the proposed permit area and 33.5 acres on the twelve bars proposed for extraction.

The mining and reclamation plan proposed in this permit renewal application incorporates several new mining and monitoring techniques. These are a result of increased understanding of what extraction methods best protect the aquatic and riparian ecosystems and what monitoring techniques provide the best information to

assess impacts and inform an adaptive management approach that allows continued mining operations while minimizing the negative impacts. This adaptive management approach may lead to changes or adjustments during the life of the permit to avoid adverse impacts, increase beneficial impacts, and/or reduce monitoring costs if appropriate. During the life of the permit, requirements can be modified by the PRMD staff based on recommendations resulting from the ongoing monitoring and assessment requirements. The four studies listed below have been completed recently and are relevant to the environmental evaluation of gravel mining operations in the Gualala River.

- “Fluvial Geomorphic Assessment of Gravel Mining, Gualala River Permit Area, Sonoma County, California” by O’Conner environmental, July 3, 2003 (The O’Conner Report).
- “Stream Inventory and Assessment Report for Gravel Extraction Operations on the South Fork Gualala River, California” by Natural Resource Management Corporation (The Halligan Report).
- “Gualala River Watershed Assessment Report” is an assessment that was completed in 2003 by the State of California under the North Coast Watershed Assessment Program and is usually referred to as (NCWAP Gualala) (Klamt et al, 2002).
- “Biological Assessment For Listed Pacific Salmonids That May Be Affected by Bed Rock Products Inc.’s Sand and Gravel Extraction in the Gualala River, Sonoma County, CA.” (Halligan, 2006)

Figure 1: Vicinity Map

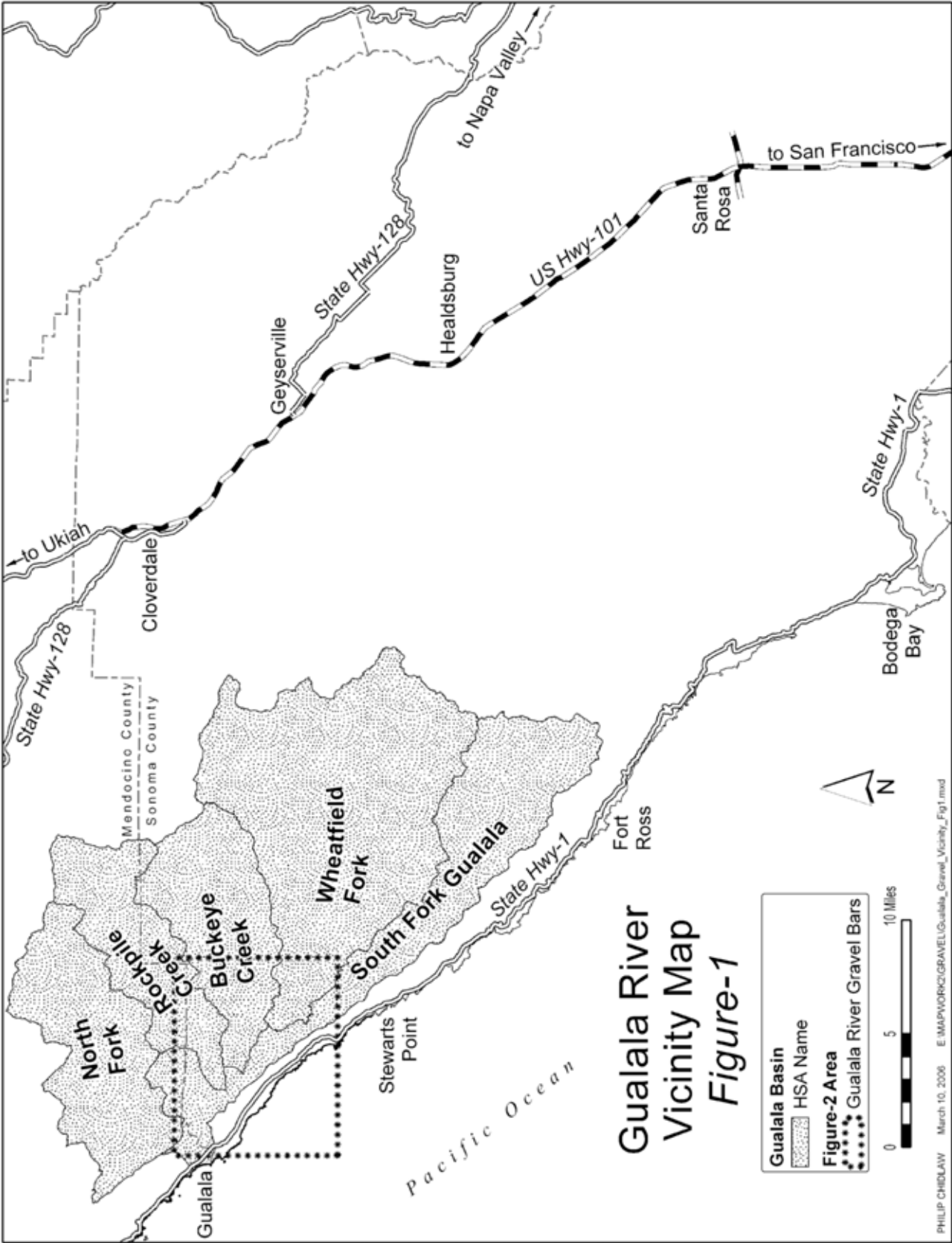
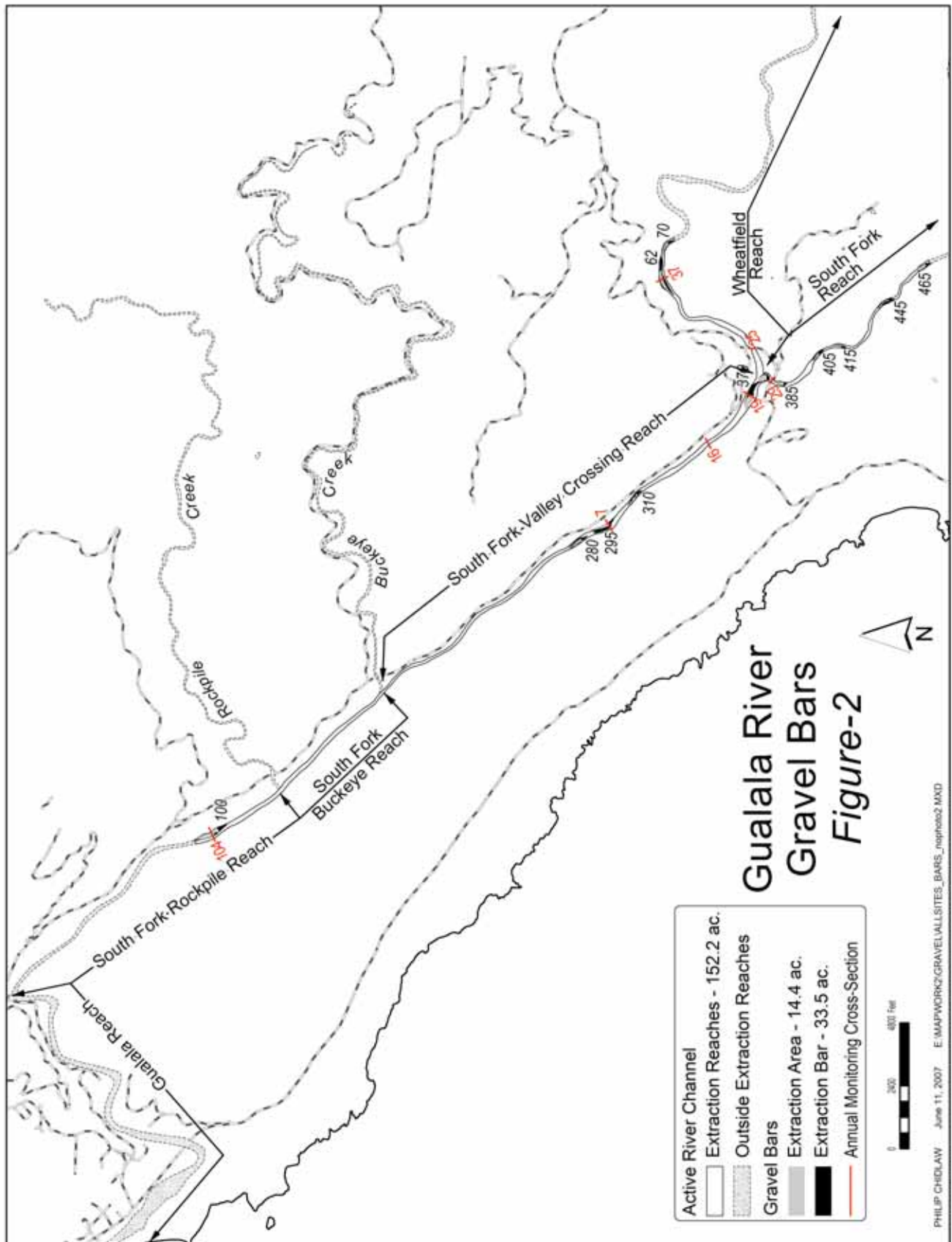


