SHASTA RANCH AGGREGATES PROJECT
MINING AND RECLAMATION PLAN

Prepared for:

Tullis, Inc.

Prepared by:

EIP Associates
and
Sharrah, Dunlap, Sawyer, Inc.

April, 2005

Revision December 2006

VESTRA Resources, Inc.

See 70542/Rec Plan Addendum/Mining Rec Plan.doc

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Appendix A Shasta Ranch Project Biological Characterization Report
Appendix B Preliminary Groundwater Technical Memorandum
Appendix C Phase 1 Environmental Site Assessment
Appendix D Groundwater Quality Monitoring and Reporting Program
Appendix E Traffic Report
Appendix F Technical Floodplain Elevation Data
Appendix G Geotechnical Report
Appendix H Financial Assurance

*Appendices are available for review at the Shasta County Department of Resource Management (Contact: Bill Walker).

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1. PROJECT SUMMARY

Project Name: Shasta Ranch Aggregates
Mining and Reclamation Plan

Mine Operator: Tullis, Inc.
8585 Commercial
Redding, CA 96002
(530) 241-5570

Owner of Property: Shasta Ranch Estates, LLC
P.O. Box 493416
Redding, CA 96049-3416
(530) 241-5570

Location: The Shasta Ranch Aggregates project site is located along the southwestern bank of the Sacramento River approximately 24 miles southeast of the Shasta Dam, 16 miles south of the City of Redding, and just east of Balls Ferry Road (see Figure 1).

Section, Township Range: The project site is in the San Buenaventura Land Grant, and is surrounded by Township 30 North, Range 3 West.

Latitude and Longitude (at center of project): -122.22149, 40.44128 (NAD 83)

Directions to the site: From Interstate 5, the project site is located approximately 3 miles east. Both the Balls Ferry Road and Deschutes Road exits off of I-5 provide regional access to the site. Existing access to the project site is a narrow, unpaved private road on the east side of Balls Ferry Road. The undeveloped road is situated approximately mid-way between Lone Tree Road to the south and Riverland Drive to the north.

Total parcel size: 660 acres

Total area to be mined: 268 acres

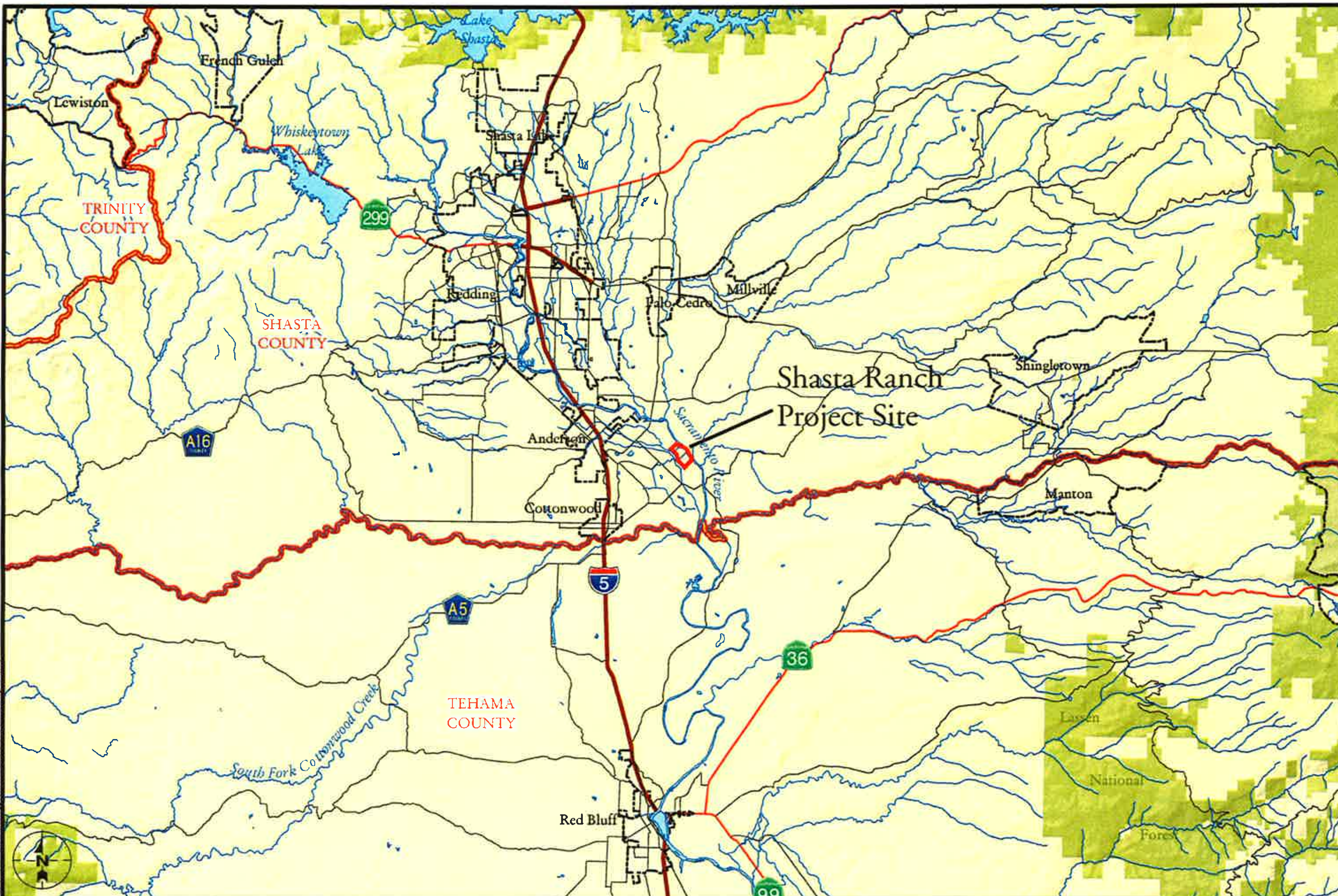
Total area to be reclaimed: 268 acres

Quantity and type of materials to be mined: Aggregate

Proposed start-up date: Fall 2005

Proposed termination date: Spring 2035

Proposed land use after reclamation: Agriculture, ponds, and open space preserves.



N:\GISProjects\Shasta Ranch 10932\Regional Location Map.mxd

EIP ASSOCIATES

Source: California Resources Agency, Legacy Project, California 90 Meter Hillshade, Nov. 2003; CADFG, Land Ownership, April 2001, County Boundaries, January 2004; US Census Bureau, City Boundaries, July 2000; USGS, Rivers and Streams, Dec. 1998; ESRI, Highways and Roads, June 1999; and EIP Associates, Approximate Study Boundary May 26, 2004; and GIS Program, Sept. 13, 2004.

GIS Data Projection: California State Plane, Zone 3, NAD 83, Feet

0 18,500 37,000
Feet

0 3.5 7
Miles

Project Boundary
County Boundary
City Boundary
Lakes and Reservoirs
State Highway
Local Road
Rivers and Streams

FIGURE 1
REGIONAL LOCATION
Shasta Ranch Mining and Reclamation Plan

Project # - 10932-00

2. INTRODUCTION

2.1 Plan Overview and Contents

The Shasta Ranch Aggregate Mining and Reclamation Plan has been prepared in order to support an application for a conditional use permit for surface mining and reclamation activities adjacent to the Sacramento River near the community of Anderson in Shasta County, California. The proposed plan addresses the excavation and processing of aggregate on an approximately 660-acre site roughly 16 miles south of the City of Redding. Approximately 268 acres of the project site would be directly affected by active mining operations, which will occur in three (3) phases over an estimated 24 to 29 years.

The project site currently supports agricultural operations and riparian habitat along the Sacramento River, which runs adjacent to the eastern boundary of the project site. The project would be operated by Tullis, Inc.

This plan was prepared in compliance with Shasta County requirements (Zoning Code, Chapter 18.04, Surface Mining and Reclamation) and the California Surface Mining and Reclamation Act of 1975 (SMARA), as amended. This plan also addresses specific site-related reclamation concerns expressed by the Shasta County Department of Resource Management, Planning Division during plan preparation and meets the California Code of Regulations, Article 9, Reclamation Standards.

The reclamation plan for the Shasta Ranch Project includes the backfill of one mined pit to restore it to active agricultural use. Two other pits created by mining operations would be modified and revegetated to create productive wetland ecosystems that are compatible with the adjacent riparian area and surrounding habitat. Mining on the project site would occur in three phases and reclamation would occur concurrently with those phases to the extent practicable.

The proposed project would preserve onsite areas of emergent marsh wetlands and protect areas of Sacramento River riparian habitat. The project would also include both temporary and permanent fish exclusion levees to exclude migrating salmon and steelhead from excavated areas of the project site during periods of high river flow.

The proposed reclamation plan is a working document and a practical approach to reclamation of the project site. The recommended methods and criteria form the basis for construction and operational procedures for reclamation enhancement following the phased mining of the site and ultimate mine closure.

The Shasta Ranch Project Mining and Reclamation Plan includes the following chapters:

Chapter 1: Project Summary
Chapter 2: Introduction
Chapter 3: Site Conditions

Chapter 4: Excavation and Mining Plan
Chapter 5: Reclamation Plan

Copies of Shasta County's Conditional Use Permit Application for the Shasta Ranch Project and the Technical Appendices referenced in this Mining and Reclamation Plan are bound separately and available for review at the Shasta County Department of Resource Management (Contact: Bill Walker).

2.2 Project Location

The Shasta Ranch project site is located along the southwestern bank of the Sacramento River approximately 24 miles southeast of the Shasta Dam, 16 miles south of the City of Redding, and just east of Balls Ferry Road (see Figure 1). Specifically, the site occurs within California 7.5 minute USGS Quadrangle (Figure 2) and occupies a portion of the San Buenaventura Land Grant, and surrounded on either side by Township 30 North, Range 3 West.

2.3 General Site Characteristics

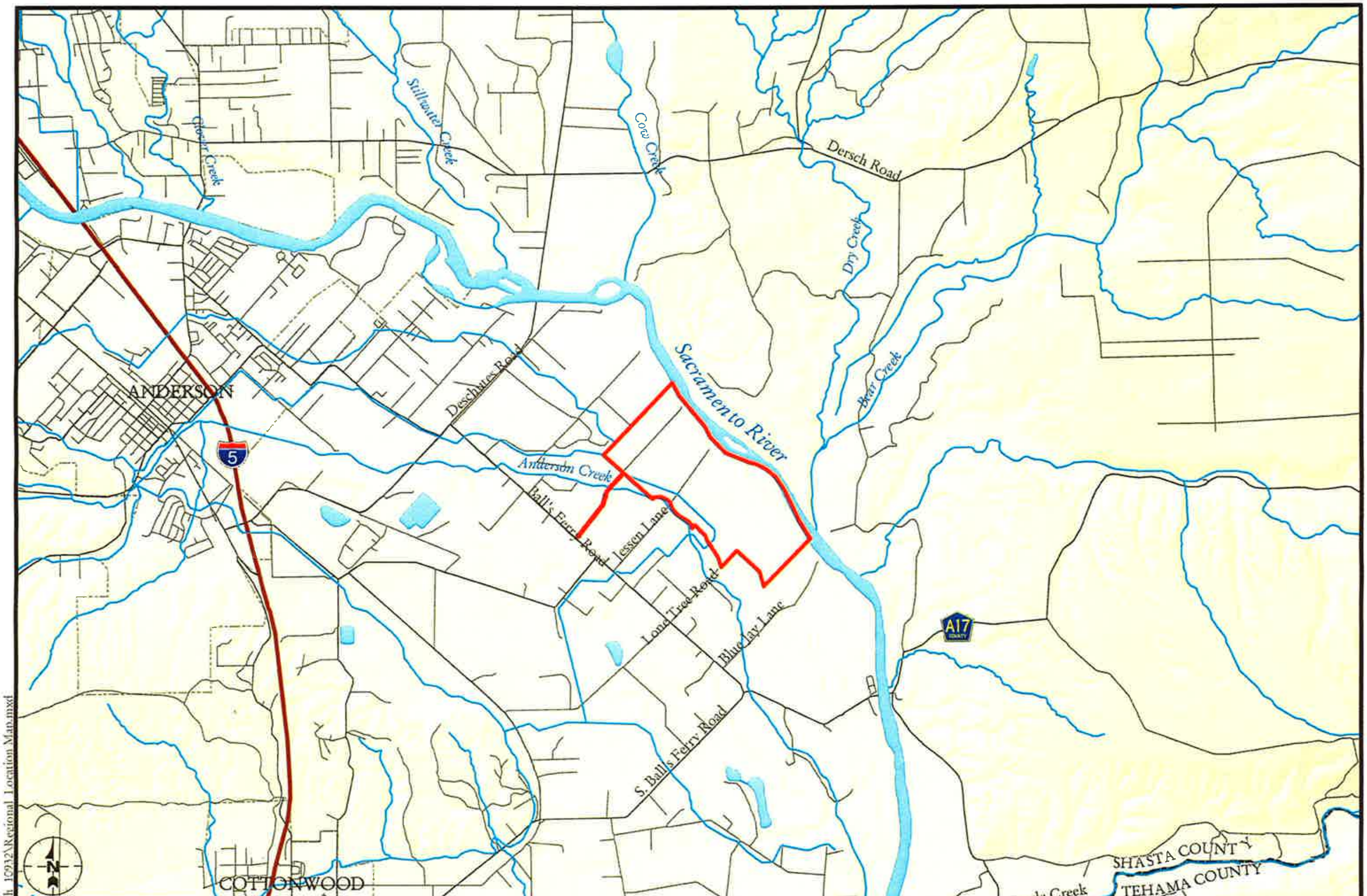
As shown in Figure 3, the project site currently supports row crops, areas of native habitat, and fallow farmland. The site is bounded by the Sacramento River to the east and properties that support a variety of land uses including agricultural and rural residential to the north, south and west. The project site is located in an alluvial floodplain that was once the original channel for the Sacramento River. This ancient channel was transformed and redirected due to historic gold mining in the area. Dredge tailings and hydraulic mining contributed to filling the historic river channel transforming the channel to its current depth and route as it exists today.

Topography of the project site is relativity flat with some gentle slopes along the banks of the river. The Anderson Cottonwood Irrigation District Canal runs adjacent to the project site's southwestern boundary. A depression left from the ancient river bed, discussed above, transects the southwestern portion of the project site running generally north to south. The depression supports areas of standing water, riparian/marsh wetland vegetation and mature trees.

Riparian vegetation occurs adjacent to the Sacramento River along portions of the project site's northeastern boundary. There are no residences located on the project site. The characteristics of the project site are discussed in greater detail in Chapter 2 (Site Conditions) of this plan.

2.4 Project Activities and Timeline

The proposed project would encompass 660 acres, of which approximately 268 acres is proposed to be mined for aggregate. This area is projected to yield approximately 12 million tons of material. This does not include approximately four to five million tons of top soil (overburden) material that would be excavated and used in reclamation. The project applicant estimates mining will occur on the site for approximately 29 years. The rate of mining would be governed by the market demands and local competition. The estimated timeline would be adjusted based on these conditions.



EIP ASSOCIATES

Source: SDS Engineering, Project Boundary, Nov. 2004; CADFG, County Boundaries, July 2004; US Census Bureau, City Boundaries, July 2000; USGS, Hydrology Dec. 1998; ESRI, Highways and Roads, June 1999; and EIP Associates GIS Program, Dec. 8, 2004.

0 0.5 1
Miles

1 inch equals 1 mile

Project Boundary

FIGURE 2
PROJECT LOCATION

Shasta Ranch Mining and Reclamation Plan

Project # - 10932-00

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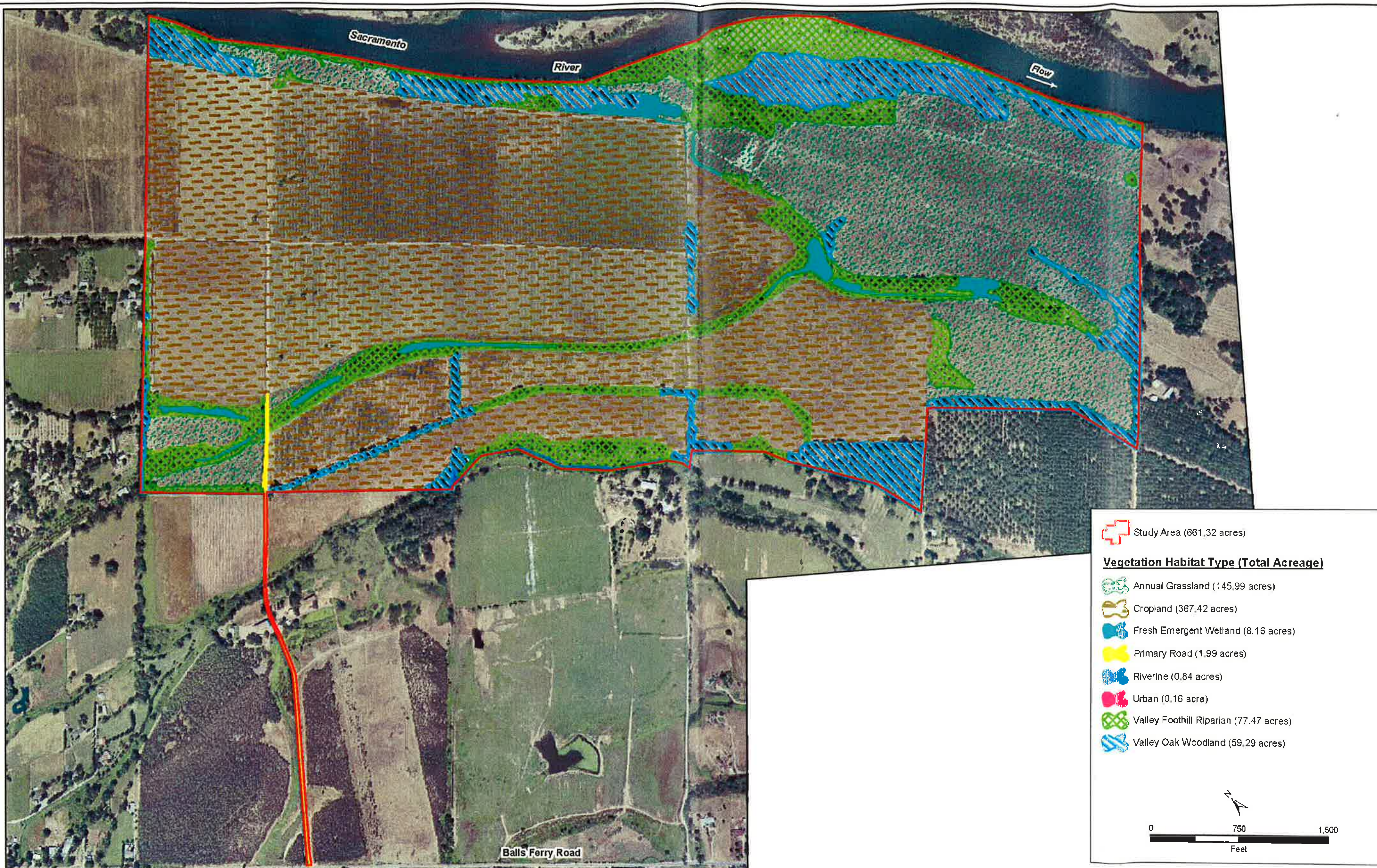


EIP ASSOCIATES

Source: North State Resources, 2005

FIGURE 3
VEGETATION HABITAT TYPES
Shasta Ranch Mining
and Reclamation Plan
Project # - 10932-00

The Shasta Ranch mining plan describes three distinct mining phases with the operation in each phase taking approximately 8-10 years to complete. The mining operations would use a variety of large machinery to transport overburden to a storage (or surge) pile, as indicated on Figure 4, and mine the underlying aggregate. Hydraulic excavators would be used for the excavation of the mining pit areas below the groundwater table, while diesel powered loaders and trucks would be used for moving materials on the project site from the excavators to the processing plant and excavating material above groundwater. The processing plant would be centrally located in relation to the mining phases on the project site so that access and transportation distance between the pits and processing plant would be minimized during the separate mining phases.

The mined aggregate material would be processed using a crusher followed by screening and washing the materials to different sizes. The processed material would become available to the local and regional area for use in general construction projects using concrete aggregate for the construction of foundations for residential, commercial, industrial, agricultural buildings and structures, and miscellaneous aggregate products.

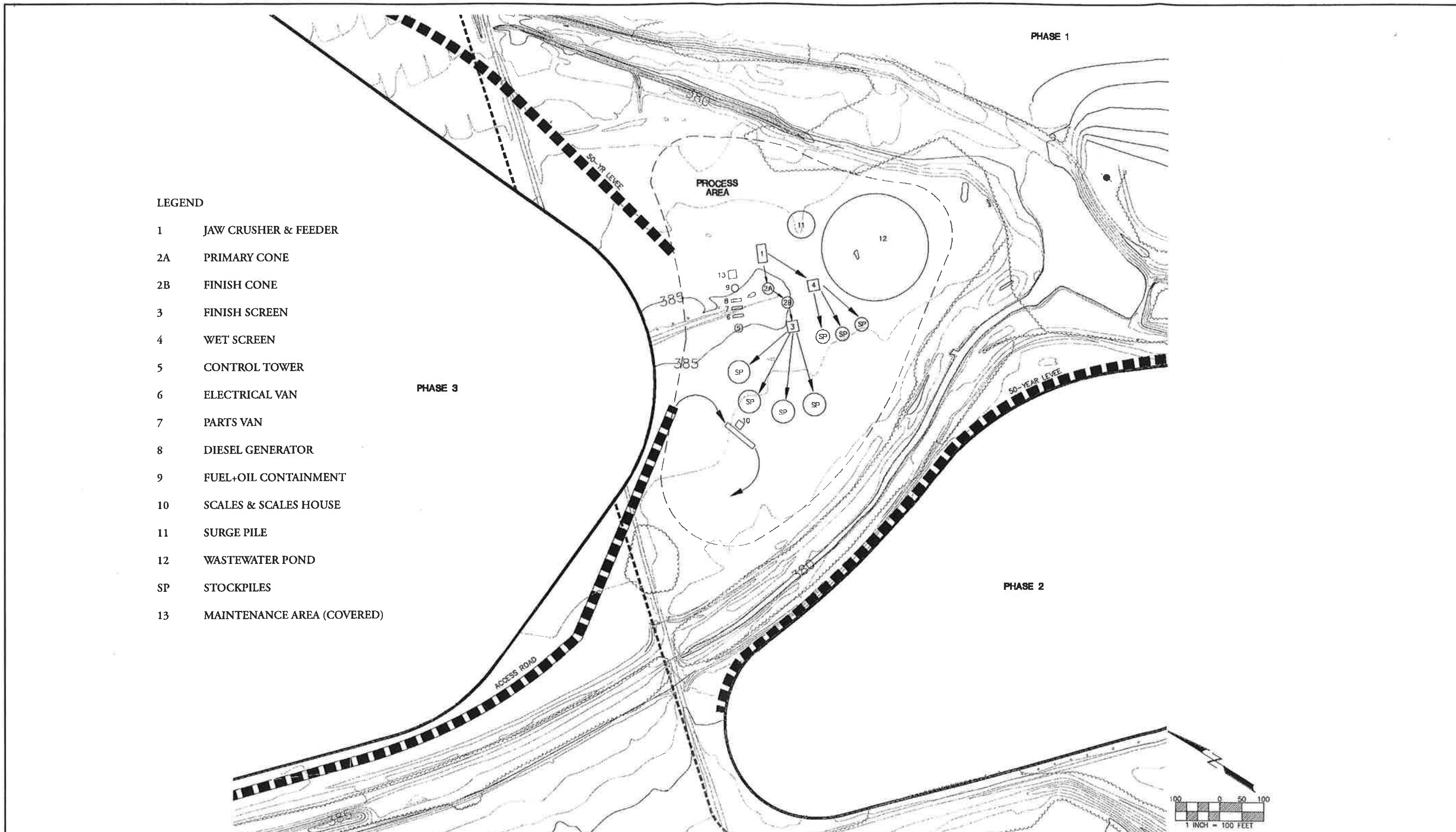
The Phase 1 mining pit would be refilled with overburden and reclaimed for use as farmland. This area is currently used for dryland crops and is not designated "prime farmland." Except for the first mining phase, the excavation pits (Phase 2 and Phase 3) would be reclaimed as ponds. Overburden or native material would be used to develop the side slopes of the ponds and levees to ensure successful revegetation. Backfilling of Phase 1 would be done in phases as mining in the Phase 1 pit proceeds and during the removal of overburden from the Phase 2 pit site after Phase 1 mining is complete.

During mining and reclamation phases of the proposed project, agricultural operations will continue in those fields that are not involved in the mining process or that represent a future phase. The final configuration of the ponds and reclaimed land will depend on the conditions during the mining operation and the available amount of overburden. Conditions that would contribute to the final reclamation of the proposed project are volume of overburden, depth of groundwater and volume of material removed for processing.

2.5 Owners of Surface Mining Interests

The surface ownership:
Shasta Ranch Estates, LLC
P.O. Box 493416
Redding, CA 96049-3416

The operator is:
Tullis, Inc.
dba Shasta Ranch Aggregates
8585 Commercial
Redding, CA 96002



EIP ASSOCIATES

Source: Sharrah Dunlap Sawyer, Inc.

FIGURE 4
PROCESS AND STORAGE AREA SCHEMATIC
Shasta Ranch Mining and Reclamation Plan
Project # - 10932-00

3. SITE CONDITIONS

<u>3.1 Existing Land Use</u>

3.1 a. Project Site

The present land use for the proposed project area is primarily agriculture with the area planted in row crops. However, the southeastern portion of the site is currently fallow. The primary crops grown on the parcel are alfalfa, corn, pumpkins and oats. The property also contains a small feed lot, cattle corrals, and homes on the southwest side of Anderson Creek, which runs along the southwest boundary of the site. A Pacific Gas & Electric (PG&E) transmission line runs northeast-southwest through the site, generally following an unimproved dirt road that provides access to the site and ends at the Sacramento River. Other smaller unimproved roads traverse portions of the site and its boundaries. These features are shown in Figure 5. The Sacramento River borders the project site along the northeast project boundary.

3.1 b. General Plan and Zone Information

The Shasta County General Plan Land Use Element designates the project area as AG (Agriculture). The properties that make up the project site are zoned EA (Exclusive Agriculture) and EA-MR (Exclusive Agriculture-Mineral Resource). The Zoning Ordinance allows for surface mining and site reclamation in the EA zone through the issuance of a Use Permit. The reclamation plan must comply with the provisions of State Mining and Reclamation Act of 1975 (and all subsequent amendments) and with the State Mining and Reclamation Policy set forth in Chapter 8, Title 14 of the California Code of Regulations.

3.1 c. Mineral Resource Zone Classification

Section 2761 (a) and (b) and 2790 of the Surface Mining and Reclamation Act (SMARA) was enacted in 1975 to provide for a mineral lands inventory process termed classification-designation. Mineral resource areas are classified by the State Geologist on the basis of geologic factors, without regard to existing land use and land ownership. The areas are categorized into four mineral resource zones (MRZ-1 through MRZ-4). The MRZ-2 classification adopted by State Mining and Geology Board (SMGB) is defined as an area where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood exists for their presence.

A Mineral Land Classification Report has been completed for Shasta County for alluvial sand and gravel, crushed stone, volcanic cinders, limestone, and diatomite (DMG Open-file Report 97-03). Portions of the project site that border the Sacramento River are classified as Sacramento River, MRZ-2b$^{SG(pcc-3)}$.

EIP ASSOCIATES

Source: Sharrah Dunlap Sawyer, Inc.

FIGURE 5
PRE-MINING TOPOGRAPHY
Shasta Ranch Mining and Reclamation Plan
Project # - 10932-00

The definition of the MRZ-2b classification is as follows:

> MRZ-2b – Areas underlain by mineral deposits where geologic information indicates that significant inferred resources are present. For this report, areas classified MRZ-2b contain discovered mineral deposits that are significant inferred resources as determined by their lateral extension from proven deposits or their similarity to proven deposits. Further exploration could result in upgrading areas classified MRZ-2b to MRZ-2a.

The "SG(pcc-3)" part of the MRZ-2b classification indicates alluvial sand and gravel suitable for use as PCC-grade aggregate. The MRZ-2b classification applies to approximately 363 acres of the project site.

The project site is also within the Sacramento River Aggregate Resource Area (ARA) C-11. An ARA is an area classified by the State Geologist as MRZ-2a$^{SG(pcc)}$ and MRZ-2b$^{SG(pcc)}$ for concrete-grade aggregate and is deemed available for mining based upon criteria for compatibility provided by the SMGB. Lands that have compatible uses are defined as those that are non-urbanized or that have very low density residential development (one unit per 10 acres), land that does not have high cost improvements, and lands used for agriculture, silviculture, grazing, or open space.[i] Approximately 313 acres of the project site are within the boundaries of the approximately 829-acre Sacramento River ARA C-11.

The location of the site relative to the MRZ-2b and ARA areas are illustrated in Figures 6 and 7.

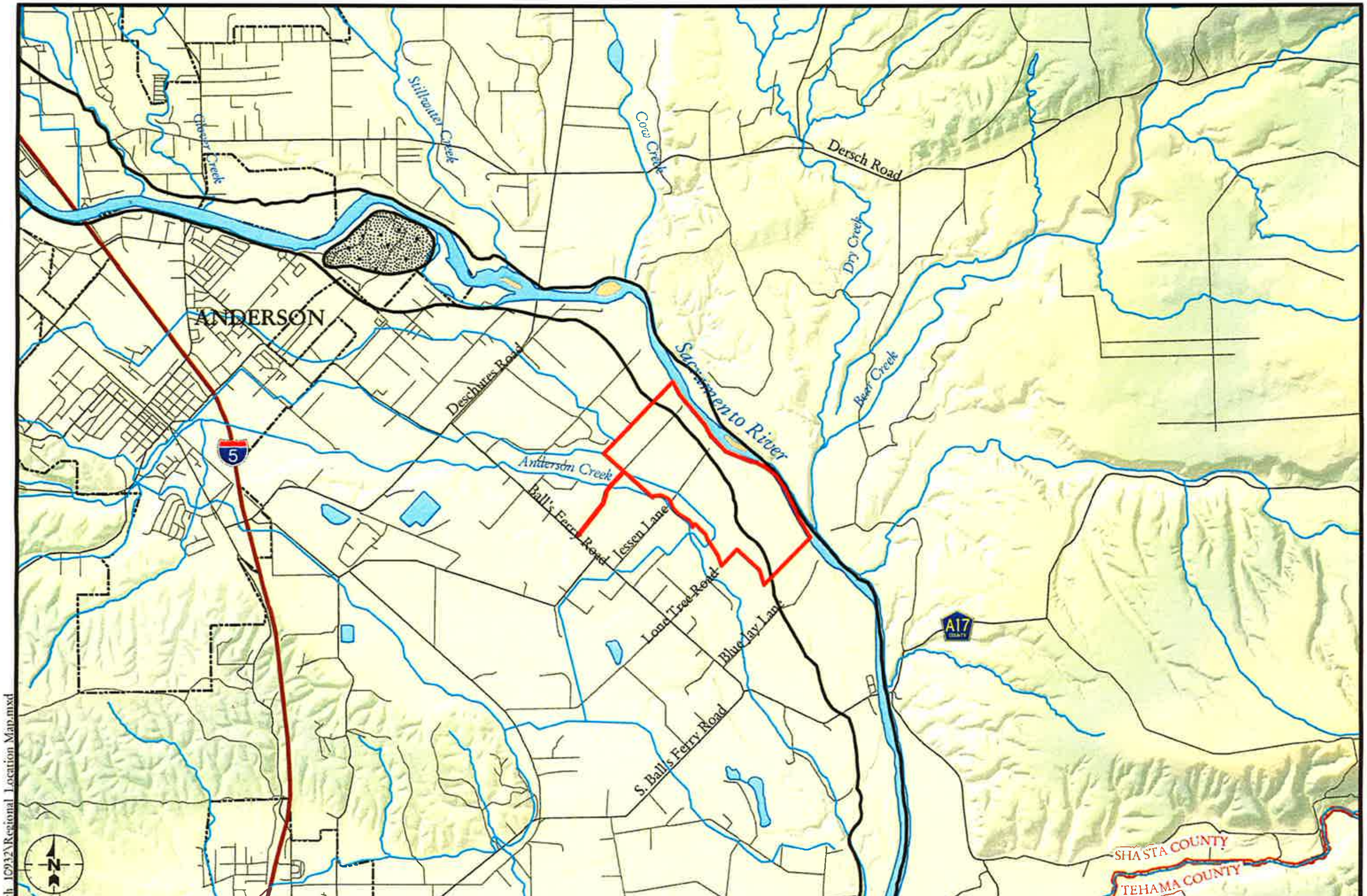
3.1 d. Surrounding Land Use

The lands surrounding the project site to the south, north, and west are primarily rural residential properties, some of which are used for ranching and farming activities. The proposed mining site is bordered on the north and northeast by the Sacramento River. The land across the river from the project site, the Fenwood Ranch, is a conservation easement used for ranching and agriculture and is part of the Shasta Land Trust. The properties to the south of the site are used for agriculture with row crops and orchards, beyond which are rural residences. The closest residence is located approximately 30 feet from the project's property line/boundary, which is approximately 1600 feet northwest of the Phase 3 extraction area. The nearest residence to the mineral extraction area is located approximately 800 feet southeast of Phase 1. The nearest residence to the processing area is located approximately 2,000 feet to the west of the processing plant. The parcels surrounding the project site and a list of the corresponding landowners are shown on Figures 8 and 9.

3.1 e. Aesthetics

The existing visual character of the site is that of an open agricultural field with power lines bisecting the site. Vegetated buffers along the Sacramento River and Anderson Creek and scattered vegetation within the site provide visual relief to the cultivated fields that dominate the site's visual environment.

The proposed operations would not be visible from Balls Ferry Road due to the shape of the site and because the portion of the site that borders this road would not be a part of the mining operations. Most of the surrounding residences would have obstructed views of the operations due to existing vegetation. Some views from properties to the southeast and northwest of the property,



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EIP ASSOCIATES

Source: USGS, 10m DEMs, 1996; Cal. Dept. of Miningand Geology, Mineral Resource Zones, 1997; SDSEngineering, Project Boundary, July, 2004;CADFG, Land Ownership, April 2001, County Boundaries, January 2004; US Census Bureau, City Boundaries, July 2000; USGS, Rivers and Streams, Dec. 1998; ESRI, Highways and Roads, June 1999;and EIP Associates GIS Program, Nov. 18, 2004.

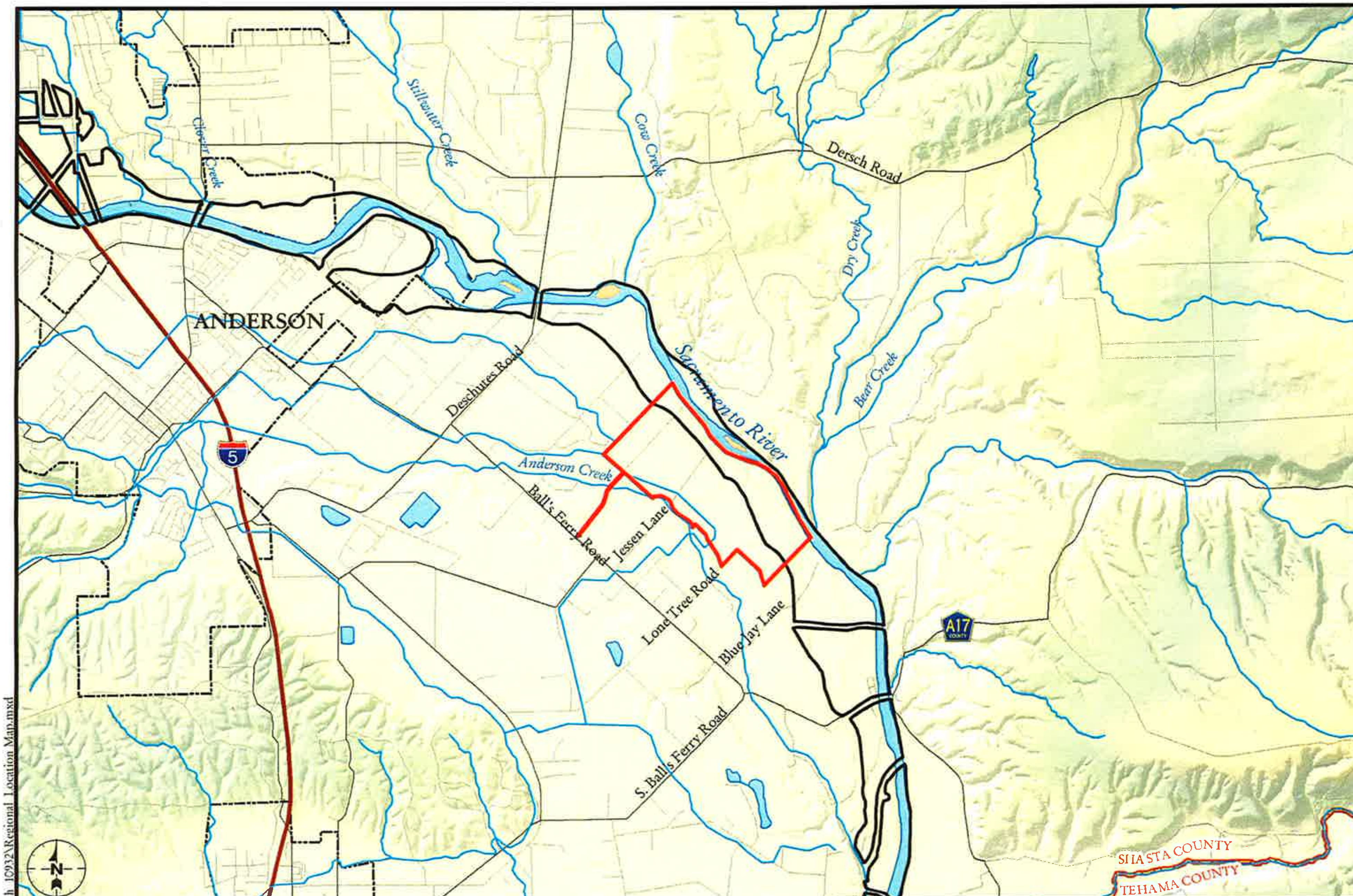
0 0.5 1
Miles

1 inch equals 1 mile

Project Boundary
MRZ-2b
Mined out areas
County Boundary
City Boundary
State Highway
Local Road
Rivers and Streams
Lakes and Reservoirs

FIGURE 6
MINERAL RESOURCE ZONE CLASSIFICATION
Shasta Ranch Mining and Reclamation Plan

Project # - 10932-00



EIP
ASSOCIATES

Source: USGS, 10m DEMs, 1996; Cal. Dept. of Miningand Geology, Aggregate Resource Areas, 1997; SDSEngineering, Project Boundary, July, 2004;CADFG, Land Ownership, April 2001, County Boundaries, January 2004; US Census Bureau, City Boundaries, July 2000; USGS, Rivers and Streams, Dec. 1998; ESRI, Highways and Roads, June 1999;and EIP Associates GIS Program, Nov. 18, 2004.