Figure 2: Gravel Extraction Bars



2. The History of Gravel Extraction in the Gualala River

Gravel extraction in the Gualala River has occurred on a small scale periodically since settlement in the late 1800's (EIP Associates, 1994), but began in earnest in the 1950's with the removal of 1,000 to 5,000 yards/year of material for the construction of logging roads. Commercial extraction began in the 1960's with rates of about 20,000 yards/year and accelerated to 40,000 yards/year in the late 1960's with increased demand for aggregate for building and roads associated with the development of The Sea Ranch. No information was available on gravel extraction rates during the period from 1972 to 1984. The average rate of gravel extraction from 1984 to 1990 was approximately 23,000 yards/year. For the period 1996-2002, the average rate of gravel extraction was 12,000 yards/year. A summary of gravel extraction rates and corresponding aggradation or degradation rates is shown in Table 1.

Table 1 Summary of gravel extraction rates in the Gualala River from the 1950's

Time period	Approximate extraction rate	Bed elevation change	Comments
	(cubic yards/year*)	(ft)	
1950's	1,000 to 5,000	+1.5	Logging road construction
1960-1964	20,000	-1	Commercial extraction
1965-1971	40,000	-0.75	Sea Ranch development
1984-1990	23,000	-1	At Clipper Mill Bridge
1996-2002	12,000	+0.1	Permit period
2003-2005	21,400		Bed Rock, Inc.

* Gravel volumes will always be described in cubic yards. The normal conversion to tonnage is 1.5 tons per cubic yard.

The current permit was issued on April 18, 1995 after a lengthy review process including the Environmental Impact Report prepared by EIP Associates in 1994. Gualala Aggregates operated under the new permit until April 22, 2002 when a series of compliance problems forced Sonoma County to issue a stop work order. At this time, Gualala Redwoods, Inc. assumed responsibility of the gravel mining use permit with Sonoma County. After bringing the permit back into compliance, the stop work order was lifted on August 19, 2003. In 2003, Gualala Redwoods signed

an agreement with Bed Rock, allowing Bed Rock to become the mining operator. Normal bar skimming operations resumed on August 19, 2003 with Bed Rock as the operator.

3. Current Mining Practices

Gravel mining: Gravel is removed from the river bars above the water surface with the use of scrapers, excavators, front end loaders and dump trucks. Gravel mining is conducted by bar skimming during the summer and fall months. The maximum amount of gravel that may be mined under the terms of the permit is controlled by the minimum baseline elevation (MBE) established for each cross section (See Table 3); the bar is skimmed such that the surface slope of the bar after mining is 2% transverse to flow from the MBE near the low flow channel to the bank. In addition, a buffer zone ten feet wide separates the low flow channel from the excavation area. The existing operation was originally permitted for an extraction rate of up to 40,000 cubic yards annually. After a fluvial geomorphic assessment was conducted by O'Conner Environmental in 2003, the extraction rate was reduced to 22,500 cubic yards annually in a letter from Sonoma County dated October 28, 2003. The natural cycle of the river has replenished the gravel each year.

The gravel extraction operations may be conducted from June 1 to November 1. Instream mining can occur from Monday to Friday from 6:00 am to 10:00 pm but operations typically conclude by 6:00 pm. Operations on Saturday are limited to processing and marketing. Generally four or five employees will be on site.

Gravel processing area: The gravel processing plant is located near the confluence of the South and Wheatfield Forks of the river. Gravel extracted from the bars is transported along the bars or existing logging roads to the processing site. Noise, dust, and view impacts created by the transport are well mitigated by the surrounding redwood forests.

The rational runoff method was used to calculate storm runoff. The runoff coefficient used was 0.40. The drainage area is six acres. The 20 year recurrence, 1 hour duration storm rainfall depth is 0.90 inches. The resulting peak discharge is 2.16 cubic feet per second.

Processing operations, including stockpiling, washing, screening, crushing, loading and hauling occur on the south bank off of the main channel at a distance of 100 feet from the active channel. The area is separated from the active channel by a levee. Once the rock is processed, it is trucked seven miles north to a concrete ready-mix

plant located in Gualala, in Mendocino County. Most of the material extracted is taken to the plant with the remaining being sold to various customers.

Transportation: All ingress and egress occurs via Annapolis Road. A paved road extends from the entrance down to the scales. Traffic volumes are extremely variable due to fluctuating supply and demand. An existing stop sign controls traffic which emerges from the site to enter Annapolis Road. Sight distance is adequate in both directions and nearly all turns from the site are to the right.

The trucks normally utilized for transport of gravel from remote bars to the processing site have a capacity of 10 cubic yards. At current extraction rates, if all gravel was mined at remote bars, 2,700 round trips per season would be generated by the operation (approximately 14 round trips per day). In reality, the number of trips will be less since some gravel is mined from the bar adjacent to the processing site. The extensive tree cover around the haul roads will mitigate any visual, noise, or dust impacts created by the trucks. Trips from the gravel bars to processing plant are conducted primarily on internal Gualala Redwoods haul roads.