0 0.5 1
Miles

1 inch equals 1 mile

Project Boundary
Aggregate Resource Area
County Boundary
City Boundary
State Highway
Local Road
Rivers and Streams
Lakes and Reservoirs

FIGURE 7
AGGREGATE RESOURCE AREAS
Shasta Ranch Mining and Reclamation Plan
Project # - 10932-00

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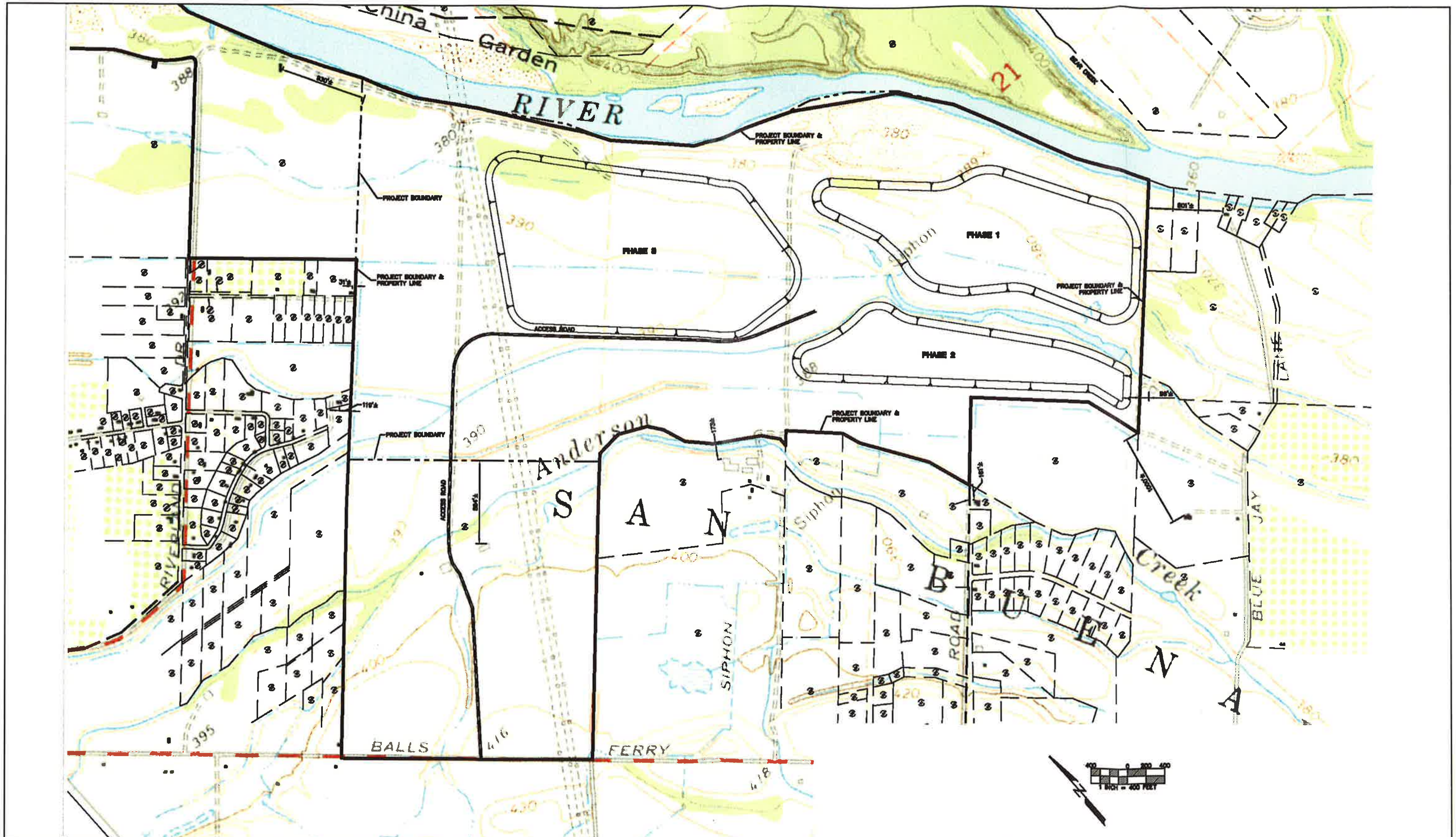

EIP ASSOCIATES

Source: Sharrah Dunlap Sawyer, Inc.

FIGURE 8
SHASTA RANCH GENERAL LOCATION MAP (1 OF 2)
Shasta Ranch Mining and Reclamation Plan

Project # - 10932-00

ADJACENT PROPERTY OWNERS

(1) APN 091-130-013
SAPP FAMILY TRUST
4407 SNAFFLE BIT CT
ANTELOPE, CA 95843

(2) APN 091-130-0011
SAPP SALLY J
4407 SNAFFLE BIT CT
ANTELOPE, CA 95843

(3) APN 091-130-004
HOWARD W BALL
4711 SHADE TREE LANE
SANTA ROSA, CA 95405-7840

(4) APN 091-130-008
PHILIP D & MELISSA RAWSON
22920 BLUE JAY LANE
ANDERSON, CA 96007

(5) APN 091-130-009
WILFRED H & JUDY BAUER
22928 BLUE JAY LANE
ANDERSON, CA 96007

(6) APN 091-130-006
LARRY C HOLT
22958 BLUE JAY LANE
ANDERSON, CA 96007

(7) APN 091-130-007
LARRY L GRAY
21143 HAWTHORNE BL. #398
TORRANCE, CA 90503

(8) APN 091-130-001
DANIEL P HAGUS
8443 COMMERCIAL WAY
REDDING, CA 96002

(9) APN 091-140-001
JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
138 REGIS ST. #A
TURLOCK, CA 95382

(10) APN 091-140-004
CYNTHIA D SCOTT
22800 BLUE JAY LANE
ANDERSON, CA 96007

(11) APN 091-140-003
BYRON C & GWENDOLYN R WIMMER
22784 BLUE JAY LANE
ANDERSON, CA 96007

(12) APN 091-140-002
J VINCENT & JOANNE M HAGUS
22742 BLUE JAY LANE
ANDERSON, CA 96007

(13) APN 091-150-001
JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
138 REGIS ST. #A
TURLOCK, CA 95382

(14) APN 091-120-006
JOHN HANCOCK MUTUAL LIFE INSURANCE CO.
138 REGIS ST. #A
TURLOCK, CA 95382

(15) APN 091-080-003
J VINCENT & JOANNE M HAGUS
22742 BLUE JAY LANE
ANDERSON, CA 96007

(16) APN 091-080-005
MICHAEL R & CHARLIS NOBLE
22485 LONE TREE ROAD
ANDERSON, CA 96007

(17) APN 091-090-019
ROBERT A & CINTHIA BRANNON
22463 LONE TREE ROAD
ANDERSON, CA 96007

(18) APN 091-090-009
FREDERICK M & NORA BUTLER
4859 PHEASANT DRIVE
ANDERSON, CA 96007

(19) APN 091-090-008
JAMES & GAIL MELLOW
4853 PHEASANT DRIVE
ANDERSON, CA 96007

(20) APN 091-090-007
JEFFREY L & STACY L HUTCHINS
4851 PHEASANT DRIVE
ANDERSON, CA 96007

(21) APN 091-090-006
CHARLES F STAPLES
PO BOX 1071
ANDERSON, CA 96007

(22) APN 091-090-005
ROBERT L & GLADYS L BOX
PO BOX 807
ANDERSON, CA 96007

(23) APN 091-090-004
RICHARD M & LA RAINE PEREZ
4823 PHEASANT DRIVE
ANDERSON, CA 96007

(24) APN 091-090-003
HARRY W JR & SHILEY MARKS
4797 PHEASANT DRIVE
ANDERSON, CA 96007

(25) APN 090-090-002
NANCY J UNGER
4773 PHEASANT DRIVE
ANDERSON, CA 96007

(25) APN 091-090-001
RAYMOND L SR & LORI JO GIFFORD
4737 PHEASANT DRIVE
ANDERSON, CA 96007

(27) APN 091-090-016
RONALD M RELIC
2564 WALNUT BLVD.
WALNUT CREEK, CA 94596

(28) APN 091-090-017
RONALD M RELIC
2564 WALNUT BLVD.
WALNUT CREEK, CA 94596

(29) APN 091-090-018
RONNIE L & MARILEE WEBB
4772 PHEASANT DRIVE
ANDERSON, CA 96007

(30) APN 091-090-015
ROBERT J & LORAIN E BUTLER
4788 PHEASANT DRIVE
ANDERSON, CA 96007

(31) APN 091-090-014
GEORGE & WINFRED MAKER
4820 PHEASANT DRIVE
ANDERSON, CA 96007

(32) APN 091-090-013
DENNIS K & JOAN HARTSOUGH
4844 PHEASANT DRIVE
ANDERSON, CA 96007

(33) APN 091-090-012
JOHN P & LISA R WESTMORELAND
4850 PHEASANT DRIVE
ANDERSON, CA 96007

(34) APN 091-090-011
JAMES L & BELVA J ARAIZA
4856 PHEASANT DRIVE
ANDERSON, CA 96007

(35) APN 091-090-010
RENEE & JASON LAUBY
4862 PHEASANT DRIVE
ANDERSON, CA 96007

(36) APN 091-090-020
JOHN KINNEAR & H REV LIV TRUST
22441 LONE TREE ROAD
ANDERSON, CA 96007

(37) APN 091-100-012
DENNIS Y & MARILYN R GOODMAN FAM TRUST
22419 LONE TREE ROAD
ANDERSON, CA 96007

(38) APN 091-100-013
HORTON REVOCABLE TRUST
22411 LONE TREE ROAD
ANDERSON, CA 96007

(39) APN 091-100-014
WM LEE & CONSTANCE S HORTON
22405 LONE TREE ROAD
ANDERSON, CA 96007

(40) APN 091-100-006
CHARLES DON & DARREL YN P DUNN
22359 LONE TREE ROAD
ANDERSON, CA 96007

(42) APN 091-080-006
DAVID & LINDA HAGUS
22515 LONE TREE ROAD
ANDERSON, CA 96007

(43) APN 091-080-007
COUNTY OF SHASTA

(44) APN 091-050-003
BENNY LEE NEWLAND TRUST
22478 LONE TREE RD
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Source: Sharrah Dunlap Sawyer, Inc.

FIGURE 9
SHASTA RANCH GENERAL LOCATION MAP (2 OF 2)
Shasta Ranch Mining and Reclamation Plan

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however, are currently unobstructed. The conservation easement land across the river is situated on a bluff at a higher elevation than the project site. If these lands were publicly accessible, project operations would be visible from the property across the river.

3.2 Geologic Description

3.2 a. Geologic Setting

Published geologic maps prepared by the United States Geological Survey (USGS), California Geological Survey (CGS) and California Department of Water Resources (DWR) indicate that the site and surrounding area is underlain by a thin mantle of Holocene (younger than 11,000 years) and Late Pleistocene age (less than about one-half million years), unconsolidated alluvial deposits associated with the Sacramento River. Weakly cemented bedrock underlying these young alluvial deposits and exposed within elevated areas in the vicinity include the Pliocene age (about 2 to 4 million years old) Tuscan and Tehama formations.

Sacramento River Channel Deposits

The youngest alluvial deposits on the site are mapped as Holocene-age alluvium within the Sacramento River channel and the lowest adjacent terraces.[ii] This alluvial material consists primarily of unconsolidated sand, gravel and cobble channel and natural levee deposits. Where these deposits form broad terraces immediately adjacent to the river, they commonly have a mantle of overbank silt flood deposit. These Holocene-age sediments are unweathered and vary in thickness up to about 70 feet. On-site, these Holocene-age deposits exist within the proposed Phase 1 mining area and along the northeast margin of the Phase 3 mining area.

Modesto Formation

The Latest Pleistocene-age alluvial deposits along the Sacramento River and tributaries form low terraces just beyond the Holocene-age deposits. The deposits are very similar to the Holocene-age alluvium, consisting primarily of unconsolidated sand, gravel, cobble and silt. The terraces generally are mantled with an overbank silt/clay deposit, which varies in thickness up to about 12 feet. The formation ranges from about 12,000 to 40,000 years in age.[iii] The deposits are generally unweathered to slightly weathered and up to about 80 feet in maximum thickness. On-site, the Modesto Formation exists within the proposed Phase 2 mining area and within the majority of the Phase 3 mining area.

Tuscan and Tehama Formations

Underlying the Holocene and Late Pleistocene alluvial deposits at the site are Pliocene-age weak bedrock deposits of the Tuscan and Tehama formations. These formations are about 1,000 feet thick in the project vicinity. The Tuscan formation consists of alluvium and volcanic mudflow deposits derived from now-extinct volcanic vents located east of the Sacramento Valley. The Tehama Formation is almost exclusively alluvial and derived from the Coast Ranges and Klamath Mountains west of the Sacramento Valley. The two formations are generally the same age and interfinger at their distal margins near the Sacramento River in the Anderson area. Bedrock of these two Pliocene-age formations is typically weak due to poor lithification and cementation. At the site, sandy tuff (volcanic ash rock) of the Tuscan Formation was encountered at depths ranging from 18 to 32 feet beneath the existing ground surface in borings. The Tuscan Formation is also exposed within the lower 30 to 40 feet of the bluff across the Sacramento River from the site.

Older Pleistocene Alluvial Deposits

In the vicinity of the site at slightly higher elevations are older alluvial terrace deposits of the Riverbank and Red Bluff formations. The Riverbank Formation consists of alluvial sand, gravel, silt and clay. Because of age, alluvial deposits of this formation are moderately to highly weathered and more consolidated that the younger alluvial deposits described above. Riverbank Formation deposits, which range in age from about 100,000 to 400,000 years, occur southwest of Anderson Creek and over broad areas west of the site.

The Red Bluff Formation is the oldest (and generally highest) Pleistocene alluvial terrace deposit. This formation covers broad areas of the northern Sacramento Valley. Because of age (about ½ to 1 million years), this formation is highly weathered for considerable depth and exhibits a strong red-orange color. This formation is exposed within the upper portion of the bluff across the Sacramento River from the site, about 40 feet above the river.

3.2 b. Topography and Landform

The entire project area encompasses approximately 660 acres of gently rolling river floodplain areas and woodlands, and relatively flat agricultural fields. Elevations within the project site range between 370 and 420 feet above mean sea level. The Sacramento River is located along the northeastern boundary of the project area with Anderson Creek running along a portion of the southwest boundary of the project site. Within the project site, an irrigation canal and ancient river channel (located between Phases 1 and 2) are the lowest points.

3.2 c. Soil Types

Soil Characteristics

Soil borings installed at six locations throughout the site indicate the following soils: silty gravel (GM); sand silty sand (SM); sandy silt/silty sand (ML/SM); silty sand/sandy silt (SM/ML); silty clay (ML-CL); and lean clay (CL). These soils extend to depths ranging from 5 feet beneath the surface to 16 feet. The granular soils were typically loose to medium-dense, while the fine-grained soils were typically soft to medium stiff. Beneath the surficial soils are dense to very dense gravel granular materials including well-graded gravel (GW), poorly graded gravel with sand (GP), and silty gravel (GM). These were encountered to depths ranging from 18 to about 28 feet. Poorly graded sand (SP), silty sand (SM), clayey sand (SC), silty gravel (GM), lean clay (CM), and sandy tuff were present beneath the gravels to a depth of 33.5 feet beneath grade (maximum exploration depth). The in-place relative density of the granular soils typically ranged from medium dense to very dense. Soil boring logs are included in Appendix G (geotechnical report).

Prime Farmland Soils

Portions of the project site are considered Prime Farmland by the Department of Conservation's Farmland Mapping and Monitoring Program. In addition, the project site consists of topsoil that was classified by the U.S. Department of Agriculture, Natural Resources Conservation Service

(NRCS) in its most recent soil survey publication of April 29, 2004. This soil data published by the NRCS indicates that the majority of soils in the project site are considered as either "farmland of statewide importance" or "prime farmland if irrigated." These soils are located in the areas that would be disturbed from mining activities (i.e., in the different extraction phases). A recent field survey of site conditions (October 2004) indicates that soils in the southeastern portion of the project site have not been actively irrigated and the topsoil appears to have a significant amount of gravel or cobbles: an indication that the NRCS inclusion of this area under the "farmland of statewide importance" and "prime farmland" designation may be incorrect, in the vicinity of Phase 1 and Phase 2 mine areas.

In addition, the geotechnical survey of the site indicates that topsoil in the same area is generally shallow, with aggregate resources occurring close to the surface. "Prime farmland" or "farmland of statewide importance" designations are based on the criteria that soils are deep and of high quality with few rocks. Because the soil in the southeastern portion of the project site is poor, it should not be considered in either of these categories.

3.2 d. Description of Aggregate Deposits

County

Five areas in Shasta County covering 14,599 acres have been classified as MRZ-2b for alluvial aggregate by the State Geologist. Concrete-grade alluvial aggregate occurs in stream beds, flood plains, terraces, and channel bars along and adjacent to the major streams and rivers in Shasta County. The Sacramento River drainage basin and its tributaries in particular, has extensive deposits of concrete-grade alluvial aggregate resources.

The Sacramento River in this area overlies the lower Pleistocene Red Bluff Formation and/or the interfingered Pliocene Tehama and Tuscan formations. The active river channel in this area has abundant alluvial sand and gravel deposits. Adjacent off-channel elevated alluvial terraces that border the active river channel also contain significant amounts of hard, durable Holocene and Pleistocene sand and gravel resources. Elevated off-channel terraces represent abandoned in-filled meandering channels with scattered random, discontinuous clay and silt lenses, which represent overbank flood deposits that formed during periods of high water. The lenses generally range in thickness from a few inches to more than 5 feet. Past sand and gravel mining in this area may have reached depths in excess of 35 feet. Average sand and gravel thicknesses are assumed to be about 20 feet beneath a soil/clay overburden that typically mantles the terraces. Overburden generally varies from less than 2 feet to more than 8 feet. Areas along the Sacramento River and its adjacent terraces in and south of Redding that are within the Sacramento River, MRZ-2b$^{SG(pcc-3)}$ boundaries have been extensively mined for aggregate since the early 1900s. An estimated 730 acres have been depleted.

The Clear Creek ARA C-11 is estimated to contain 658,000 tons of aggregate resources (including permitted reserves).[iv]

Project Site

Soil borings were conducted by Kleinfelder Engineering at six locations across the Shasta Ranch project site. The soil bore logs show that aggregate was encountered at depths ranging from 0 to 10 feet below the ground surface. The thickness of these aggregate deposits average approximately 15 feet.

Aggregate in these deposits typically is mixed with silt and sand in varying proportions. Overburden found above the aggregate deposits was identified in the bore logs as consisting of a variety of materials including lean clay, sandy silt, silty sand, and silty clay. Materials encountered beneath the aggregate deposits included Tuscan Formation, lean clay, clay sand, clay and tuft, tuft, and sandstone.

3.2 e. Seismic Considerations

<u>Faulting</u>

Anderson and the Sacramento Valley, in general, are not characterized by an abundance of active faulting. The site is not located within an Earthquake Fault Zone designated by the State of California.[v] Published mapping indicates that the closest active fault system considered to have ruptured the ground surface is Hat Creek fault zone located about 48 miles northeast of the site.[vi] The north end of the Mohawk Valley fault zone, located about 45 miles to the east, is considered active as well. The closest fault known to have been active during the Pleistocene, thus considered to be potentially active, is the Battle Creek fault, which is mapped about 3 miles south of the site.

The northern terminations of the Corning and Chico Monocline faults are mapped by CGS about 20 miles south and 22 miles southeast of the project site, respectively. Although these faults do not break the ground surface, and interpretation of associated geologic structures indicate that large earthquakes likely have recurrence intervals on the order of tens of thousands of years, they are considered to be possible sources of significant earthquakes. Numerous microseismic events and at least two earthquakes greater than Richter magnitude 4 have been recorded at the southern end of the Coring fault. Additionally, the Corning fault has deformed the ground surface through folding of latest Pleistocene sediments and is, therefore, also considered a potential seismic source in the region.

There are a series of thrust faults located along the western margin of the Sacramento Valley, about 30 to 40 miles west of the site, which comprise the northern portion of the Great Valley fault system. The Great Valley fault system, like the Chico Monocline and Corning faults does not reach the ground surface, but is known to be active. These active and potentially active faults are potential sources of earthquakes that could result in moderate to strong shaking in the Anderson area.

<u>Historical Seismicity</u>

Anderson is located within an area of low seismic activity relative to other areas of California. According to the California Building Code (CBC, 2001 edition) the site is located in Seismic Zone 3. *The Probabilistic Seismic Hazards Mapping Ground Motion Page* at the CGS website indicates that the peak ground acceleration (PGA) for the DBE at this "alluvial" site is 0.25g.

Relative to historical seismicity, CDMG Map Sheet 49 indicates that six M5 or greater earthquakes, and none of M6 or greater, have been reported to have occurred within about 70 miles of the site during the period of 1800-1999. Table 1 lists these earthquakes, dates of occurrence, and respective distances from the site.

TABLE 1 SIGNIFICANT HISTORICAL EARTHQUAKES			
Date	**Magnitude (M)**	**Approximate distance & direction from site (miles)**	**Location (Approx.)**
01-07-1881	5.0	32 SE	Los Molinos
04-15-1928	5.5	37 SW	Newville
02-08-1940	5.7	44 SE	NE of Chico
07-07-1946	5.0	38 E	Lassen Peak
03-20-1950	5.5	38 E	Lassen Peak
11-26-1998	5.2	13 N	Redding
Source: Kleinfelder (2005). Based on *Epicenters and Areas Damages by M>5 Earthquakes in California*, *Map Sheet 49,* prepared by CDMG in 2000, and the *Seismic Hazards Assessment for the City of Redding, California,* prepared by Woodward-Clyde in 1995. Seismographic values for magnitude (M) are used as available, moment magnitude is used where available, otherwise Richter (local) magnitude of surface wave magnitude is used.			

In addition to those listed above, an earthquake of estimated Richter magnitude 4.5 struck the Anderson area on April 16, 1904.

Liquefaction

A variety of factors can influence liquefaction potential, including soil type, grain size, relative density, soil age, depth to groundwater, and intensity and duration of ground shaking. Soils most susceptible to ground shaking are saturated, Holocene-age, and consist of loose clean sand and silty sand.

The potential for an earthquake with the intensity and duration characteristics capable of promoting liquefaction is a possibility during the design life of the project. Additionally, relatively clean granular soils are common in the subsurface. Relatively low-density silty sands were encountered in three of the six borings extending from near-surface to as deep as 12 feet beneath existing grade, with groundwater at 8 to 9 feet. Results of liquefaction analysis indicate the very loose to loose sands are susceptible to liquefaction when subjected to the seismicity expected in the vicinity of the site. Estimates of potential settlements range from ½ inch to nearly 3 inches. Settlement as much as 5 inches could occur if a seismic event were to occur while a quarry is flooded such that the existing site elevations become submerged.

Lateral Spreading

The presence of potentially liquefiable silty sands indicates the potential for lateral spreading. Laboratory testing of soils indicate the very loose to loose silty sands could experience lateral spreading on the order of 1 to 4 feet under the seismic accelerations expected during the life of the project.

Seismic Design Considerations

The site is in a region of low to moderate seismic activity, but could be subjected to strong ground shaking during the life of the project. As a result, facilities at this site should be designed in accordance with applicable seismic provisions of the building codes. Structures should be designed for lateral force requirements as set forth in Section 1630A of the CBC (2001). Parameters for input to seismic modeling are provided on the basis of information contained in this report and the CBC Design Basis Earthquake (DBE) as follows:

TABLE 2

SEISMIC DESIGN PARAMETERS

Seismic Design Parameter	Reference	Symbol	Value
Seismic Source Type[1]	CBC Table 16A-U	A-C	C
Near Source Factor[1]	CBC Table 16A-S/T	Na, Nv	1.0, 1.0
Seismic Zone	CBC Figure 16A-2	1-4	3
Seismic Factor	CBC Table 16A-I	Z	0.30
Soil Profile type	CBC Table 16A-J	S	S_D
Seismic Response Coefficient	CBC /Table 16A-Q/R	Ca, Cv	0.36, 0.54
Peak Horizontal Ground Motion	CGS (2003)*	g_h	0.25g
Peak Vertical Ground Motion	CBC §1631A.2.5	g_v	0.16g
Spectral Acceleration (0.2 sec)	CGS (2003)*	Sa (0.2)	0.59g
Spectral Acceleration (1.0 sec)	CGS (2003)*	Sa (1.0)	0.29g

Source: Kleinfelder (2005)
Notes:
* California Geological Survey Probabilistic Seismic Hazards Mapping Ground Motion Page (http://www.consrv.ca.gov/cgs/rghm/pshamap).

3.3 Present Site Use and Conditions

3.3 a. Agricultural Land Uses

The agricultural uses on the proposed project site consist of row crops. The primary crops grown on the parcel are alfalfa, pumpkins, and oats. Figure 3 shows the present vegetation type, including crop type and Figure 5 shows existing land uses and features on the project site.

3.3 b. Natural Resources

Terrestrial Biological Resources

The following information is based on a biological resources survey conducted by North State, Resources, Inc. a copy of which is included as Appendix A. Vegetation within the project site has been classified as valley oak woodland, valley foothill-riparian, fresh emergent wetland, valley foothill/fresh emergent wetland complex, annual grassland, eucalyptus, irrigated hayfield, irrigated row crops, orchard, urban, and riverine plant communities (please see Figure 2 in Appendix A [*Shasta Ranch Project Biological Characterization Report*, North State Resources, Inc. August 2004]). Valley oak woodlands occur scattered throughout the site, valley foothill-riparian and fresh emergent marsh occur mainly in floodplain areas and along agricultural drainages, and annual grassland, which comprises the largest portion of the project site (426 acres), occurs within fallow fields and under a power line easement on the western portion of the site.

Reconnaissance-level biological surveys, wetland delineation, and vegetation mapping have been conducted for the entire project site. Database searches and reviews of various state and federal special-status species lists in support of these activities revealed 15 special-status plant species and 34 special-status wildlife species with the highest likelihood to occur within the project area (please see Tables 2 and 3, respectively, in Appendix A). Incidental observations during biological surveys have identified the presence of one special status plant occurring in riparian and emergent wetland habitats on the site, fox sedge (*Carex vulpinoidea*), and nine special-status wildlife species, four of which are special-status fish species known to occur immediately adjacent to the project site in the Sacramento River. Wildlife species observed during reconnaissance-level biological surveys include Northwestern pond turtle (*Clemmys marmorata marmorata*), osprey (*Pandion haliaetus*), white-tailed kite (*Elanus leucurus*), Nuttall's woodpecker (*Picoides nuttalli*), oak titmouse (*Baeolophus inoratus*), California thrasher (*Toxostoma redivivum*), and yellow-breasted chat (*Icteria virens*).[vii]

Aquatic Biological Resources

Listed fish species known to occur within adjacent portions of the Sacramento River include Central Valley steelhead (*Oncorhynchus mykiss*), Central Valley spring-run chinook salmon (*Oncorhynchus tshawytscha*), winter-run Chinook salmon (*Oncorhynchus tshawytscha*), and fall/late fall-run Chinook salmon (*Oncorhynchus tshawytscha*).[viii] The Central Valley steelhead spawn in the Sacramento River basin typically from late December through April, with most adults spawning in January through March. A majority of the steelhead migrate upstream from the Pacific Ocean between August through March. Juvenile migration to the ocean generally occurs from March through June. Based on salvage data at the state and federal export facilities in the Delta, the peak months of juvenile migration appear to be March and April.

The Sacramento River winter-run chinook salmon return to the upper Sacramento River in the winter but delay spawning until the spring and summer. The winter-run chinook typically spawn from April through August. They migrate upstream from the ocean between December and July.

Spring-run chinook salmon enter the Sacramento River between mid-March and October. These fish migrate into the headwaters, hold in pools until they spawn, starting as early as August and ending in mid-October, peaking in September. The juvenile fish emerge starting in early November continuing through the following June. These juveniles emigrate from the tributaries as fry from mid-November through June. Some fish remain in the stream until the following October and emigrate as "yearlings", usually with the onset of storms starting in October through the following March, peaking in November-December.

Sacramento late-fall run chinook enter the Sacramento river between mid-October and April. They spawn, starting as early as August and ending in mid-October, peaking in September. The juveniles emigrate from the tributaries as fry from April through June.

As discussed in detail below, portions of the project site are subject to periodic flooding from the Sacramento River. The protection of Sacramento River fish resources, therefore, was a primary consideration in development of the Shasta Ranch Aggregates Mining and Reclamation Plan.

3.3 c. Surface and Groundwater Characteristics

Surface Water

The proposed site is adjacent to the Sacramento River and was developed through flooding events prior to the construction of Shasta Dam upstream of the site. The project site currently includes several drainage features, including Anderson Creek on the south boundary of the project site, the Anderson Cottonwood Irrigation District (ACID) lateral that bisects the southern half of the project site, and other natural drainage features from the ancient river channel. The major surface water body in the area is the Sacramento River, which forms the northeastern boundary of the project site. All these features are shown on Figures 2 and 5. During storm events, surface water runoff from the project site generally travels across the site as sheet flow into Anderson Creek, the ACID canal, the ancient river channel, or into the Sacramento River. When precipitation levels are light, stormwater will not sheet flow across the site, but will percolate directly into the ground.

<u>Groundwater</u>

Groundwater in the project site is heavily influenced by the hydrology of the surface water bodies and soil characteristics. A preliminary survey of groundwater in the project site was conducted by Hydmet, Inc. from October through December 2004. The survey measured groundwater levels across the site. Currently, groundwater levels in the project site range between 362 to 385 feet above mean sea level (msl). See Figure 10 for a depiction of groundwater levels, or contours, across the project site using data collected during Winter 2005. In general, the preliminary survey results show that groundwater in the project site is more shallow in the western two-thirds of the project site (e.g., in the areas of active irrigation) and deeper in the eastern third of the project site. The groundwater elevations also display a north to south down-gradient slope with a slight rise near the ACID lateral and Anderson Creek. In general, groundwater levels beneath the project site fluctuate seasonally in response to Sacramento River elevations and area irrigation rates. Due to the highly permeable nature of the aggregate deposits beneath the project site groundwater beneath much of the project site is hydraulically connected to the river and to the ACID lateral and Anderson Creek. Groundwater levels are responsive to changes in the water levels in these water bodies.

3.4 Archaeological and Historical Resources

The site was investigated in 2004 by Jensen & Associates. The investigation included a records search at the Northeast Information Center at CSU Chico, consultation with the Native American Heritage Commission and Native American representatives, and field work in the project area. The findings of the records search determined that approximately 10% of the project area had been formally surveyed for cultural resources prior to the 2004 Jensen survey. Previous surveys resulted in the identification and documentation of two prehistoric sites and one historic site within the approximately 1,100-acre project area. One of the prehistoric sites included lithic material, freshwater shell, and midden. The site met the criteria for significance under the California Environmental Quality Act and was recommended as eligible for listing in the National Register of Historic Places. The second prehistoric site included a drill, flake scrapers, basalt cores, hopper mortars, and pestles; this site underwent intensive surface reconnaissance and surface collection in the mid-1970s and 1999. The historic site consists of a PG&E electrical transmission line between Burney and Cottonwood, a portion of which traverses the project site. Neither the second prehistoric site nor the transmission lines were recommended/determined eligible for listing in either the National Register of Historic Places or the California Register of Historical Resources when they were investigated.[ix]

The two prehistoric and one historic recorded resources noted above are outside of the proposed mining area, and no new sites were identified during the 2004 Jensen survey. Nonetheless, evidence of human burial or scattered human remains related to prehistoric occupation or the area could be inadvertently encountered anywhere in the area proposed for mining operations. Potentially significant or important cultural materials could be encountered on or below the surface during gravel extraction work or any other activities within the overall project/study area.[x] The mining activities at the project site will be conducted in accordance with State law, and if any cultural resources are discovered during the course of the project, a qualified professional will be consulted to determine the importance of the finding and to determine the appropriate course of action. This would follow the recommendations of the Jensen report and the staff from the Northeast Information Center.

EIP ASSOCIATES

Source: Sharrah Dunlap Sawyer, Inc.

FIGURE 10
GROUNDWATER CONTOURS
Shasta Ranch Mining and Reclamation Plan
Project # - 10932-00

3.5 Air Quality

3.5 a Climatology

Shasta County is located near the northernmost end of California's Central Valley. Several mountain ranges exist in the County that create various elevations and influence climatic conditions. In the winter, storms blown by southerly winds often concentrate precipitation at the northern end of the Valley. Precipitation is also common in the western mountains, as air moving from the Pacific encounters the Coastal Mountain Ranges. Generally, atmospheric conditions in the county are relatively stable. This stability is characterized by little vertical movement of air, which can inhibit the dispersion of air pollutants.

The site of the proposed project itself is 16 miles south of the City of Redding. Redding's annual average rainfall is 34.2 inches, mostly during the months of December through March. Snowfall is minimal. The average winter low temperature is 35.1 degrees Fahrenheit, and the average maximum summer temperature is 98.2 degrees Fahrenheit.

3.5 b Project Emissions and Permitting Requirements

Mining projects generally affect air quality by producing small particulate matter (PM_{10}), and nitrogen oxides (NO_x). PM_{10} is generated by the active disturbance of earth during mining activities, and NOx is generated by the combustion of diesel fuel used in heavy-duty mining equipment. PM_{10} has been identified by the U.S. Environmental Protection Agency (USEPA) as a "criteria air pollutant" that is harmful to human health. NO_x react with organic compounds in the air to form ozone, which is also a criteria air pollutant. The USEPA and the California Air Resources Board (CARB) set standards for criteria pollutants. The State standards are more stringent than the federal standards. Shasta County does not attain the State standards for either ozone or PM_{10}. According to CARB, the CARB monitoring site closest to the proposed project registered four State ozone exceedances and two State PM_{10} exceedances from 2001 to 2003. There were no federal exceedances for either ozone or PM_{10} during this time.

The Shasta County Air Quality Management District (District) has permitting authority over the proposed project. A source must comply with all District requirements before operating in the County. The District was contacted to determine what permitting requirements would apply to the proposed project. The material excavated at the proposed project site would be processed on-site at a newly-constructed processing plant. In order to build and operate this plant, the applicant would need to obtain an "Authority to Construct" (ATC) from the District, followed by a "Permit to Operate" (PTO). The ATC allows construction to begin, but operation may not begin until the PTO is obtained. The amount of material that the plant would be able to process yearly would be regulated by the District as part of the PTO. The plant would need to notify the District if the increase in processed material from the proposed project would cause the plant to exceed its permitted production levels. Any portable equipment, such as internal combustion engines that would remain in one stationary location for more than six months, would also be covered under the PTO. For such equipment, the facility would be required to list the equipment and the expected hours of operation.

3.6 Hazardous Materials

3.6 a Site History

Kimberly Clarke acquired the approximately 1,100-acre ranch site in 1964. Operations, including the off-site mill and the ranch, were purchased by Simpson Paper Company in 1972, and subsequently by the Shasta Paper Company in 1998 and two other parties in 2002 and again in 2004. The ranch site was purchased in 2004 by Shasta Ranch LLC.

The Shasta Paper Mill consisted of a bleached kraft pulp mill and a paper mill that produced fine and coated paper. Wastewater from pulp and paper mills generally contained adsorbable organic halides (AOX) and volatile organic compounds (VOCs) from the pulping process, and AOX, VOCs, and dioxins from the bleaching processes (EPA 1995). Wastewater from the Shasta Paper Mill was also high in total suspended solids (TSS), biological oxygen demand (BOD), and chemical oxygen demand (COD). Industrial wastewater from the Shasta Paper Mill was combined with a small amount of effluent from the domestic wastewater treatment plant and routed to an industrial wastewater treatment system prior to discharge.

The industrial wastewater treatment system consisted of holding basins and clarifiers on the mill property and treatment lagoons on property located along Hawes Road across from the mill property. Wastewater from the pulp and paper mill was first treated in clarifiers for primary solids removal. Clarifier solids were dewatered with a screw press and disposed of offsite. Between 1964 and 1971, primary and secondary sludge was disposed on the Shasta Ranch property. Beginning in 1972, primary sludge was diverted to the Dersch Road Landfill.

On site holding basins were used to even out solid loading to the clarifiers. After clarification, the wastewater was discharged to two treatment lagoons equipped with mechanical aerators. The lagoons were operated in series with an average residence time of approximately seven days at average plant effluent flow. The combined lagoon area is approximately 25 acres.

Treated process water from the lagoons was historically discharged to the Sacramento River. The discharge point was approximately 4,000 feet downstream from the Deschutes Road Bridge. Beginning in 1976, a portion of the wastewater was diverted and used for irrigation on the ranch property. At the ranch, the effluent was used to irrigate trees and crops. Shasta Paper Mill routed approximately 11 million gallons per day of treated effluent and domestic waste water to the Sacramento River and ranch property in 2000. A flange was installed on the discharge pipe in 2001 to prevent river discharge while still allowing discharge of effluent to the ranch property.