4. Assessment of the Natural Environment

a. General

The Gualala River watershed is located along the southern Mendocino and northern Sonoma Coast (See Figure 1), and drains to the Pacific Ocean near the town of Gualala. The total catchment area is 298 square miles. Four major tributaries flow into the permit area. They are; the Wheatfield Fork (71,500 acres), the South Fork (40,800 acres), Buckeye Creek (25,800 acres) and Rockpile Creek (22,400 acres). The combined catchment area of (160,500 acres) is approximately 85% of the total Gualala drainage area. Topography in the catchment consists of moderate to steep slopes, flat-topped ridges, and marine terraces. Coastal conifer forests of redwood and Douglas fir occupy most of the western portions of the watershed, while oak-woodland and grassland occupy many slopes in the eastern basin.

b. Hydrology and Soils

Precipitation in the Gualala Watershed is highly seasonal, with the majority of precipitation falling between October and April. Mean annual precipitation ranges from about 33 inches at the coast to 63 inches at higher elevations. The highest rainfall amounts occur along the drainage divide in the southeastern region, in the

headwaters of the Wheatfield and South Forks. The following information was summarized from the NCWAP Gualala report.

The Gualala River is a gravel bed river that exhibits extensive gravel bars and a meandering low flow channel configuration. The low flow channel is approximately 10 to 30 feet wide, and the gravel bars are occasionally vegetated. The bed material is composed of particle sizes ranging from silt to cobbles, but consists primarily of medium to coarse gravel underlain by finer gravel and sand. The surface bed material D90 was estimated in the field in October 2002 at approximately 63-90 mm (where D90 represents the diameter (D), in millimeters, of which 90% of the bed material is finer), and the surface D50 was about 22-31 mm. The subsurface D50 was estimated at about 6 mm, and it appeared to contain a substantial proportion of sand. The channel banks were composed of sand and silt, and in the vicinity of the project area were approximately 10 ft high. Aggradation in the lower reaches of the Wheatfield and South Forks has probably resulted in subsurface water flow in these areas, especially in the summer months.

In the Gualala watershed, the distribution of landslides, channel types, and sediment are primarily controlled by the distribution and physical properties of the underlying geologic formations (Klamt et al, 2002). The resistance of the bedrock to erosion is highly variable and depends on the rock composition and the degree of deformation. The Gualala watershed developed in response to a complex series of episodes of subsidence and uplift probably associated with strike-slip faulting on the San Andreas Fault. The majority of the Wheatfield and South Fork catchments are underlain by the Franciscan formation, and the whole of the Gualala watershed is within the boundaries of the San Andreas Fault System and the Tombs Creek Fault Zone. As a result the underlying rocks are generally intensely sheared and inherently unstable. Mass wasting is common and sediment supply rates to both the Wheatfield and South Fork tributaries are high. The underlying geology and potential for landslides is similar in both catchments (Landslide Potential Map prepared by California Geologic Survey, included in Klamt et al, 2002).

The NCWAP Gualala report concluded that there are indications of excess sediment in all of the tributaries of the Gualala River. There is, however, evidence of significant recovery particularly in the vicinity of Valley Crossing.

The O'Conner report concluded that, "Aggregate extraction over the past five years has not caused a significant geomorphic impact in the vicinity of the mining site."

c. Fauna

There are three fish species of concern known to exist in the Gualala River Basin. These are the coho salmon (*Oncorhynchus kisutch*), the steelhead trout (*O. mykiss*), and the Gualala Roach (*Lavina symmetricus parvipinnis*). Both coho and steelhead trout are listed as threatened under the Endangered Species Act. Coho salmon are present in the North Fork Gualala watershed, but have not been observed in the South Fork sub-basin in many years. In recent years steelhead populations have declined as well (Klamt et al, 2002).

The Gualala Roach is a State listed species of concern, but site surveys indicate that this species' population is abundant along the river. The species is listed because little information is available and because it has limited geographic range. The roach resides predominately in pools and spawns between March and July. The observed plentiful population is apparently not disturbed by current mining operations.

The fisheries resource of the Gualala River is a subject of much concern. The Gualala River is listed as a 303d impaired watershed for sediment and temperature.

Biological observations were performed by Dennis Halligan in October of 2002 during the habitat inventory by streambank observation method. The general purpose of the biological inventory was to document species composition with emphasis on determining whether salmonids were present. Several juvenile steelhead in the 0+, 1+, and 2+ age classes were observed during the survey. In addition, Gualala Roach, belted kingfisher (*Ceryle alcyon*), great blue heron (*Ardea herodias*), and yellow-legged frog (*Rana boylei*) were also observed. Several old redds from the previous salmonid spawning season were present in the survey reach.

Gualala Redwoods, Inc. has been recording water temperatures in the South Fork and its tributaries for several years. The summertime moving weekly average temperatures (MWAT) at the downstream end of the survey reach for the years 1994-2004 was 19.1-22.4°C (See Appendix F). These temperatures are basically the same as those recorded upstream of the extraction area in the upper South Fork (18.4-22.3°C) and Wheatfield Fork (20.9-23.1°C). It appeared that extraction activities had little or no effect on the reported water temperatures.

The Halligan report concluded that;

- The deepening of pools that occurred between 1991 and 2002 likely improved the amount of stratified temperature locations and salmonid habitat.

- Extraction activities do not appear to have adversely affected water temperatures.
- Extraction activities do not appear to have affected the development of deep pools and corresponding improvement in rearing habitat quality.
- The Draft EIR contains avoidance and replanting mitigations to ensure riparian vegetation is not adversely affected by operations.
- The high embeddedness levels were not likely the result of the extraction operation since similar conditions exist further upstream in the Wheatfield Fork and upper South Fork.

The Halligan report goes on to suggest that the County;

- Allow alternatives to the traditional bar skimming technique if they could be used to improve rearing habitat.
- Consider allowing extraction volumes above the current permitted amount if it can be shown that fish habitat could be improved from such activities and the permitting agencies determine a goal for the Gualala River is to reduce channel elevation/aggradation. Effects on other environmental factors such as riparian vegetation and channel and bank stability should be considered prior to allowing any increase in extraction volume.

The northern spotted owl (*Strix occidentalis*), a federally listed species, is present in the watershed. Mining operations will not affect habitat. Since the noise has been continuous for several decades it can be assumed that the owls are accustomed to it. Gravel mining will not have a significant impact on northern spotted owls.

Marbled murrelets (*Brachyramphus marmoratus*), a federally and state listed species, have also been detected in the watershed although rarely. Two years of protocol Murrelet surveys were conducted by Leopardo Wildlife Associates on the South Fork of the Gualala River from bar 310 north to the mouth of the South Fork and no Murrelets were detected. Biologists Troy Leopardo (Leopardo Wildlife Associates) and Stacy Martinelli (California Department of Fish and Game) determined that there was no suitable Murrelet habitat in the vicinity of the processing plant at Valley Crossing. Mining operations will not affect habitat.

d. Flora

A rare plant assessment and survey of the alluvial flats along the Gualala River has been conducted by Clare Golec, formally staff botanist for Natural Resources

Management Corporation and currently of California Department of Fish and Game. The assessment identified potential rare plants, and the survey focused on potential habitat for rare plants and inventoried species composition.

The soils along the alluvial flats are unconsolidated gravel, sand, silt, and clay. The area is a tree-dominated vegetation type with coastal redwood (*Sequoia sempervirens*) as the principal species. The understory is moderate to dense in the mesic redwood flats.

The assessment for potential rare plants reviewed California Native Plant Society's electronic inventory (January 1999), California Department of Fish and Game's Natural Diversity Data Base Rare Find 2 (February 1999), taxonomic literature, and topographic maps.