Discharge of sludge and effluent from the Shasta Paper Mill was regulated by NPDES No. CA0004065 originally adopted in 1973 (Water Quality Order No. 73-172). Requirements in the 1973 permit included monthly monitoring for boron, selenium, sodium adsorption ration, specific conductance, and chlorides. In response to information summarized in the above mentioned dioxin studies, dioxin analyses were added to the NPDES monitoring requirements in 1987. The early analyses only quantified 2,3,7,8-TCDD and 2,3,7,8-TCDF. Other chlorine containing dioxin congeners, and the calculation of toxic equivalent concentrations, were added to the NPDES permit in 1991.

Waste lime (a byproduct of the paper manufacturing process) was spread on irrigated portions of the site, including most of the fields within the proposed Phase 2 and Phase 3 gravel extraction areas. Between 1964 and 1971, primary sludge received at the ranch was disposed in two trenches located in the northeastern portion of the current "E" field. It has been estimated that approximately 15 tons per day of primary treatment sludge were disposed in the two trenches during this time period, for a total of approximately 38,000 tons of sludge. Secondary sludge was land applied within the current "C" field. Wastewater effluent from the mill was discharged to the Sacramento River (Geomatrix 2004).

Shasta Paper Company purchased the Shasta Paper Mill and Shasta Ranch in 1998. Shasta Paper continued to divert mill sludge to the landfill, and irrigate portions of Shasta Ranch with mill effluent until 2002, when the mill was closed (Geomatrix 2004).

Areas of Shasta Ranch Aggregates proposed for aggregate extraction are shown along with areas that received sludge and mill effluent in Figure 10A. Gravel extraction during the first 20 years of the proposed project (Phase 1 and Phase 2) will occur in areas that did not receive mill sludge or effluent.

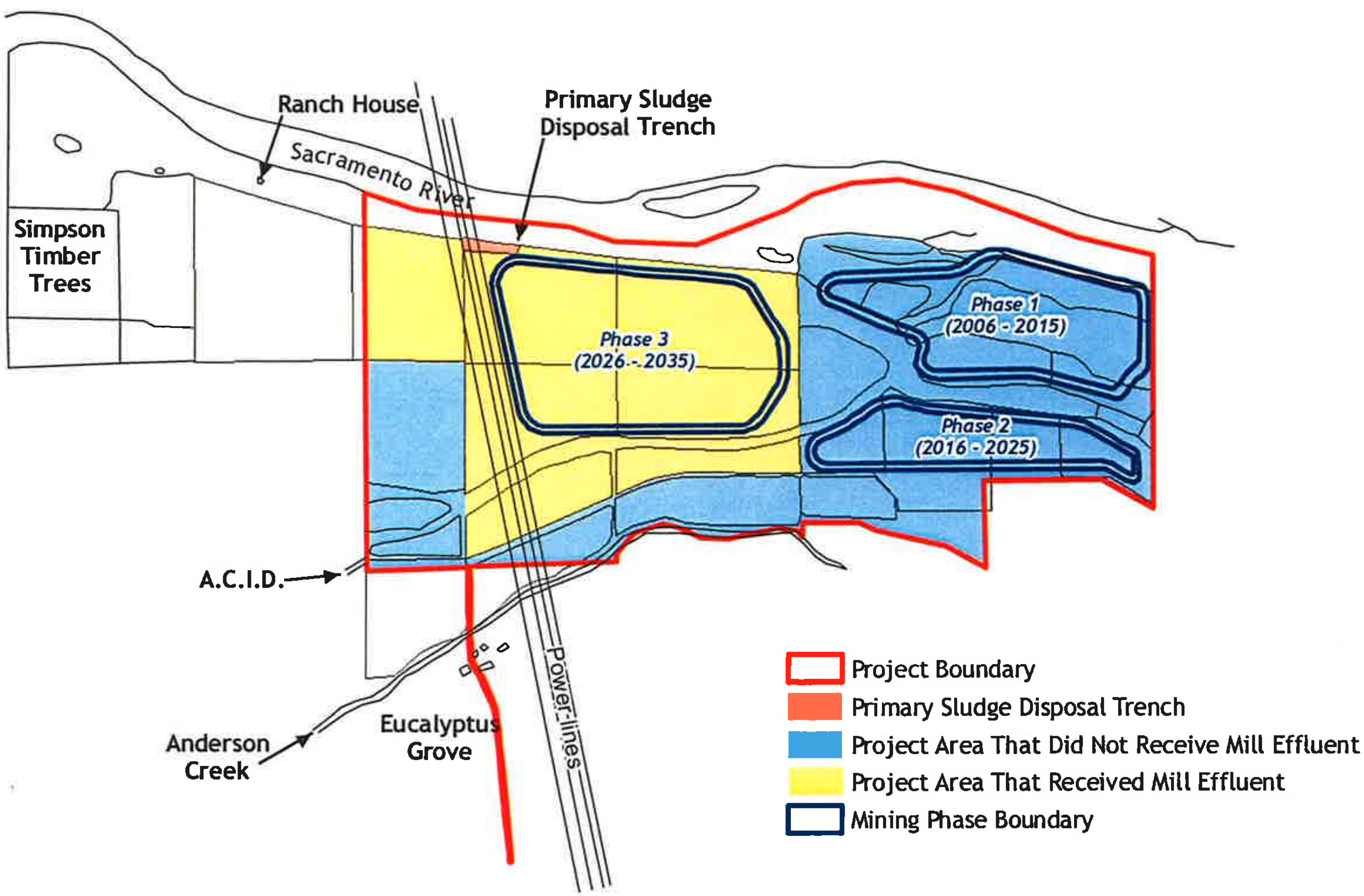
The RWQCB issued a Cleanup and Abatement Order (C&A Order) in February 2004 to address waste disposal issues at the mill and its facilities, including the ranch site. Because of the recent change in ownership, the original C&A Order was rescinded and a new order issued for the mill and its disposal facilities but not the ranch site. A separate order was not written for the ranch site because the new owners have agreed in writing to meet the requirements of the original C&A Order. The RWQCB to issued a "13267 letter" (referring to Section 13267 of the California Water Code), which is an enforceable letter that required Shasta Ranch LLC to remove (or spread) the lime stored at the ranch site, and implement quarterly groundwater monitoring in six wells at the site, including three along the river and three along the western boundary of the site for one year.

This monitoring has been completed and results are summarized below.

3.6 b Dioxin Compounds and Paper Mills

In 1987, EPA released the results of a 3-year National Dioxin Study on the extent of dioxin contamination in the United States. The study was conducted at the request of congress following dioxin contamination incidents at Times Beach, Missouri; Love Canal, New York; and Jacksonville, Arkansas. The study was conducted under EPA's National Dioxin Strategy, which provides a coordinated approach for investigative, remedial and regulatory activities.

Results from the National Dioxin Study provided one of the first indications that bleached kraft paper mills were a possible source of dioxin in the environment. In response to this finding, EPA conducted a cooperative study with the National Council of the Paper Industry for Air and Stream Improvement to investigate dioxin contamination in process and discharge water from five bleached kraft and paper mills in 1986, the Five Mill Study. This study indicated that bleaching of kraft pulp with elemental chlorine and chlorine derivatives results in the formation of 2,3,7,8-TCDD and 2,3,7,8-TCDF. These results led to a more comprehensive survey of all 104 domestic pulp and paper mills manufacturing chemically bleached pulp, the 104 Mill Study.



Prepared to present field past use and soil sample locations with revised project boundary.

Abbreviation:
A.C.I.D. = Anderson/Cottonwood Irrigation District

0 1,000 2,000 4,000 Feet

VESTRA

SOURCE: GEOMATRIX, 2005

FIGURE 10A
AGGREGATE EXTRACTION AREAS AND EFFLUENT FIELDS
SHASTA RANCH AGGREGATE
ANDERSON, CALIFORNIA

P:\GIS\70542\RevisedReclamationBoardPermit\Figure10A_AggregateEffluentAreas.mxd

Based on the results of the Five Mill Study and the 104 Mill Study, dioxin fish consumption advisories were issued on many rivers, including the Sacramento River between Keswick Dam and Red Bluff in 1988; and EPA began developing a strategy to regulate and eliminate dioxin from pulp and paper mill discharge. As a result of this strategy, dioxin levels in mill discharge declined significantly. For example, based on improvements at the Shasta Paper Mill, the dioxin fish consumption advisory was lifted from the Sacramento River in 1994. As part of this strategy, EPA issued final effluent limitation guidelines and pre-treatment standards for pulp and paper mills in 1998. These EPA effluent limitations are enforced by the Regional Water Quality Control Board (RWQCB) via the National Pollution Discharge Elimination System (NPDES) permit process.

EPA initially proposed best available technology (BAT) and effluent regulations to limit precursors to the formation of dioxins and other organochlorines in the pulp and paper manufacturing process in 1993. This technology-based approach involved: 1) substituting chlorine dioxide or other bleaching agents (e.g., peroxide or ozone) for elemental chlorine, and 2) using alternative methods of pulp delignification to reduce the chlorine requirements necessary to achieve a given quality of product. In 1994, EPA and the pulp and paper industry also announced a voluntary agreement regarding land disposal of dioxin-contaminated sludge. No restrictions on the use of sludge were proposed if the dioxin and furan concentrations were less than 10 parts per trillion (ppt). At 50 ppt, sludge cannot be land applied.

3.6 c Regulatory Screening Levels

Current regulatory screening levels for dioxin, expressed as toxic equivalent concentrations, that apply to soil and groundwater at Shasta Ranch are summarized in Table 3.

TABLE 3

REGULATORY SCREENING LEVELS

Standard	TEQ	Type	Source
Soil (ng/kg or ppt)			
Residential PRG[1]	3.9	10^{-6} Human Health Risk-Based Screening Level[3]	EPA 2004a
Industrial PRG[1]	16	10^{-6} Human Health Risk-Based Screening Level[3]	EPA 2004a
Residential EMEG[2]	50	Screening Level[3]	ATSDR 1997
California TTLC[4]	10,000	Standard[5]	CCR, Title 22
Groundwater (pg/l or ppq)			
Tap Water PRG[1]	0.45	10^{-6} Human Health Risk-Based Screening Level[3]	EPA 2004a
Federal MCL[6]	30	Risk and Technology-Based Standard[5]	DHS 2003
California MCL[6]	30	Risk and Technology-Based Standard[5]	DHS 2003
OEHHA PHG[7]	1	10^{-6} Human Health Risk-Based Drinking Water Goal	CalEPA 2005

[1] PRG is a Preliminary Remediation Goal published by EPA Region 9 and based on 10^{-6} human health risk.
[2] EMEG is an environmental media evaluation guide published by the Agency for Toxic Substances and Disease Registry, US Department of Health and Human Services
[3] Screening Level generally represents a level below which additional evaluation or action is not required.
[4] California Total Threshold Limit Concentration for handling material as a hazardous waste.
[5] Standard is a level that triggers a regulatory action.
[6] MCL is the Maximum Contaminant Level for drinking water.
[7] OEHHA PHG is Public Health Goal established by California Environmental Protection Agency Office of Environmental Health Hazard Assessment. The proposed OEHHA PHG is for 2,3,7,8-TCDD only.

Preliminary remediation goals (PRGs) established by EPA Region 9 combine current human health toxicity values with standard exposure factors to estimate contaminant concentrations in environmental media (soil, air, and water) that are considered to be protective of human exposures (including sensitive groups) over a lifetime. These PRGs are updated by EPA Region 9 on a regular basis.

As the human health-based PRGs are the most stringent regulatory levels listed in Table 3, it is important to note that concentrations above the PRG do not necessarily require action or indicate a health risk, rather further evaluation is necessary. Further evaluation may include: 1) additional sampling, 2) consideration of ambient levels in the environment, or 3) a reassessment of the assumptions contained in the screening-level estimates (e.g. appropriateness of route-to-route extrapolations, appropriateness of using chronic toxicity values to evaluate childhood exposures, appropriateness of generic exposure factors for a specific site etc.). Commonly, this reassessment leads to action levels that are higher than the screening level values. For example, it is common for ambient concentrations of dioxins from combustion and other non-specific sources to exceed the PRG. In such cases, ambient or higher concentrations may be allowed (EPA 1998a).

3.6 d Recent Studies at the Site

Sludge, soil, and groundwater samples have been collected from the Shasta Ranch property and analyzed for dioxins for many years. Unfortunately, the early data were collected using different laboratory procedures with higher detection limits than laboratory data collected more recently. For this reason, the early data cannot be compared with the more recent data. Recent studies and dioxin results from samples analyzed using current laboratory procedures are summarized in this section. These results are representative of baseline conditions at the ranch.

EPA Expanded Site Inspection (1996)

Shasta Ranch was identified as a potential hazardous waste site and entered into the Comprehensive Environmental Response, Compensation, and Liability System (CERCLIS) on June 1, 1981. A preliminary assessment of the Shasta Ranch was conducted by EPA on September 1, 1982, and a detailed site inspection was conducted on August 6, 1990. A site inspection prioritization was completed on September 9, 1994.

After reviewing the preliminary assessment and site inspection reports, EPA determined additional information was required to evaluate the site for inclusion on the National Priority List (NPL or Superfund List). The expanded site inspection was complete in September 1996, and included collecting six sludge samples from the Shasta Ranch property and seven sediment samples from the Sacramento River for dioxin analyses. Based on the findings, EPA concluded:

- Concentrations of site-related hazardous substances detected in sediment samples collected downstream from the site are comparable to background concentrations.

- No site-related hazardous substances were detected in groundwater samples collected from on site drinking water wells.

- The site is completely fenced, except along the Sacramento River, and there are no schools or day care centers on, or within 200 feet of the site.

EPA's overall conclusion was the Shasta Ranch did not qualify for further remedial site assessment under CERCLA. EPA's only follow up recommendation was that the discharger continues to monitor on site groundwater for dioxins.

Dioxin TEQ results from the six sludge samples collected by EPA in 1996 ranged between 0 ppt and 225 ppt. The sludge trenches are not located in areas proposed for aggregate extraction and these results are not indicative of the results obtained across the remainder of the property. The EPA results are included in the appendix.

Tetra Tech Phase 1 (2004)

Tetra Tech completed a Phase 1 Environmental Site Assessment (ESA) of the Shasta Ranch in 2004. This Phase 1 included a review of available analytical data, including dioxin results from soil, sediment, and groundwater. Based on this review, Tetra Tech concluded that:

> "The mill's treated waste water was historically discharged onto on-site agricultural fields. Historically, the wastewater contained dioxins and furans. While treatment of wastewater improved during the discharge period and monitoring occurred, the condition of the soil and groundwater at the agricultural fields is unknown. It is Tetra Tech's understanding that this discharge was approved by the RWQCB and that currently, RWQCB staff does not consider this historical discharge to present a significant threat to groundwater in the area of the subject site".

Geomatrix Phase 1 (2004)

Geomatrix conducted a Phase 1 ESA of the Shasta Ranch in 2004. Based on a review of prior soil and groundwater dioxin results, Geomatrix concluded that additional soil samples should be collected to better characterize dioxin concentrations in fields where sludge and/or effluent was discharged. Additionally, Geomatrix recommended collecting groundwater samples from on site monitoring wells to verify prior results suggesting that groundwater contamination was not significant. Geomatrix implemented these recommendations by conducting a soil sampling program and working with the RWQCB to implement a groundwater monitoring and reporting program.

Geomatrix Soil Sampling Program (2004)

Historically, significant portions of the Shasta Ranch were flooded by the Sacramento River. Anderson Creek also transects the central portion of the ranch and continues along the southwestern boundary of the site. As a result, the ranch property consists of a veneer of clayey silt underlain by sandy gravel. The depth to the sandy gravel varies between 1.5 feet to more than 5 feet. Geomatrix collected 11 on site soil samples for dioxin analyses in 2004. The samples were collected from the clayey silt layer in areas that received mill sludge and/or effluent. The samples were collected from approximately 6-inches below ground surface (Geomatrix 2005a). The sample locations are shown on Figure 10B.

Dioxin TEQ results from the Geomatrix investigation are presented in Table 4. The results are compared to current regulatory levels in Table 5. As shown, the results are less than the ATSDR residential EMEG of 50 ppt, and 9 out of 11 results are less than EPA industrial PRG of 16 ppt. It is also important to note that the 95 percent upper confidence level concentration is less than the

EPA industrial PRG of 16 ppt. The 95 percent upper confidence level concentration is typically used as the exposure point concentration when conducting a baseline risk assessment. The Geomatrix samples were collected from overburden that will not be processed or transported from the site.

VESTRA Resources Investigation (2006)

The Geomatrix soil sampling program focused on collecting shallow soil samples from fields that received mill sludge and/or effluent. Because these samples were collected from overburden that will not be processed as part of the proposed aggregate project and because the proposed project will not extract aggregate from these areas for approximately 20 years, VESTRA collected a total of 10 additional soil samples for dioxin analyses from areas proposed for aggregate extraction. Three samples were collected from the Phase 1 area, three samples were collected from the Phase 2 area, and four samples were collected from the Phase 3 area. In general, individual samples were collected from the clayey silt overburden material approximately 18-inches below ground surface, from the sandy gravel just below the clayey silt, and from the sandy gravel approximately five feet below the clayey silt. Only one sample was collected from Test Pit P3A because shallow water was encountered. The VESTRA sample locations are shown along with the Geomatrix sample locations on Figure 10B.

The results are presented in Table 6, and the results are compared to current regulatory levels in Table 4. A summary of the findings include:

- The TEQ results from the Phase 1, Phase 2, <u>and</u> Phase 3 areas are less than the EPA residential PRG.

- At a given depth, the TEQ results in areas that did not receive mill effluent (Phase 1 and Phase 2) are an order of magnitude lower than the corresponding TEQ results in areas that received effluent (Phase 3).

- TEQ results decrease with depth. The highest concentrations are in shallow soils that will be stripped and stockpiled for rehabilitation. TEQ results in the underlying sandy gravel that will be processed for aggregate are orders of magnitude less.

In areas where effluent was applied, the highest dioxin concentration in the underlying aggregate was 0.034 ppt. In areas where effluent was not applied, the highest dioxin concentration in the underlying aggregate was 0.008 ppt. These levels are at least two orders of magnitude less than the EPA residential PRG 0f 3.9 ppt, and the average near-surface background concentrations of 4.1 ppt observed in urban areas (Washington DOE 1999). Background dioxin concentrations are generally higher near the surface because the primary source of background dioxin is the airborne deposition from combustion sources (EPA 1999).

Geomatrix Groundwater Monitoring Program (2005)

Groundwater occurs at depths of approximately 10 to 15 feet below ground surface and flows northeast toward the Sacramento River. There are approximately 70 groundwater wells on the Shasta Ranch, 17 of which have been used to monitor water quality. The wells are typically 2 inches in diameter. These wells were installed to monitor hydrologic conditions when the fields were irrigated. In addition, a total of three water supply wells are located on site: near the laboratory, ranch house, and chemical storage shed (Geomatrix 2004).

Geomatrix submitted a monitoring and reporting program to the RWQCB in January 2005 (Geomatrix 2005b). In part, the program included collecting quarterly groundwater samples for dioxin analyses from seven on site monitoring wells on a quarterly basis for 1 year. The monitoring well locations are shown on Figure 10C. The RWQCB approved the program in March 2005 (RWQCB 2005).

As outlined in the approved monitoring program, quarterly groundwater samples were collected from the seven on site monitoring wells during 2005. The most recent results collected during the fourth quarter 2005 are summarized on Table 7 (Geomatrix 2005b). Additional groundwater results are tabulated in the appendix.

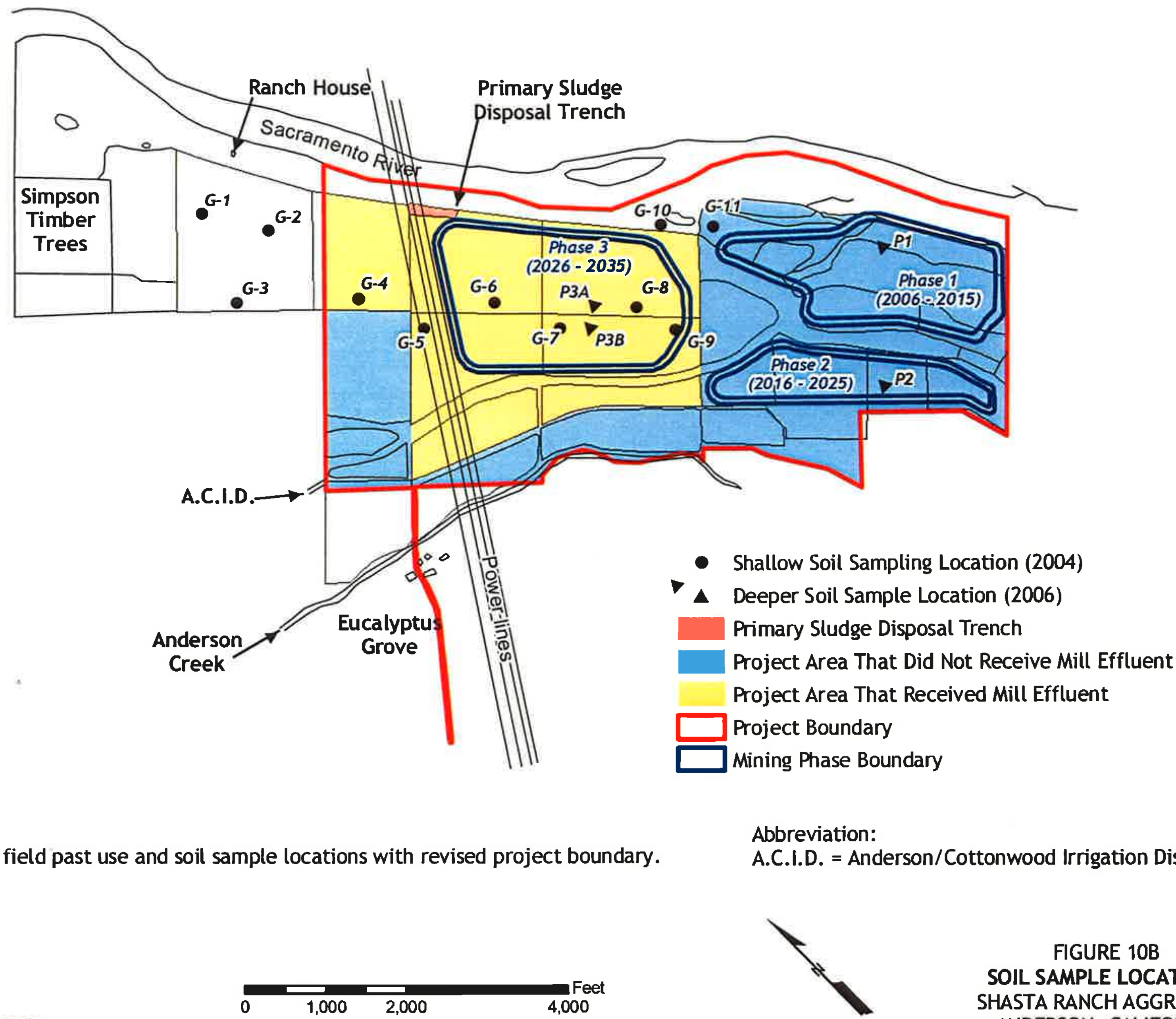
Groundwater results from the most recent quarter and from the last four quarters are compared to current regulatory levels for drinking water in Table 5. As shown, the maximum TEQ result of 0.0261 parts per quadrillion (ppq) observed during the 4th quarter 2005 is less than the current regulatory levels. Only one TEQ result collected during 2005 exceeded the EPA tap water PRG of 0.45 ppq. A TEQ of 0.62 ppq was observed in Monitoring Well MW-62 during the third quarter. The TEQ results in this well during the other three quarters (0 ppq, 0.0006 ppq, and 0.0003 ppq) were less than the EPA tap water PRG.

3.6 e Dioxin Summary

Dioxin TEQ results in the shallow overburden soil and in the underlying material to be processed for aggregate during the first 20 years of the proposed project (Phase 1 and Phase 2) are less than current regulatory levels, including the EPA residential PRG. These areas did not receive mill effluent. Furthermore, the dioxin TEQ results in all of the samples collected from the sandy gravel that will be process for aggregate (including Phase 3) are less than the EPA residential PRG, and are significantly less than the overburden levels.

Within areas proposed for aggregate extraction, the only TEQ results that exceeded the EPA residential or industrial PRG were observed in the Phase 3 overburden. The maximum TEQ result in samples collected from the Phase 3 overburden was 18.5 ppt. This level exceeds the EPA industrial PRG of 16 ppt, and is less than the ATSDR residential EMEG of 50 ppt. The Phase 3 overburden is not suitable for aggregate and will be stockpiled on site and used for site restoration.

Dioxin TEQ results in the underlying groundwater are less than the federal and state drinking water standards, and 28 out of 29 samples were less than the EPA tap water PRG.



Prepared to present field past use and soil sample locations with revised project boundary.

Abbreviation:
A.C.I.D. = Anderson/Cottonwood Irrigation District

VESTRA

SOURCE: GEOMATRIX, 2005

FIGURE 10B
SOIL SAMPLE LOCATIONS
SHASTA RANCH AGGREGATE
ANDERSON, CALIFORNIA

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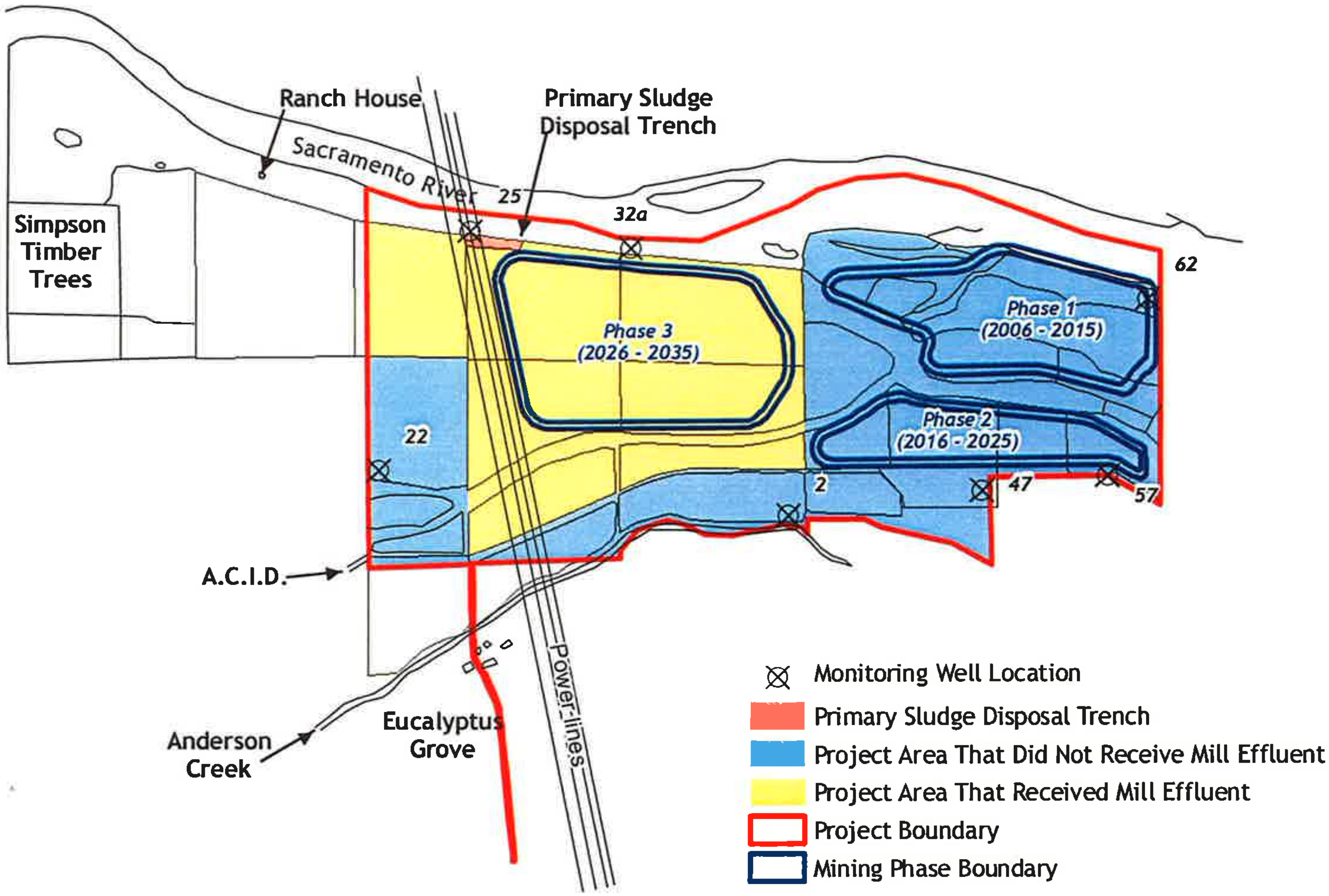

Prepared to present field past use and soil sample locations with revised project boundary.

Abbreviation:
A.C.I.D. = Anderson/Cottonwood Irrigation District

VESTRA

SOURCE: GEOMATRIX, 2005

Feet 0 1,000 2,000 4,000

FIGURE 10C
MONITORING WELL LOCATIONS
SHASTA RANCH AGGREGATE
ANDERSON, CALIFORNIA

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Table 4

2004 SOIL DIOXIN RESULTS
GEOMATRIX INVESTIGATION
(ng/kg or ppt)

Compound	G-1	G-2	G-3	G-4	G-5	G-6	G-7	G-8	G-9	G-10	G-11
PCDDs											
2378 TCDD	0.6	1.56	0.3	2.65	2.83	5.14	1.75	3.96	6.46	0.7	*
12378-PeCDD	0.2	0.31	0.09	0.54	0.34	0.41	0.28	1.05	1.02	0.14	0.13
123478-HxCDD	0.08	0.2	0.07	0.64	0.2	0.16	0.2	1.27	0.71	*	0.14
123678-HxCDD	2.42	1.66	0.49	2.62	2.5	3.85	2.28	2.74	7.16	0.75	1.54
123789-HxCDD	1.37	1.19	0.42	2.3	1.6	2.13	1.33	2.4	4.33	0.49	0.88
1234678-HpCDD	5.28	10.4	2.7	22.9	14.58	16.68	14.09	10.3	32.45	4.83	27.05
OCDD	24.17	65.64	13.37	156.57	107.66	177.79	105.58	56.43	228.72	37	126.48
PCDFs											
2378 TCDF	5.55	20.94	2.59	41.09	36.78	91.83	18.69	67.44	78.74	8.08	0.29
12378-PeCDF	0.11	0.64	0.03	0.69	1.49	0.71	1.14	1.72	3.38	*	0.05
23478-PeCDF	0.12	0.47	0.05	0.62	0.78	0.97	0.7	1.91	2.06	0.13	0.06
123478-HxCDF	0.15	0.33	0.09	0.43	0.31	0.28	0.31	1.49	1.12	0.15	0.2
123678-HxCDF	0.09	0.23	0.04	0.31	0.21	0.14	0.22	1.46	0.86	0.11	0.15
234678-HxCDF	0.05	0.05	0.02	*	*	0.05	0.06	1.23	0.28	*	*
123789-HxCDF	0.1	0.2	0.03	0.25	0.17	0.18	0.21	1.47	0.61	0.15	0.16
1234678-HpCDF	0.91	1.69	0.36	4.06	1.69	1.38	1.95	2.8	3.7	0.64	1.38
1234789-HpCDF	0.08	0.15	*	0.24	*	0.09	*	1.39	0.46	*	0.14
OCDF	6.32	5.01	0.89	10.01	7.01	3.77	6.85	6.52	13.26	1.25	2.26
TEQ	1.91	4.75	0.82	8.59	7.99	16.13	4.94	14.15	18.45	1.94	0.80

To calculate the TEQ for each sample, multiply the concentration for each congener by the appropriate TEF on Table 1 and sum.
* Concentration was less than the detection limit.

TABLE 5

REGULATORY SCREENING LEVEL COMPARISON SOIL AND GROUNDWATER TEQ RESULTS

Parameter	Geomatrix Soil Samples [1] (ng/kg or ppt)	VESTRA Soil Samples [2] (ng/kg or ppt)	2005 Groundwater Samples [3] (pg/l or ppq)	4th Quarter 2005 Groundwater Samples [3] (pg/l or ppq)
Number Samples	11	10	29	7
Minimum Conc.	0.80	0.0024	0	0
Maximum Conc.	18.45	0.4235	0.6236	0.0261
Average Conc.	7.31	0.0900	0.0409	0.0063
95 % UCL Conc.	11.08	0.1897	0.0854	0.0141
EPA Residential PRG	3.9	3.9	---	---
EPA Industrial PRG	16	16	---	---
Residential EMEG	50	50	---	---
EPA Tap Water PRG	---	---	0.45	0.45
Federal/State MCL	---	---	30	30
Summary	All levels are below the ATSDR residential EMEG, 95% upper confidence level is below EPA industrial PRG.	All levels are below regulatory levels, including the EPA residential PRG.	All levels are below the drinking water MCL, 95% upper confidence level is below the EPA tap water PRG.	All levels are below regulatory levels.

[1] Shallow soil samples were collected in 2004 from approximately 6 inches in depth from areas that received mill effluent. Sampling objective was to evaluate impact of mill effluent on shallow soils.

[2] Deeper soil samples were collected in 2006 from a minimum depth of 12 inches from areas proposed for aggregate extraction. Sampling objective was to determine concentrations in deeper soils and material to be processed.

[3] Groundwater samples were collected for four quarters during 2005. Sampling objective was to quantify levels in shallow groundwater in the vicinity of fields that received mill effluent.

Table 6

2006 SOIL DIOXIN RESULTS
VESTRA INVESTIGATION
(ng/kg or ppt)

Compound	P1-18	P1-42	P1-96	P2-18	P2-48	P2-96	P3A-15	P3B-18	P3B-54	P3B-96
PCDDs										
2378 TCDD	*	*	*	*	*	*	0.143	0.14	*	*
12378-PeCDD	*	*	*	*	*	*	*	*	*	*
123478-HxCDD	*	*	*	*	*	*	*	*	*	*
123678-HxCDD	0.094	*	*	*	*	*	*	0.182	*	*
123789-HxCDD	*	*	*	*	*	*	*	0.182	*	*
1234678-HpCDD	0.613	0.637	0.255	0.367	0.135	0.145	0.577	1.393	0.194	0.121
OCDD	2.204	2.508	0.856	1.158	0.656	0.847	2.829	6.861	0.857	0.627
PCDFs										
2378 TCDF	*	*	*	*	*	*	2.131	1.796	*	*
12378-PeCDF	*	*	*	*	*	*	*	0.069	0.048	*
23478-PeCDF	*	*	*	*	*	*	*	0.054	0.041	*
123478-HxCDF	0.084	*	*	*	*	*	*	0.092	0.05	0.054
123678-HxCDF	0.082	*	*	*	*	*	*	0.045	0.031	0.034
234678-HxCDF	*	*	*	*	*	*	*	*	*	*
123789-HxCDF	0.094	*	*	*	*	*	*	0.059	*	*
1234678-HpCDF	0.208	*	0.17	0.182	0.1	0.141	*	0.278	0.131	0.075
1234789-HpCDF	0.181	0.173	*	*	*	*	*	*	*	*
OCDF	0.671	0	0.164	0.288	0.2	0.259	0.21	0.308	0.102	*
TEQ	0.0457	0.0084	0.0044	0.0056	0.0024	0.0030	0.3622	0.4235	0.0343	0.0108

Samples designated as P1 and P2 were collected from the Phase 1 and Phase 2 areas proposed for aggregate extraction. These areas did not receive mill effluent. Samples designated as P3 were collected from the Phase 3 area scheduled for aggregate extraction. This area received mill effluent. The sample ID includes the approximate depth of the sample in inches. To calculate the TEQ for each sample, multiply the concentration for each congener by the appropriate TEF on Table 1 and sum.
* Concentration was less than the detection limit.

:

Table 7

FOURTH QUARTER 2005 GROUNDWATER DIOXIN RESULTS
GEOMATRIX MONITORING PROGRAM
(pg/l or ppq)

Compound	MW-25	MW-32A	MW-62	MW-57	MW-47	MW-2	MW-22
PCDDs							
2378 TCDD	*	*	*	*	*	*	*
12378-PeCDD	*	*	*	*	*	*	*
123478-HxCDD	*	*	*	*	*	*	*
123678-HxCDD	*	*	*	*	*	*	*
123789-HxCDD	*	*	*	*	*	*	*
1234678-HpCDD	*	*	*	2.387	1.497	*	*
OCDD	*	1.45	2.603	22.282	13.061	8.724	6.61
PCDFs							
2378 TCDF	*	*	*	*	*	*	*
12378-PeCDF	*	*	*	*	*	*	*
23478-PeCDF	*	*	*	*	*	*	*
123478-HxCDF	*	*	*	*	*	*	*
123678-HxCDF	*	*	*	*	*	*	*
234678-HxCDF	*	*	*	*	*	*	*
123789-HxCDF	*	*	*	*	*	*	*
1234678-HpCDF	*	*	*	*	*	*	*
1234789-HpCDF	*	*	*	*	*	*	*
OCDF	*	*	*	*	*	*	*
TEQ	0	0.00015	0.0003	0.0261	0.0163	0.0009	0.0007

To calculate the TEQ for each sample, multiply the concentration for each congener by the appropriate TEF on Table 1 and sum.
* Concentration was less than the detection limit.

3.7 Transportation

Existing access to the project site is a narrow, unpaved private road on the east side of Balls Ferry Road. The undeveloped road is situated approximately mid-way between Lone Tree Road to the south and Riverland Drive to the north. There are no traffic signals or stops signs within close proximity to the driveway access, and the posted speed limit along the segment of Balls Ferry Road is 45 mph. Adjacent to the project site, Balls Ferry Road is relatively straight with gentle undulations. The line of sight from the driveway intersection is generally unobscured in both directions.

Interstate 5 (I-5) is located approximately 3 mile west of the project site. Both the Balls Ferry Road and Deschutes Road exits off of I-5 provide regional access to the site. Deschutes Road and Balls Ferry Road are two-lane arterials. Average daily traffic volumes along roadway segments and intersections closest to the project site range from approximately 2700 on Balls Ferry Road and approximately 4300 on Deschutes Road.

3.8 Utilities and Services

The following list of agencies provides public or private services or utilities to the project site.