The field survey was performed July 21, 1999 and involved twenty field person hours, ten of which were the reviewing botanist and the other ten John Bennett (forester, Gualala Redwoods, Inc.). An intuitive controlled survey was employed that was overall moderate in the intensity of coverage and high in areas with good potential habitat for rare plants. In particular mesic to wet openings and semi openings were reviewed for the rare plant, swamp harebell (*Campanula californica*). The survey was seasonally appropriate and floristic in nature. The survey not only focused on the predicted rare plants and potential habitats, but also identified all taxa encountered to a taxonomic level (such as genus or species). An overall species list of the vascular plants encountered is presented below and the nomenclature used follows the Jepson Manual. The survey method was based on the California Department of Fish and Game protocol for rare plant surveys developed by James Nelson.

One rare plant, swamp harebell, was observed at ten locations during the field survey. Swamp harebell is a rare California endemic species known from the northern Central Coast and southern North Coast of California and is associated with coastal marshy habitats (Hickman 1993). The present status of the swamp harebell is a federal Species of Concern and a CNPS list 1B. This species was noted in well developed wetlands and/or road associated wet to mesic areas such as the shady moist bank of access road and various skid trails). The swamp harebell appears to be scattered and often locally common along the alluvial flats and was found in natural marshy areas as well as seasonally wet and disturbed sites.

No other rare plants were observed. There is good potential habitat available for American manna grass (*Glyceria grandis*), Sonoma alopecurus (*Alopecurus*

aequalis var. *sonomensis*), maple-leaved checkerbloom (*Sidalcea malachroides*), and Point Reyes checkerbloom (*Sidalcea calycosa* ssp. *Rhizomata*). These species were not observed.

One uncommon plant, fringed false hellebore (*Veratrum fimbriatum*), was noted throughout the alluvial flats and drainages.

Use of access roads during gravel extraction operations could result in negative impacts to individual swamp harebell plants. Equipment running on the road surface could impact individual plants; however it is uncommon for swamp harebell to grow in the compacted running surface of truck roads. Individual swamp harebell plants could be impacted by grading or widening of roads. This would involve scraping the edges of roads. This potential impact may be offset because the same activities would also create harebell habitat thus allowing further colonization by the population.

The gravel extraction operations proposed will not cause significant negative impacts to rare plant populations in the project area.

5. Assessment of Other Uses

Land Use: The Gualala Redwoods Company timberlands surround the mining site. The land is zoned Timber Production Zone (TPZ). The entire permitted reach is zoned Mineral Resource (MR) in addition to the TPZ. The Valley Crossing extraction area was determined to have vested rights by Sonoma County on March 20, 1981.

In the larger land use context, the mining site and the surrounding area are designated for "resource and rural development." This designation is consistent with current land use practices. The Gualala River corridor is classified as a "riparian corridor to be protected" in the Open Space Element of the 1990 Sonoma County General Plan. It is important that proposed reclamation in this area be sensitive to the natural resource value of the Gualala River Basin.

In 2003 pursuant to AB 1168, the State of California designated the portion of the Gualala River from the Ocean to the confluence of the North Fork and The South Fork of the Gualala River under the Wild and Scenic Rivers Act as a Wild and Scenic – Recreation River. The designated area is downstream and outside of the permit area. Additionally, this status does not preclude gravel extraction.

The gravel mining will have no significant negative impact on other land uses.

Domestic Water Use: The Sea Ranch Water Company is the only significant domestic user in the permit area. The Sea Ranch Water Company draws water from the aquifer beneath the riverbed by offset wells located at cross-section 16, 0.6 miles downstream from the confluence with the Wheatfield Fork. The Sea Ranch only draws water during high flow periods in the winter to fill a reservoir for summer use.

Water necessary for processing gravel is obtained from the Gualala River to wash the gravel and for dust abatement. Approximately 6,000 gallons of wash water are retained for every 350 cubic yards of washed rock processed at the plant. This equates to about 171,430 gallons of retained water for every 10,000 cubic yards of raw extracted aggregate. The rest of the wash water is directed to settling ponds where it infiltrates back into the water table and eventually returns to the river.

Neighbors: The nearest residences are about ¼ mile up the hill to the west and are protected by the forest and the terrain from noise and dust. The “Hot Spot”, near cross-section 16, is a popular picnic area and river access point for Sea Ranch members. The “Hot Spot” is about ¼ mile downstream from the processing site and is protected by the forest and the terrain from noise and dust.

Services and Utilities:

- During periods of operations, a portable toilet is on site that is serviced by a commercial contractor every two weeks.
- Potable water will be provided on site.
- Power is provided by a generator. The generator has a self-contained fuel tank that is filled about once a week. There is no fuel storage on site. Fuel for heavy equipment is hauled in by employees in the necessary quantities on an as needed basis.

Traffic and Circulation: The operation will result in about 1,400 highway loads per year. Assuming 300 work days per year, this amounts to approximately 4.7 loads per day. The empty backhaul rate would be the same. Therefore, it can be expected that a daily average of 9.4 truck trips would occur over the Annapolis Road and Highway 101. Hauling of raw aggregate from the gravel bars to the plant would occur primarily on internal Gualala Redwood, Inc. haul roads.

6. Appropriate Gravel Extraction Rates

The sustainability of any gravel extraction operation relies on appropriate extraction rates. Over-extraction can result in degradation and de-stabilization of the river

channel; degradation and destruction of wildlife habitat; degradation of ground water quality and excessive erosion and landsliding in tributary streams as they attempt to adjust to lowered bed levels in the main river channel.

On the other hand, some changes in the morphology of the channel associated with channel degradation may be considered positive for aquatic habitat. For example, a general lowering of the channel bed in relation to the water table could result in a more continuous and/or deeper surface flows in summer with positive effects on fish habitat.

The O'Conner report found that aggradation continues to occur in the channel of the Wheatfield and South Forks of the Gualala River, despite annual extraction of gravel from the channel bed from 1996 to 2001. O'Conner calculated a yearly rate of gravel replenishment for the Valley Crossing reach of the Wheatfield and South Forks of approximately 17,000 yards/year from analysis of channel cross sections, surveyed over the 6 year period, and cumulative extraction rates over the same period. During that 6 year period, 9,000 yards/year to 24,000 yards/year (with an average rate of about 12,000 yards/year) of aggregate were extracted from the channel by bar skimming operations. No significant changes to the plan form morphology of the river or an increase in bank erosion were detected by aerial photograph interpretation. Aggregate extraction over the past five years has not caused a significant geomorphic impact in the vicinity of the mining site.

At present the maximum permitted extraction rate is 22,500 yards/year (modified from 40,000 yards/year). The current average extraction rate of 21,400 yards/year for the entire permit area is on the low end of the estimated recharge rate of about 16,340 to 50,440 yards/year O'Conner and Rosser (2003) and Klamt (2002), suggesting that extraction rates could be increased without causing channel degradation. Therefore, extraction will be limited to that volume that has accumulated above the minimum baseline elevations and is not expected to exceed 40,000 cubic yards per year.