Fire Protection: Shasta County Fire Department
Law Enforcement: Shasta County Sheriff's Department
Electricity: Pacific Gas & Electric
Natural Gas: Propane by Private Contractor
Water: Private wells on the project site
Wastewater: Private septic system
Solid Waste: Private disposal service
Telephone: Pacific Bell

4. EXCAVATION AND MINING PLAN

4.1 Excavation and Mining Overview

Proposed mining and reclamation operations on the Shasta Ranch project site would be carried out by Tullis, Inc. The project site encompasses approximately 660 acres, of which 268 acres will directly affected by mining, processing and reclamation activities (see Figure 11). The remaining 392 acres will serve as setback areas or buffers from adjacent properties and support a variety of uses including continued agricultural production and habitat reserves.

Materials mined onsite would consist exclusively of aggregate (sand and gravel). Aggregate mined on the Shasta Ranch site would be washed, crushed, screened and graded on-site, and transported off-site for use in the production of asphalt and concrete. These end products are generally associated with new home and roadway construction, but they would also be used by public agencies to improve existing infrastructure.

Proposed Shasta Ranch mining operations will follow the guidelines established by SMARA and will conform to the monitoring schedule established by the Shasta County Planning Department. The site will be mined in three phases, with each phase taking from 8 to 10 years to complete. The reclamation of any given phase will commence as soon as the mining operation allows. Reclamation and mining will be done concurrently, to the extent possible, but reclamation will begin no later than at the completion of each phase. The mining operation will begin within one year of County approval of the Conditional Use Permit and Reclamation Plan and could be completed by 2035 with reclamation completed within 10 years of completion of mining activities. This schedule, however, is uncertain and would be controlled by the local demand for aggregate products.

4.2 Materials to be Mined

4.2 a. Overburden

"Overburden" is the material lying above the aggregate deposits that would be mined and processed under the proposed mining and reclamation plan. Overburden on the Shasta Ranch site varies in nature depending on its location on-site, but is generally a mix of clay, silt, sand and topsoil that is relatively rich in organic materials. Much of the project site has historically supported the production of row crops.

According to soil borings, overburden on the Shasta Ranch site is generally 0 to 10 feet deep. In the course of proposed mining operations, overburden will be removed and used for a variety of purposes in support of mining or site reclamation. Overburden will be used in the construction of proposed flood-control and fish exclusion levees. Overburden will also be used for back fill in excavated pits after mining activities are complete. Overburden will also provide the growth medium for proposed reclamation revegetation activities.

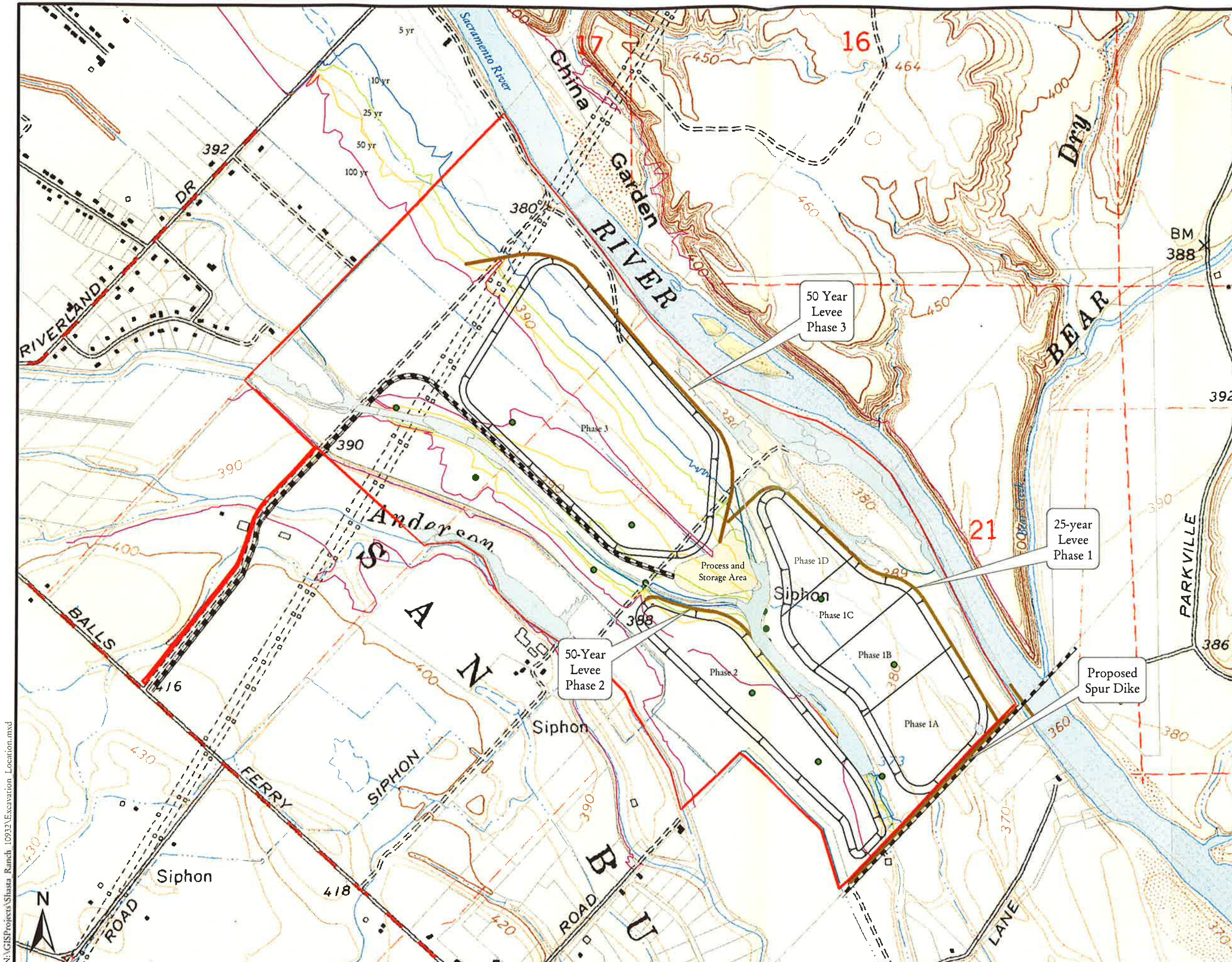

FIGURE 11
EXCAVATION LOCATIONS

Shasta Ranch Mining and Reclamation Plan
Shasta County, CA

Project Boundary
Excavation Area
Levee
Proposed Spur Dike
Road
Parcel Boundary
Piezometer Location

Flood Zones

5-Year
10-Year
25-Year
50-Year
100-Year

0 500 1,000
Feet

1 inch equals 1,000 feet

Source: Sharrah Dunlap Sawyer, Site Plan, Nov. 2004; USGS, DEMs, Sept. 2001, Hydrography, Dec. 1998; and EIP Associates GIS Program, Jan. 13, 2004.

Project Number 10932-00

Requested by: RH Created by: PaPr Date: 01/13/04

EIP ASSOCIATES

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To the extent possible, overburden will be moved directly to its final planned location immediately after excavation. Toward the end of the last phase of planned mining operations, however, it may be necessary to temporarily stockpile some overburden in order to complete final site reclamation. If stockpiling is necessary, stockpiles will be managed to minimize water and wind erosion. Any stockpiles will receive an application of hydro seed/mulch to stabilize the slope as determined by the SWPPP for the site.

The reclamation plan sets out to reclaim approximately 85 acres of land for agricultural use with the adequate supply of overburden. The overburden shall be used to develop the pond shores as shown on the reclamation plan drawings for Phases 2 and 3. See Table 1 for volumes in each phase. See Figure 4, for proposed locations of stockpile material location in the processing area.

4.2 b. Aggregate (Sand and Gravel)

The aggregate layer is under the overburden layer and the thickness of the aggregate layer generally average 15 feet deep on the project site. The aggregate material is well graded across the site, ranges from #16 sand to 6 inch and larger cobbles. The applicant gathered this information by having a geological study with bore logs conducted across the site. See Table 8 for volumes in each of the three proposed mining phases.

TABLE 8

ESTIMATED VOLUMES OF OVERBURDEN AND AGGREGATE (MILLION CUBIC YARDS)

Phase/Years	Overburden	Aggregate
1/2006-2015	1.08	2.16
2/2016-2025	0.40	1.10
32026-2035	1.95	2.80
TOTAL	**3.43**	**6.06**

4.3 Mining Operation Plan

4.3 a. Operation Overview

The mining of the site will be completed in three phases as depicted on Figure 11. This figure shows the setbacks and other areas of non-mining operation for the site. The summary of materials to be mined for each phase is given in Table 8. The mining operation is to occur in the phase order as indicted on Figure 11. The applicant has planned a preliminary schedule that is shown in Table 8; however, some overlap may occur between phases due to overburden requirements of the levees and Phase 1 reclamation. In addition, the operator could change the phasing schedule to meet operating conditions or market demand for the material. The project life of the operation is from 24 to 29 years and many future factors affecting market demand for the material would alter this projection. It is recommended that this not be a condition of the permit.

Another factor that will determine the amount of material to be removed is the quantity and quality of the aggregate in the gross excavated material. The depth of mining will vary with the depth of the material. Generally the maximum depth of cut will be up to 25 feet below ground surface, but it is possible for the maximum depth of cut to reach 30 feet in a few areas. Slopes of excavation will vary from 2H:1V to 1.5H:1V under water and 3H:1V in areas above the water.

4.3 b. Approach to Mining and Excavation

The mining and excavation of each phase shall begin with the removal of the topsoil and overburden material. This material will be used for construction of levees, or used immediately for reclamation in previously mined areas. As discussed above, in the final phase of proposed mining activities, it may be necessary to stockpile some quantities of overburden to support final site reclamation.

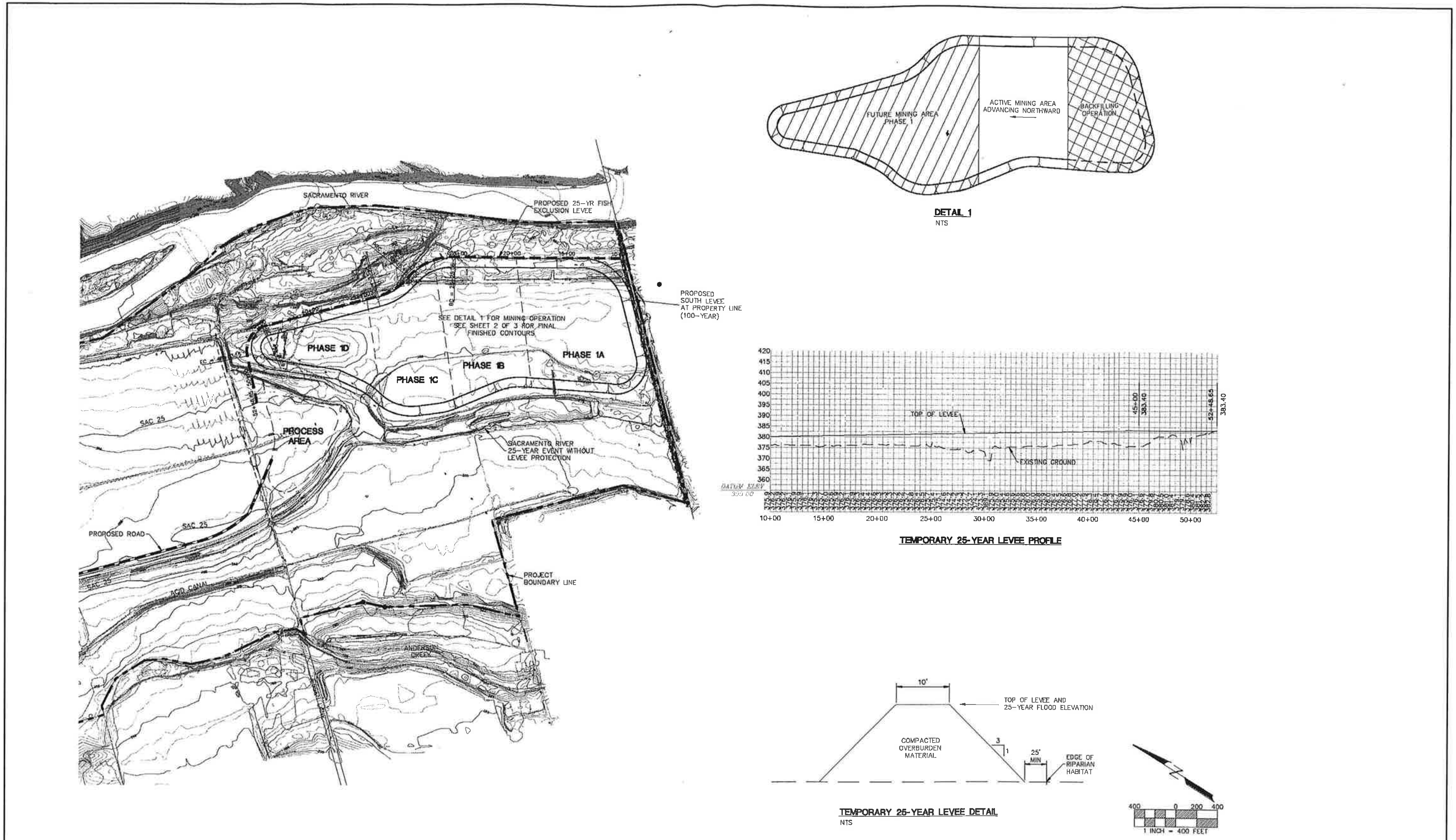
After the removal and placement of overburden materials, the mining and processing of underlying aggregate materials will begin. Figure 12 shows the proposed starting point and direction of mining in phase.

The proposed approach to overburden removal and aggregate extraction for Phase 1 will be different than that proposed for Phases 2 and 3. Overburden in Phase 1 will be removed in four stages as illustrated in Figure 12. This will be done in order to efficiently accommodate the backfilling of the Phase 1 pit as mining proceeds. At the start of Phase 1 mining operations (referred to here as Phase 1a), overburden will be scraped and stockpiled or used for the construction the proposed levee and "spur dike" adjacent to the southwest boundaries of the Phase 1 extraction site. At the completion of mining Phase 1a, any stockpiled overburden will be placed back in the pit created by the Phase 1a excavation. As mining proceeds to Phases 1b, c and d, overburden from these operations will be moved into previously mined portions of the Phase 1 pit.

With the start of mining operations in Phase 2, overburden will be scraped and used to create the proposed levee along the northeast corner of the Phase 2 pit (see Figure 13). Surplus overburden will then be used for backfill of the Phase 1 pit.

With the start of Phase 3 operations, overburden will be removed to complete construction of the proposed levee bounding the northeast, eastern and southern edges of the Phase 3 pit (see Figure 14). Remaining overburden will then be used for backfill of the Phase 1 pit. To complete the backfill of the Phase 1 pit, the temporary levee next to the Phase 1 pit will be leveled and graded to form the final proposed topography of the Phase 1 site. Any surplus overburden from Phase 3 will be used to complete reclamation activities for Phase 2 or stockpiled for final reclamation once Phase 3 mining is complete and the processing plant facilities removed from the project site.

An evaluation of the impact of levee installation on Sacramento River flood elevations was conducted as part of the mining and reclamation planning process (see Appendix F). The evaluation concluded that an effect on flood elevations due to the placement of project levees is discernable only at very large flood events. During a 100-year flood event the greatest increase in flood elevation detected at any of the prepared river cross-sections was shown to be approximately 0.1 foot. This increase occurred at a cross-section of the river adjacent to the project site. No increase in elevation up or downstream of the project site, during the 100-year flood event would occur as a result of the proposed project.



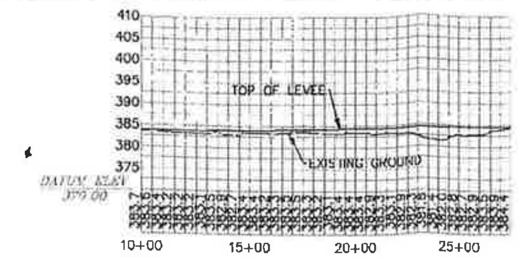
EIP ASSOCIATES

Source: Sharrah Dunlap Sawyer, Inc.

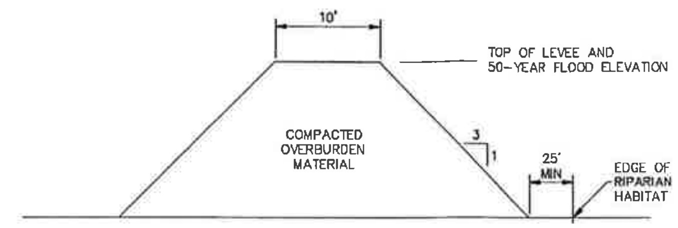
FIGURE 12
PHASED OPERATIONS PLAN
PHASE 1

Shasta Ranch Mining and Reclamation Plan

Project # - 10932-00



PHASE 2 50-YEAR LEVEE PROFILE



50-YEAR LEVEE DETAIL
NTS

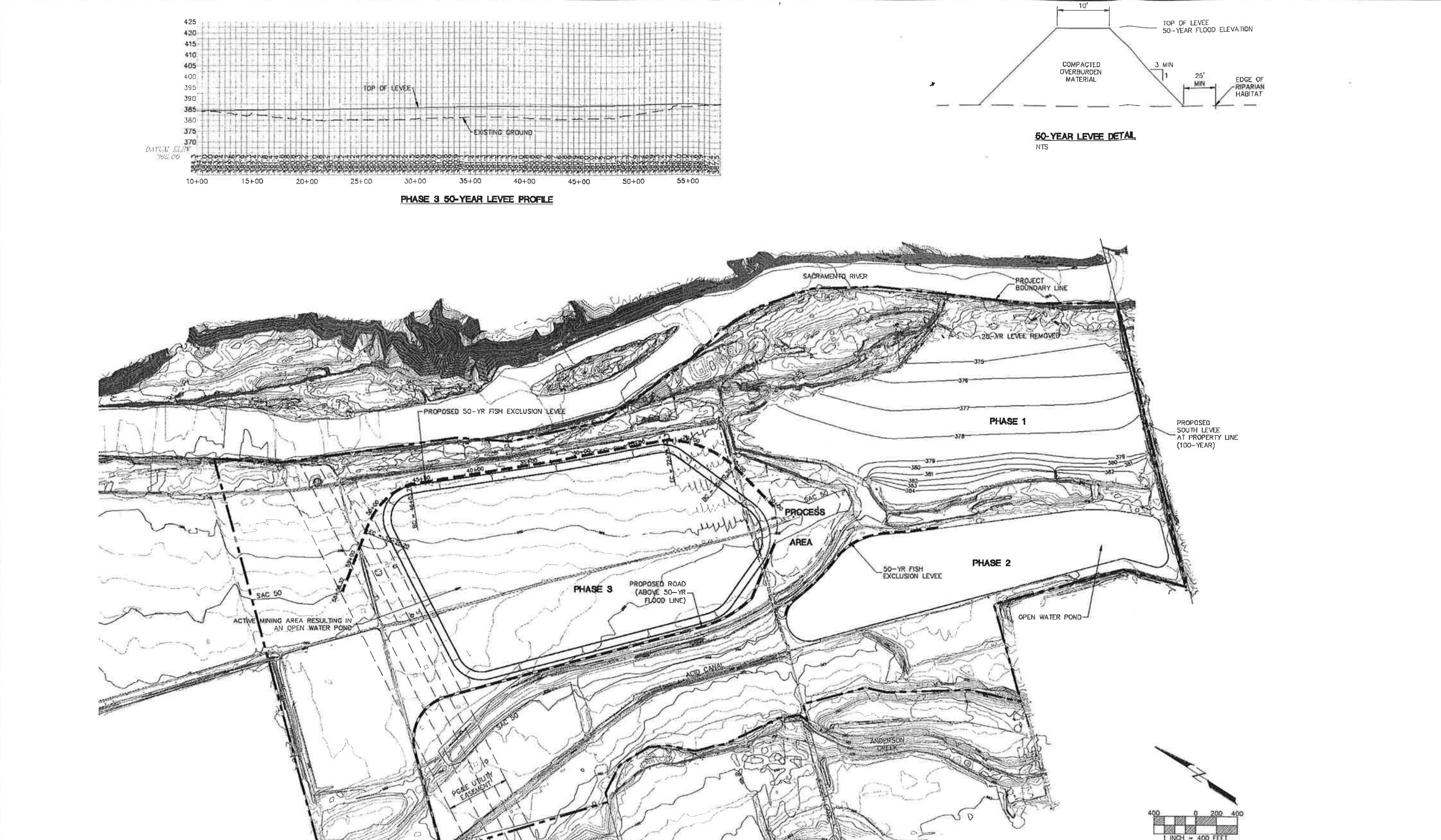
EIP ASSOCIATES

Source: Sharrah Dunlap Sawyer, Inc.