Over extraction and habitat degradation will be avoided by prescribing appropriate extraction methods for each bar each year (See Section 8) and by limiting the extraction volumes to the volume of gravel that has accumulated above the minimum baseline elevations on the permitted bars. Minimum baseline elevations (MBE) have been established for three or more cross sections on most of the bars (See Table 3). On bars 405, 415, 445, and 465 where minimum baseline elevations have not been established, surveys will be conducted prior to extraction and

minimum baseline elevations will be established for three or more cross sections and agreed upon with the county before operations. The minimum baseline elevation for each cross section will be set at the average low flow water elevation but never less than one foot above the thalweg. Minimum baseline elevations for each bar will fall from the upper to the lower end of the bar to allow for drainage of the extraction area.

Extraction methods to be utilized in the first year include horseshoes and secondary channel skims (See Table 3). Extraction methods and volumes in subsequent years will be developed through an adaptive management strategy after surveying and assessing the amount of recruitment above the minimum baseline elevation on each bar proposed for extraction that year.

7. Gravel Extraction Sites

The proposed project area contains at least 27 gravel bars of which 12 Bars are being proposed for extraction activities. A number of bars (15) are not being proposed as extraction. The reasons for not including these bars in the permit application include: riparian vegetation presence, being more of a sediment transport rather than depositional reach, access, instream habitat quality, and other issues

The extent of mining impact is relatively small. There are 152 acres of active channel in the permitted reach. The twelve bars proposed for mining cover approximately 33.5 acres and the actual area of proposed extraction is approximately 14.4 acres, or less than 10% of the total area in the permitted reach.

The proposed instream extraction sites are located to take advantage of physical and channel features and hydraulic characteristics that promote sediment deposition. Physical and channel features that enhance deposition include: 1) being upstream of a channel or bridge constriction that creates a backwatering effect during flood flows, 2) being downstream of a constriction where the channel width expands and water velocities decrease, 3) areas that have a naturally high width to depth ratio where sediment loads exceed local transport capacity, and 4) at the confluence of two watercourses (e.g. South Fork and Wheatfield Fork). Hydrological characteristics that promote sediment deposition include areas that exhibit a decrease in the water surface or energy gradients, and decreasing flow velocity, and shear stress. Concentrating instream extraction activities at locations that exhibit these characteristics precludes the need to operate on less suitable sites, reduces the disturbance area, and minimizes adverse effects.

O'Conner and Rosser (2003) analyzed Wheatfield and South Fork longitudinal profiles from the years 1996 through 2002. Inspection of the longitudinal profiles revealed that both Wheatfield Fork and South Fork exhibit a decline in slope at their confluence suggesting a decrease in stream power and sediment transport capacity in this location. The decrease in stream power presumably results in the accumulation of gravel at this location. In addition, the upper South Fork is steeper than the Wheatfield Fork, and also appears to be transporting a greater sediment load. When this sediment is deposited in the channel of the Wheatfield Fork (greater catchment area but lower slope than the South Fork), the river is unable to transport this increased load and as a consequence aggradation occurs at the confluence (O'Conner and Rosser 2003).

In addition to the decrease in channel slope in the Valley Crossing area, the channel width underneath the bridge over the South Fork is significantly narrower than that along the extraction bar upstream. The channel constriction created by the bridge abutments results in a backwatering condition at very high flows, which encourages sediment deposition on the bar upstream.

Table 2 Gravel bars proposed for extraction activities (See Appendix A)

Bar Number	Bar Name	River Segment	Start Distance (Feet)	End Distance (Feet)	River Bank	Bar Length (Feet)	Skim Area (Acres)	Bar Area (Acres)
100	Big bar	South Fork - Rockpile	9,400	10,800	Right	1,400	2.8	5.2
280	Fat Bar	South Fork - Valley Crossing	27,800	28,700	Left	900	0.9	2.1
295	Thin Bar	South Fork - Valley Crossing	29,000	30,000	Right	1,000	1.1	3.9
310	Rebar	South Fork - Valley Crossing	30,600	31,500	Left	900	0.7	1.8
370	VC Bar	South Fork - Valley Crossing	36,500	38,200	Left	1,700	3.4	6.8
385	Bridge Bar	South Fork - Upper	38,300	39,000	Right	700	0.6	1.2
405	Log Jam	South Fork - Upper	40,200	40,900	Left	700	0.5	1.3
415	GS Bar	South Fork - Upper	41,300	41,800	Left	500	0.6	1.2
445	Landing Bar	South Fork - Upper	44,000	44,700	Left	700	0.5	1.9
465	South Bar	South Fork - Upper	46,200	46,700	Left	500	0.7	1.3
62	Long Bar	Wheatfield Fork	5,100	6,700	Right	1,600	2	5.5
70	Shady Bar	Wheatfield Fork	6,800	7,500	Left	700	0.6	1.3

8. Gravel Extraction Methods and Related Operations

The proposed project is situated in a reach that exhibits varied channel morphology, elevation, vegetation patterns, aquatic habitats, and aggregate deposits. This variation in physical and biological characteristics requires an innovative site-specific planning approach rather than a one-size-fits-all methodology. For this application a variety of extraction methods are being considered that may be applied on a site-specific basis depending on bar and discharge characteristics and proximity to sensitive habitats. The following extraction options for the various bars are based on the 2005 conditions. Winter flows and 2006 channel alignment may require some adjustment to these methods. These proposed extraction methods include, but are not limited to:

Secondary Channel Skim: Elongate, shallow excavations adjacent to dry, secondary channels, designed to be free-draining and open along its length so as to not impede fish passage/migration and to prevent potential fish stranding. The skim

floor elevation shall be at least one foot above the crest of downstream secondary channel riffle feature and may extend into and beyond the midline crest of the bar surface. The finished grade of the extraction area will have a downstream gradient equal to the river and a flat cross slope and will be no lower in elevation than the minimum baseline elevations in Table 3 or as agreed upon for bars 405, 415, 445 and 465. The upstream riffle crest, or elevation control of secondary channel shall not be affected by extraction operation.

Horseshoe Skim: This method extracts gravel from the downstream two-thirds of gravel bars. A lateral buffer is maintained along the edge of water that is equal to 20% of the active channel width as measured at established cross-sections. The upper third of the bar is left in an undisturbed state as an upper bar buffer. The finished grade of the extraction area will have a downstream gradient equal to the river and a flat cross slope and will be no lower in elevation than the minimum baseline elevations in Table 3 or as agreed upon for bars 405, 415, 445 and 465. Cut-slopes will be left at a 1:1 (horizontal:vertical) slope except along the upstream side at the head of bar buffer where a 5:1 slope will be established. There will be a 15-foot offset buffer from the bank. The extraction surface shall daylight along the downstream one-fifth of the bar to facilitate drainage following high runoff events. The horizontal and vertical offsets are intended to remove the excavation area away from the low flow channel and minimize effects to listed salmonid species by disconnecting the mined surface from frequent flow inundation. Due to less frequent flow inundation, horseshoe shaped skims may take larger flow events to replenish than traditional skim designs depending on the unaltered bar height between the excavation and the stream.

Traditional Skim: This method extracts gravel from the downstream 2/3 of the bar. It involves leaving a 1/3 head of bar buffer, 2% cross-slope, 15-foot edge-of-water and bank buffer, and a finished groomed surface that will facilitate drainage and reduce stranding potential. The extraction surface elevation shall at no times be lower than the minimum baseline elevations in Table 3 or as agreed upon for bars 405, 415, 445 and 465.

Inboard Skim: This method is similar to the horseshoe except that it maintains a wider horizontal offset from the low flow channel. These areas are excavated to a depth no lower than the minimum baseline elevations in Table 3 or as agreed upon for bars 405, 415, 445 and 465, with a 0-0.5% cross slope, steeper (1:1) slopes on the sides, and gentler (5:1) slopes at the head of the excavation. The horizontal and vertical offsets are intended to remove the excavation area away from zones of

frequent flow inundation. There is a 15-foot offset buffer from the bank. The excavation may extend into the upper 1/3 head of bar buffer if sufficient rationale is provided to show that protection of the upstream riffle is maintained.

Alcove: Alcove extractions are located on the downstream end of gravel bars, where naturally occurring alcoves generally form and would provide velocity refuge for juvenile salmonids during moderate to high flows. Alcove extractions are irregularly shaped to avoid disturbance of riparian vegetation, and are open to the low flow channel on the downstream end to avoid stranding salmonids. Alcoves are extracted down to the low flow surface elevation and are small in area and volume extracted, relative to other extraction methods. They are primarily used as a habitat enhancement tool and could be constructed in conjunction with other extraction methods.

Oxbow Extraction: Narrow (average low-flow channel width or less), linear, off-channel excavations along historic channel locations, typically defined on aerial photographs by curvilinear vegetation colonization, muted secondary channels, or as the toe of a moderate to high floodplain or valley margin. Extraction shall be located where a future channel would be desired should the thalweg shift in future years. Features should be located in downstream two-thirds of bar to minimize channel capture and shall not be excavated deeper than the adjacent thalweg. Oxbow extractions located below the 2-year floodplain will be free-draining so as not to impede fish passage, or they can be located on the 2-5 year floodplain.

Access Roads: Access roads exist to all the bars except the four bars on the Upper South Fork of the Gualala; bars 405, 415, 445 and 465. Access roads to these bars have been identified and care will be taken to minimize impacts on the riparian zone. Any new roads that may be required will be located to minimize environmental impact and agency review will be invited prior to construction.

Processing Plant Site Maintenance: Runoff from the processing area is collected in a small settling pond. The ground in the processing and stockpile area is sloped away from the river. When the operation is shut down for the winter, a filtration berm is placed between the processing area and the river. This reduces the amount of gravels and silt that could enter the river.

Stockpiled fines in the processing area shall be moved offsite to an area that is above the estimated elevation of the 100-year flood prior to the wet season. If any expansion of the settling pond is required during the term of the use permit, it should be expanded in the vicinity of the existing settling pond and in the area defined by

the protective berm. Alternatively, a supplemental pond could be located at another site that is at least as high as the estimated 100-year flood stage in that location and at least 100 feet from the top of the channel bank.

9. Annual Extraction Plan

A primary component of the gravel extraction project's planning and impact minimization measures is the continuation of monitoring programs that assess river resource trends over time and adaptive management that results from these monitoring data. Planning and impact minimization of the proposed gravel extraction activities is accomplished through a combination of river monitoring activities involving periodic biological monitoring, evaluation and comparison of aerial photographs coupled with the surveying and comparison of recent and historic surveyed full-channel cross-sections or digital terrain models (DTM) (See Appendix B for examples), which identify hydrological and morphological alterations. The DTMs are created by licensed surveyors using a total station and a stadia rod. The DTM will include the entire extraction bar from bank to bank and 100' up stream and down stream of the extraction bars as show in Appendix A. Using the DTM, a topographic map and cross sections will be produced. The resulting cross sections will meet or exceed the standard of ± 1.0 feet horizontally and ± 0.3 feet vertically. Seven monitoring cross sections (104, 7, 16, 19, 25, 29 and 37) will be measure every year while mining continues.

In addition, Gualala Redwoods, Inc. in cooperation with the Gualala River Watershed Council has an extensive instream monitoring program that was begun in 1998 (See Appendix F). There are monitoring reaches above and below the gravel mining sites. Data collected include temperature, riparian condition, canopy cover, pebble counts, cross sections, thalweg surveys, fish counts, macroinvertebrates surveys, photographs and large wood surveys.

Gravel and sand extraction methods were developed in consideration of local and reach-wide geomorphic process, protection of landforms important for sediment transport continuity, changes in local reach hydraulics and sediment transport characteristics as the result of specific skimming grading plans, and an assessment of the volumes that can be safely extracted without causing reach-wide extraction-induced lowering of the channel bed elevation (degradation) or inducing channel instability.

Prior to extraction, surveyed cross-sections or a DTM of the project area will be developed to document extraction bar topography, typically in the spring after winter stream flows. The cross-sections and/or DTM are utilized to: estimate the volume of replenished aggregate; identify changes in river alignment as well as depositional/degradational trends; propose annual extraction volumes; locate and design extractions complimentary to the natural features of the river channel and track the conditions of previously extracted surfaces to better design future extractions. Aerial photographs will also be taken at least every five years to help track vegetation development within and adjacent to the project area. Much of the information within the review and extraction plan is derived from the comparison of the sequential annual historic photographic and DTMs, channel thalweg surveys, cross sections, physical and biological monitoring data, and field reviews.

The pre-extraction cross-section survey and/or DTM development is typically conducted during the months of May and June. Bed Rock and/or its consultants use the cross-sections and/or DTMs to identify potential extraction areas within the project boundaries. Several factors are considered during extraction planning including site-specific determination of replenishment since the previous season; locations of gravel deposits; morphological changes caused by high flows and changes in sediment deposition patterns from the previous season; assessment of how extraction of selected features will potentially effect surrounding morphology when flows increase again; how the extraction can be blended to surrounding natural contours to minimize extraction-induced depressions and initiation of nick point erosion; assessment of whether riparian vegetation will be disturbed by the extraction activities; and potential use of alternative extraction methods to improve some instream or floodplain habitat features.

Once the proposed extraction plan is developed it is submitted to Sonoma County, CDFG, RWQCB, and NMFS. A field review may be conducted, at the request of the agencies, to describe the proposed plan, solicit comments or recommendations, and make any final modifications. Extraction designs are implemented during operations by marking extraction areas, which may include grade staking, similar to the process utilized in road construction. The heavy equipment operator is provided with temporary stakes and/or hubs in or around the area of extraction indicating the boundaries and grades determined during the extraction plan review process. Typically, final surfaces are designed to be: 1) free-draining toward the river channel; 2) sloped downstream, parallel to the river and/or; 3) complimentary to surrounding natural contours. This design strategy reduces potential channel

shifting, ponding, fish stranding and nick point erosion due to moderate to high-flow inundation.

Gravel extraction will be conducted by skimming of the dry bar surface. Extraction will be accomplished through use of scrapers, tracked bulldozers, front-end loaders and excavators which skim exposed gravel bars. The extraction occurs within an area surrounded by existing ground buffers at the head of bar, edge of water, and floodplain banks. The bar is skimmed down to specific elevations tied to the established local datum as prescribed on the approved annual extraction plan. The finished grade provides for positive drainage towards the low flow channel following inundation by post-mining flow events. The head of bar and edge of water buffers are left intact so that moderate flows and the associated bedload will be directed around the operations area and bar feature, maintaining the low flow channel, not over the bar surface, which might lead to a shift of the channel or braiding. The head of bar buffer is sloped at a 5:1 grade to minimize the potential for headcutting at high flows. The final extraction surfaces readily replenish with aggregate when high flow commences. Extraction bars are chosen because they are within areas of declining sediment transport capacity and sediment deposition during flood events and often they have a recorded history of past gravel extraction, replenishment and maintenance of channel stability of habitat features (i.e. pools, riffles).

In most cases, extraction bars do not support extensive riparian vegetation because they are inundated and scoured frequently by high flows, are too high above summer low flow and groundwater or the sediments are too coarse to hold soil moisture through the summer growing season. However, strips of vegetation are located along the outside of several of the bars (See section 5.3 for a description of riparian vegetation within the project area).

Alternative extraction techniques may be used in some circumstances if the reviewing agencies determine that such methods could be used to enhance aquatic or riparian habitat. Alternative techniques may include excavation below summer low flow to create backwater sloughs and/or alcoves to improve fish and amphibian habitat.

Channel alignment and sediment depositional areas may change from year to year throughout reaches of a particular river. Changes in morphology may necessitate the installation of temporary crossings to access extraction areas where none were needed previously. Summer crossings typically consist of rail flat car bridges or

suitably sized culverts placed across a narrow portion of channel. Installation requires one loader to cross through the active channel to construct the far-side gravel abutment and secure the bridge. Often, sill logs or large concrete blocks are placed beneath the ends of the bridge to provide an elevated abutment to support the ends of the bridge, provide adequate clearance above the low flow channel, and to contain abutment fill. In addition, the installation of summer crossings requires CDFG 1600 agreements.

All activities must be completed by October 31 of each year.

Volumes of extracted aggregate will be reported annually in a manner that links extraction volume with the extraction bars.

During the extraction season and following cessation of seasonal operations, the extraction site may be visited and reviewed by regulatory agency representatives to document compliance with the approved extraction plans. The operator and/or consultants may conduct site reviews at or near the end of the season to recommend bar smoothing and reclamation, prior to agency reviews. The operator is required to do additional reclamation/grading of the site if so determined during the post-extraction visit. Any mitigation measures that were proposed as part of the operator's annual extraction plan will also be analyzed for compliance during the post-extraction visits.

Post-extraction cross-section surveys or DTMs will not normally be required. However, if requested by Sonoma County, the operator's consultant will create a post-extraction DTM of the mined area of the extraction sites.

Biological and geomorphological monitoring will be conducted according to the terms and conditions contained in the 404 permit, 1603 agreement, and 401 certification. The monitoring program will be designed in consultation with Sonoma County, the Corps, NMFS, CDFG and the RWQCB. The intent of the monitoring program is to help ascertain the potential effects gravel skimming may have on aquatic and riparian resources. Examples of monitoring techniques may include instream habitat mapping, water temperature data collection, underwater observation, and adult salmonid spawning surveys. Monitoring reports will be developed and submitted to the Corps, NMFS, CDFG, RWQCB, and County on an annual basis, and distributed to other agencies as requested.

Table 3 Bar names, estimated volumes, minimum baseline elevations by cross section and propose mining approach.

Bar ID	Estimated Volume (cubic yards)	Cross Section Number	Minimum Baseline Elevation	Comment
100 Big Bar	25,600 <i>based on 2005 pre-extraction cross-sections</i>	100	485.61*	The primary extraction approach is a “ horseshoe ” excavation on the bar. The upper 1/3 of the bar is left untouched as is a buffer along the outer edge of the bar equal to 20 percent (40-50’) of the overall channel width. The downstream edge of the horseshoe may also provide some refuge at intermediate flows. Riparian vegetation along the edge of water will be retained as a natural buffer between operations and the wetted channel.
		102	486.1*	
		104♦	486.2*	
		106	486.3*	
		108	486.4*	
		112	486.7*	
		110	486.9*	
280 Fat Bar	3500	1	37.51	The primary extraction approach is a “ horseshoe ” excavation on the bar. The upper 1/3 of the bar is left untouched as is a buffer along the outer edge of the bar equal to, or greater than, 20 percent (30-50’) of the overall channel width. In this case, the buffer may be wider due to a relatively wide vegetated strip.
		1-A	37.85	
		2	38.2	
		2-A	38.45	
		3	38.55	
		4	38.89	
295 Thin Bar	5,600	5	39.53	As the bar is currently configured the primary extraction approach is an inboard skim . The edge of excavation is held away from the dry scour channel located adjacent to the vegetated berm. The reason for the offset is to allow the secondary channel to fill with gravel and keep the extracted surface out of the frequent inundation zone.
		6	39.79	
		6-A	40.17	
		6-B	40.55	
		7♦	40.93	
		7-A	40.97	
		8	40.99	
		9	42.08	
310 Rebar	6,600	10	42.39	The primary extraction approach is a “ horseshoe ” excavation with an irregular outline to avoid patches of riparian vegetation. The upper 1/3 of the bar is left untouched as is a buffer along the outer edge of the bar equal to 20 percent of the overall channel width.
		11	42.51	
		12	42.86	
		11-A	42.91	
		11-B	43.32	
		13	43.72	
Hot Spot		16♦		Long term monitoring Cross Section
370 Valley Crossing Lower	6,400	17	51.62	The primary extraction approach is a “ horseshoe ” excavation on the bar. The upper 1/3 of the bar is left untouched as is a buffer along the outer edge of the bar equal to 20 percent of the overall channel width. The skim will daylight along the downstream 1/3 of the bar to facilitate even drainage.
		18	51.83	
		18-A	51.84	
		18-B	51.84	
		19♦	51.85	
		20	51.89	
370 Valley Crossing Upper	9,200	21	54.01	The primary extraction approach is a “ horseshoe ” excavation on the bar. The upper 1/3 of the bar is left untouched as is a buffer along the outer edge of the bar equal to 20 percent of the overall channel width. Upstream bedrock promontory helps maintain channel steerage.
		22	54.99	
		28	55.26	
		29	55.75	

Wheatfield Bridge CS		25♦		
South Fork Bridge CS		29♦		
385 Bridge Bar	1,350	30	56.43	The primary extraction approach is a “ horseshoe ” excavation on the bar if the channel moves back to its normal location along the left bank. The upper 1/3 of the bar is left untouched as is a buffer along the outer edge of the bar equal to 20 percent of the overall channel width. An alcove excavation may be proposed if the thalweg stays over along the right bank. The alcove shape is intended to provide a refuge for fish during high river flows where reduced turbidity would result in less gill abrasion.
		31	57.18	
		32	57.27	
		33	58.35	
405 Log Bar	2,500	405.1	87.48*	The primary extraction approach is a “ horseshoe ” excavation on the bar. The upper 1/3 of the bar is left untouched as is a buffer along the outer edge of the bar equal to 20 percent of the overall channel width to protect a vegetated strip and channel steerage.
		405.2	89.93*	
		405.3	89.95*	
		405.4	89.97*	
		405.6	90.00*	
		405.7	90.02*	
415 Gauging Station Bar	2,500	415.1	87.49*	The primary extraction approach is a “ horseshoe ” excavation on the bar. The upper 1/3 of the bar is left untouched as is a buffer along the outer edge of the bar equal to 20 percent of the overall channel width or on the inside of the vegetated buffer.
		415.2	87.72*	
		415.3	87.91*	
		415.4	89.13*	
		415.5	89.23*	
		415.6	90.86*	
445 Landing Bar	1,650 with an additional 900 yards for secondary channel skim	445.1	91.91*	The primary extraction approach is a “ horseshoe ” excavation on the bar. The upper 1/3 of the bar is left untouched as is a buffer along the outer edge of the bar equal to 20 percent of the overall channel width or on the inside of the vegetated buffer. Possible secondary channel skim along inboard edge.
		445.2	91.93*	
		445.3	91.96*	
		445.4	92.00*	
		445.5	92.04*	
		445.6	92.10*	
		445.7	92.62*	
465 South Bar	4,000	465.1	94.56*	The primary extraction approach is a “horseshoe” excavation on the bar. The upper 1/3 of the bar is left untouched as is a buffer along the outer edge of the bar equal to 20 percent of the overall channel width or on the inside of the vegetated buffer.
		465.2	94.58*	
		465.3	94.60*	
		465.4	94.62*	
		465.5	94.64*	
		465.6	94.66*	
62 Long Bar	12,000	36	61.80	The primary extraction approach is a “ horseshoe ” excavation on the bar. The upper 1/3 of the bar is left untouched as is a buffer along the outer edge of the bar equal to 20 percent of the overall channel width or on the inside of the vegetated buffer.
		37♦	61.82	
		38	62.28	
		39	62.74	
70 Shady Bar	No data	40	63.72	The primary extraction approach is a “traditional” excavation on the bar. The upper 1/3 of the bar is left untouched as is a 15-foot buffer along the outer edge of the bar.
		41	64.06	
		42	64.17	
		43	65.08	
		44	65.78	

* Elevations are tied to the local datum coordinate system.

♦ Monitoring cross sections that will be measured annually while mining is occurring.

10. Reclamation

The term of the permit is expected to be from July 15th 2007 to July 14th 2017. The reclaimed use will be timber production and is consistent with the zoned use of Timber Production Zone. The area will be reclaimed after mining ceases through natural and intentional means described below.

- The mining area within the active channel will not require any further intentional reclamation beyond the annual reclamation.
- Most of the roads used in the mining operation are permanent logging roads and will remain in use after the mine reclamation. There are ten short bar access roads connecting the logging roads to the gravel bars that will be reclaimed.
- The processing site and the ten bar access roads will be restored to their previous condition of alluvial Redwood forest. We will retain the main road through the processing site for use in forest management and timber harvesting.

Annual reclamation activities will be conducted at the end of the extraction season and include:

- All equipment will be removed to the processing plant site.
- A three foot high berm of washed rock will be place between the extraction site and the river to act as a filter for storm water run off from the site.
- All stream crossings will be removed.
- Stream crossing abutments will be recontoured to match surrounding bar surfaces.
- Post-extraction bar surfaces will be smooth and free-draining as per the extraction plan.
- Bar access roads leading from the floodplain to the extraction bars will be waterbarred. Straw mulch will be applied to a thickness of between 2 and 6 inches to access roads where they cross from the floodplain onto the bars.

Table 4: Annual Reclamation Cost

Item	Cost
Equipment removal	\$500
Grading/waterbarring	\$1,000
Mulching	\$750
Subtotal	\$2,250
Overhead and risk	\$500
Total	\$2,750

Within one year of the time it is deemed necessary to close operations due to termination of the permit, lack of material, failure to extend the mining agreement or other reasons, the following procedures are to be implemented:

- All equipment and buildings will be permanently removed.
- The sediment ponds will be filled in.
- The processing area and the bar access roads will be regraded at no greater than 1 1/2:1 final grading slope or to conform to existing slopes.
- In the processing area, the road which extends from Annapolis Road through the processing site will be maintained as access to the property for future use.
- The processing site and the bar access roads will be ripped at 3' intervals down to 18" to loosen the soil.
- The processing site and the bar access roads will be mulched after ripping. Mulching is to consist of hay or straw and is to be applied 2" to 6" thick.

The goal of the revegetation plan is to reestablish the alluvial Redwood forest. The mining area outside of the active channel was a dense Redwood forest prior to the mining operation. The adjoining forests are almost pure Redwood, with an occasional Alder and California Bay tree.

All denuded area outside the active channel of the river requiring stabilization will be sloped, mulched and revegetated to prevent erosion and to restore the riparian forest and ecological balance of the biotic community. This will be accomplished by completing the following steps.

- Redwood seedlings will be planted at 10' intervals. The seedlings will be healthy young trees in Styro 15 tubes or the equivalent.
- To maintain the natural diversity, Red Alder or California Bay trees in one gallon containers will be planted at a density of at least 5 trees per acre.

- Competing vegetation will be treated with herbicides as necessary.
- The performance criteria for successful revegetation will be to meet the standards in the California Forest Practice Rules Title 14, California Code of Regulations, Chapters 4, 4.5 and 10, Article 5, Standardized Stocking Sampling Procedures. Replanting of Redwood seedlings will occur if the performance criteria are not met.

Bed Rock Inc. accepts the responsibility for reclaiming the mined lands in accordance with the reclamation plan. The post-mining beneficial use of the area will be riverine habitat, forested timberlands and logging staging area.

Table 5: Final Reclamation Costs

Item	Cost
Primary reclamation activities	\$22,240
Revegetation costs	\$5,300
Plant structures and equipment removal costs	\$16,950
Indirect costs	\$15,807
Lead agency administrative costs	\$2,325
Total	\$64,621

Bibliography

EIP Associates, 1994, Gualala Aggregates, Inc. Draft Environmental Impact Report, State Clearinghouse No. 92123014, October 1994, Permit and Resource Management Department, Sonoma County, California.

Klamt, Robert R., C.M. LeDoux-Bloom, M. Fuller, M. Scruggs, D. Morse and J. Clements (multi-disciplinary team leads), 2002, Gualala River Watershed Assessment Report. North Coast Watershed Assessment Program, p. XXX plus Appendices. California Resources Agency, and California Environmental Protection Agency, Sacramento, California.

Halligan, 2003, Stream inventory and assessment report for gravel extraction operations on the South Fork Gualala River, California. Prepared for Gualala Redwoods Inc. by Dennis Halligan, Natural Resources Management Corporation, Eureka, California.

O'Connor, M. and B. Rosser. 2003. Fluvial geomorphic assessment of gravel mining, South Fork and Wheatfield Fork, Gualala River, Sonoma County, California. Prepared for Gualala Redwoods, Inc. O'Conner Environmental, Inc., Healdsburg, CA.

Halligan, 2006, Biological Assessment For Listed Pacific Salmonids That May Be Affected By Bed Rock Products Inc.'s Sand and Gravel Extraction in the Gualala River, Sonoma County, CA.. Prepared for Gualala Redwoods Inc. by Dennis Halligan, Natural Resources Management Corporation, Eureka, California.

Appendix A

Aerial Photos of the Extraction Bars

Appendix B

Typical Extraction Plans

Appendix C

O'Conner Report

Appendix D

Halligan 2003 Stream Inventory and Assessment

Appendix E

Halligan 2006 Biological Assessment

Appendix F

Stream Monitoring Report