FIGURE 13
PHASED OPERATIONS PLAN
PHASE 2

Shasta Ranch Mining and Reclamation Plan

Project # - 10932-00



EIP ASSOCIATES

Source: Sharrah Dunlap Sawyer, Inc.

FIGURE 13
PHASED OPERATIONS PLAN
PHASE 2

Shasta Ranch Mining and Reclamation Plan

Project # - 10932-00

Mining would occur below the groundwater level using hydraulic excavators (e.g., CAT type bucket excavators). Therefore, it would not be necessary to dewater the mining pits in order to excavate all of the available aggregate.

The mining plan, as shown in Figures 12 (amended) through 16 (amended), is designed to have little or no impact on the surrounding areas through the use of set-backs and set-aside areas. The use of water on the site for irrigation of agricultural crops on land proposed for future phases will be routed around the mining operation. The mining operation will result in small amounts of dust that is to be controlled through the use of water during washing and chip sealing or paving internal roads. Speeds will be limited to 15 mph.

As noted, the overburden/topsoil will be used in the creation of fish exclusion levees as shown in Figures 12 through 14 of the reclamation plan to prevent flood waters from entering the ponds and prevent entrapment of fish in the ponds during flood events. The overburden/topsoil will also be removed and used in the development of the 85 acre reclaimed Phase 1 site and for construction and maintenance of the levees until mining is finished. The side slope areas of Phases 2 and 3 will have a re-vegetation seeding program as outlined in the reclamation plan.

4.3 c Spur Dike – Engineering

Based on initial concerns from adjacent owners that the mining operation would exacerbate existing flooding problems downstream of Anderson Creek, Shasta Ranch Aggregate proposed construction of a spur dike on the south edge of the mine site.

The spur dike is proposed along the south property boundary, somewhat perpendicular to the Sacramento River. It will create a barrier that prevents any excess river flow that may spill into the site from continuing southward during a major flood and will cause this excess flow to be redirected back to the river. Downstream of the site, the Sacramento River may still exceed its banks and inundate adjacent lands during a major flood after project implementation, but essentially in the same manner as it would for the preproject condition.

The spur dike would incorporate an engineering fill keyway beneath the levee extending to a depth of approximately 8 feet beneath existing grade. Potentially liquefiable soils are present at the site and extend to depths as deep as about 13 feet beneath grade, leaving about 5 feet or less of potentially liquefiable material beneath the bottom of the spur dike. Because seismically induced settlement and lateral spreading could be expected to occur at the site (assumes a design seismic event and full flood stage), it will be necessary to reduce the potential for liquefaction to affect the spur dike foundation by improving strength and/or improving the drainage of the native soils. the amount of settlement and lateral spreading, and, therefore, the amount of distress to the spur dike, would depend on several factors, including the looseness of the loose sand, the thickness of the sand soil, and whether the soil is saturated. These conditions are expected to vary, as indicated by the variations in soil borings at the site.

The most likely approach for constructing the spur dike will be to excavate and remove the loose soils and reconstruct the foundation with engineered fill constructed with native soil (soils not suitable for aggregate production and dried to provide a suitable moisture content for compaction to the standards for engineered fill). Embankment slopes will be constructed at gradients no steeper than 2-1/2(H):1(V) upstream and 2:1 downstream. Plate 3 in Appendix G shows a cross-sectional detail of this approach. Specific engineered fill requirements are listed in Table 7 in Appendix G.

Because the static water level appears to be around 368 feet, dewatering will be required to excavate unsuitable soils and construct the spur dike foundation to the standards for engineered fill. Narrow trench excavations that penetrate less than a few feet below the groundwater with no loose and/or cohesionless soils can be accomplished by directing inflow to a sump pump. Wider, deeper, and/or more extensive excavations may require well points, deep wells, and/or deep sumps, and some groundwater drawdown would be required. The type of dewatering method will depend on the construction methods and scheduling.

Assuming the spur dike is constructed as described above and shown on Plate 3 in Appendix G, the modeling results of the stability analysis indicate the spur dike should be stable for the cases usually considered for evaluation (: (1) after construction (static and pseudostatic); (2) during sudden drawdown (static); and (3) steady seepage from full flood stage (static and pseudo-static). Under intermediate flood conditions (e.g., a 10-year event), some liquefaction of foundation soils beneath the spur dike could result in settlement and lateral spreading; however, the amount of settlement or lateral spread is not expected to result in a levee breach because there should be sufficient freeboard above the flood elevation to retain flood waters.

Seepage will occur through the spur dike and native silty sands and gravels. If the spur dike is constructed with fines compacted to standards for engineering fill, it should take between 20 and 50 days to become saturated during flooding, assuming hydraulic conductivities on the order of 10^{-4} cm/sec to 10^{-2} cm/sec. The silty sand foundation hydraulic conductivity will be much greater than 10^{-2} cm/sec and readily permeate water. However, during design floods, water will flow around the spur dike and submerge the area downstream of the levee.

Static settlement of the spur dike foundation and soils will occur. Settlements on the order of 2 to 4 inches should be expected to occur in the silty sand foundation soils due to the addition of the levee soil loads. The majority of this settlement should occur during construction with addition of the spur dike fill, provided the soils are saturated. Some minor settlement of the spur dike soil (approximately 1 inch) should be expected to occur rapidly during construction.

In accordance with the recommendations of the project geotechnical report (see Appendix G, page 20, second bullet), quarry excavation slopes for phases 1, 2 and 3 will be constructed no steeper than 2.5H/1V in native "silty sand" and no steeper than 1:1 in dense gravel. Proposed mining excavation slopes generally will be constructed to a slope gradient of approximately 2H:1V. Reclaimed slopes, following backfill and final grading will not be steeper than 1.5H:1V below groundwater surface elevation and 3H:1V above groundwater. In localized areas where native silty sand occurs, excavated slopes will be constructed no steeper than 2.5H:1V. Based on soil borings conducted to date, locations of silty sand are expected to occur along the southwestern slope of the proposed Phase 3 pit and along the northwestern slope of the Phase 1 pit.

4.3 c. Employees and Equipment Use

A maximum of nine employees will be employed to operate the various types of equipment and machinery on the project site. The equipment to be used for the mining and excavation of materials will generally be diesel-powered, hydraulically operated wheel and track-mounted machines. The following equipment will be used on the project site:

- one water truck for dust control;
- two front-end loaders to feed the crusher and load trucks;
- one hydraulic excavator to harvest raw material from extraction areas;
- three off-highway trucks to transport raw material from extraction areas to the processing area;
- two self-loading scrapers to remove overburden and transport overburden to backfill Phase 1 extraction site;
- one track dozer to level fill at Phase 1 extraction site; and
- one 750 kilowatt diesel generator to power crushing equipment.

A centralized processing plant is proposed to reduce traffic and dust generation. Tracked equipment will be parked in the area designated for processing current mining phase when not in use. Other equipment will be parked at the existing processing facility and personnel cars will be parked at this location during working hours. The processing facility will be the site where daily fueling, lubing and repairs take place for all equipment. There may be minor occurrences of breakdowns away from the processing facility that will require equipment to be repaired in the field.

4.3 d. Processing Plant Operations and Aggregate Transport

Processing Plant Operations

Processing plant operations would include the stockpiling of aggregate, loading of raw aggregate into conveyor chutes, washing the aggregate, sorting, crushing the aggregate to market specifications, and delivery into stockpiles or into hauling trucks for delivery. In general, the proposed mining operations would normally occur between the hours of 7 am and 5 pm, Monday through Friday, with occasional need to operate longer hours from 7 am to 6 pm, Monday through Saturday, during peak demand periods. The plant operations would be centrally located in reference to the mining pits, thereby reducing the distance traveled by the large aggregate haulers from the pits to the plant.

Loaders would deliver raw mined aggregate to the plant chutes, which would carry aggregate into a jaw crusher. Aggregate would then enter a cone crusher, followed by screening and washing into its final form for delivery to client hauling trucks. An average of approximately 64 25-ton loads would leave the processing plant on normal production days Monday through Friday. There would be 120 load per day maximum during peak demand periods with deliveries from Monday through Saturday.

Aggregate Transport

Hauling trucks would deliver aggregate processed at the Shasta Ranch site to a variety of markets in the region. In general trucks will use the following routes:

- Balls Ferry Road West to Deschutes Road to I-5;
- Balls Ferry Road East to Panorama Road to Deschutes Road to I-5; and
- Kimberly Road to Panorama Road to Deschutes Road to I-5.

Every effort will be made to equally divide the traffic trips from deliveries among these three different routes. Based on these assumptions a preliminary analysis of project impacts on traffic and circulation conditions was conducted by Omni-Means, Ltd., a transportation consulting firm working under contact to the project applicant.

The preliminary project traffic analysis assumes that the transport of aggregate excavated and processed by the Shasta Ranch Project will occur as follows:

- aggregate hauling will occur 250 days/year;
- approximately 60% of the processed aggregate will be hauled to nearby asphalt plants and approximately 40% will be hauled to the open market;
- aggregate will be hauled Monday through Friday between the hours of 6 AM and 6 PM with occasional deliveries on Saturday and no deliveries on Sunday;
- a single truckload will carry approximately 25 tons of aggregate;
- 400,000 tons of aggregate will be processed and transported per year;
- peak summer season may require Saturday deliveries;
- an average of 64 daily roundtrips for haul trucks will be generated;
- a maximum daily volume of 120 haul truck round trips may occur periodically;
- AM and PM peak hour truck trips will average 6 round trips per hour for a total of 12 trips per hour;
- maximum AM PM peak hour truck trips will number 12 round trips per hour and occur periodically; and
- the daily average total trips number (including employee trips, other non-truck traffic, and haul trucks) will be 168 trips per day.

4.3 e. Water Usage

Approximately 50,000 gallons per day would be used for washing the aggregate and for dust suppression in the project site. The water used on the site for these purposes would be pumped from the small pond located on the project site north of Phase 1. Water will also be recycled from the washwater settling pond and used for either dust suppression or washwater. Sediment will be excavated from settling ponds for use as fill in Phase 1 and subsequent reclamation activities. The proposed settling basin will be approximately 1 acre in size and ten (10) feet deep. The basin will collect used washwater from the processing plant and allowed to settle. An adjustable standpipe will collect clarified surface water from the basin for reuse as process washwater or for dust suppression.

4.3 f. Drainage Plan

The existing surface water drainage flow across the site follows the natural slope of the site, which is generally in a southeasterly direction. The sheet flow of water follows natural drainages on the site into the fields and roadside ditches with some discharge into the river. The proposed project would prevent surface water flows from the mining operations discharging into the river. This would be accomplished through construction of the levees, grading during mining operations so that surface flows are directed to the interior of the mining phases, and through the construction of a spur dike at the southwestern boundary of the project site. The design of the haul roads and pond levees would be sloped toward the pond areas to prevent stormwater runoff from leaving the site and from flood waters entering the ponds. These measures would redirect the existing drainage pattern so that sheet flow discharges into the mining pits and ponds. Therefore all drainage water will be contained within the mining portion of the project site.

The overall configuration and grading plan for the site would prevent the discharge of stormwater from the site to any waterways. The stockpiles of overburden and aggregate materials will be placed so that runoff can be collected and contained on-site. The one exception to this is the Phase 1 area following reclamation. This area will be graded to allow unimpeded drainage of the site following periodic flood events. This is to ensure that fish are not entrapped in pits or depressions on the Phase 1 site as floodwaters recede.

The project is designed to comply with all federal, State and local laws, such as the Porter Cologne and Clean Water acts. As such, the RWQCB was consulted during the application process. The RWQCB will issue Water Discharge Requirements after review and approval of this mining and reclamation plan.

4.3 g. Pollution Prevention

The only potential source for pollution on the site could be from the fuels and oils used for equipment. The maximum amount fluids stored on-site will be 10,000 gallons of fuel in an above-ground storage tank and approximately five 55-gallon drums of lubricants and transmission oil. Storage of fuels and oils would comply with the State Water Quality Control Board guidelines for pollution prevention near water bodies. The vehicles and equipment used in the operation of the project would be maintained to prevent any possible leaks. Routine on-site maintenance will be conducted under an approximately 900 square feet maintenance canopy. Major repairs, other than emergency repairs, will be conducted at an off-site facility. Since on-site drainage will be designed to stay on the site and erosion control measure would be used to control off-site erosion, off-site drainage of potential leaks from operations would not occur.

4.3 h. Disposal of Mine Wastes

The mining operation would crush and produce materials from aggregate that would be classified as non-hazardous by the California Integrated Waste Management Board. All overburden will be used on-site for backfilling the mining pit at Phase 1, the construction of levees, and formation of the shorelines of the ponds from Phases 2 and 3. A small portion of the aggregate material would be used on-site for roads, while the majority would be transported to the plant site to be processed and sold.

4.3 i. Dust and Noise Control

Water and dust suppressants shall be used during the mining operation to control dust. Dust created by vehicle movement will be controlled by chip sealing or paving all internal haul roads. Other actions to be undertaken by Shasta Ranch Aggregate to mitigate dust and other air-quality impacts include:

- All disturbed areas, including storage piles, that are not being actively used shall be effectively stabilized of dust emissions using water, chemical stabilizer/suppressant, or vegetative groundcover.
- Alternatives to open burning of vegetative material on the project site shall be used unless otherwise deemed infeasible by the AQMD. Among suitable alternatives are chipping, mulching, or conversion to biomass fuel.
- Shasta Ranch Aggregates will be responsible for ensuring that all adequate dust control measures are implemented in a timely and effective manner during all phases of project development and construction.
- All material excavated, stockpiled, or graded shall be sufficiently watered to prevent fugitive dust from leaving property boundaries and causing a public nuisance or a violation of an ambient air standard. Watering shall occur at least twice daily with complete site coverage, preferably in the midmorning and after work is completed each day.
- All onsite unpaved roads shall be effectively stabilized of dust emissions using water or chemical stabilizer/suppressant.
- Onsite vehicle speeds on unpaved surfaces shall be limited to 15 mph.
- All land clearing, grading, earth moving, or excavation activities on the project site shall be suspended when winds are expected to exceed 20 miles per hour.
- All inactive portions of the development site shall be seeded and watered until a suitable grass cover is established. Seeding shall be with an approved native seed mix.
- Shasta Ranch Aggregates will be responsible for applying Department of Public Works-approved nontoxic soil stabilizers (according to manufacturers' specifications) to all inactive construction areas (previously graded areas which remain inactive for 96 hours), in accordance with the Shasta County Grading Ordinance.
- When materials are transported offsite, all material shall be covered and effectively wetted to limit visible dust emissions, or at least 6 inches of freeboard space from the top of the container shall be maintained.
- All operations shall limit or expeditiously remove the accumulation of mud or dirt from adjacent public streets at least once every 24 hours when operations are occurring.
- The site access road shall be paved prior to conducting other onsite construction activities (e.g., grading of the processing area, construction of equipment footings, equipment installation).
- Idling time for all diesel-powered equipment shall be limited to no more than 5 minutes when not in use.
- Heavy-duty (>50 horsepower) off-road vehicles to be used in the initial construction process, including owned, leased, and subcontractor vehicles, shall achieve a minimum fleet-average 45 percent particulate reduction, compared to the most current ARB fleet average at the time of construction. Acceptable options for reducing emissions may include use of late model engines, low-emission diesel products, alternative fuels, engine retrofit technology, after-treatment products, and/or other options as they become available.

- Onsite truck and equipment engines shall be maintained in good running condition, in accordance with manufacturers' specifications. Maintenance records demonstrating compliance shall be kept onsite by the applicant and shall be made available to AQMD upon request.
- Shasta Ranch Aggregates shall develop and implement a fugitive dust control plan (FDCP) for purpose of reducing project-related fugitive dust emissions associated with the long-term operation of the proposed project.
- Off-road and on-road vehicles, including owned, leased, and subcontractor vehicles, shall use the lowest sulfur-content fuel available.

The potential sources of noise on the site will be from the operation of the heavy equipment and processing plant during the mining operation. The earthmoving and processing plant equipment would operate in accordance with the Shasta County Noise Ordinance. Although new noise sources would be created by the project that would affect nearby residences, the proposed project would incorporate noise control measures into the project. The mobile machinery and equipment used on the site would be fitted with noise suppression mufflers in accordance with applicable federal, State, and local regulations. The processing plant would use teflon-coated aggregate chutes to reduce noise levels. Other measures that could be used to comply with the Shasta County ordinance could include noise curtains installed around operating equipment and trucks operating within the property using strobe lights rather than warning beepers. Noise mitigation measures would be implemented to the extent necessary to ensure that noise levels would remain within Shasta County and Mine Safety & Health Administration (MSHA) standards. The project is designed to comply with all federal, State and local laws pertaining to air quality control standards and regional air quality plans. As such, the Shasta County Air Quality Management District was consulted during the application process. The Shasta County Air Quality Management District will issue permits for mining and reclamation operations after review and approval of this mining and reclamation plan.

4.3 j. Natural Resources Protection

Fish

All Sacramento River fish species described in Section 2.3b, Natural Resources, as well as other native and non-native fish species, could have the potential to become stranded, or entrained, in the mining pits during high flow periods. Entrainment is defined as redirection of fish from their natural migratory pathway into areas or pathways not normally used. Entrainment also includes the take, or removal, of fish from their habitat through the operation of water diversion devices and structures such as siphons, pumps, gravity diversions or mining pits. As discussed above, three fish exclusion levees are proposed as part of the proposed mining and reclamation project. These levees would be constructed to provide protection for fish from entrainment in the proposed pits during active mining operations and after the completion of site reclamation.

Fish exclusion levees were incorporated following discussions with National Oceanic & Atmospheric Administration (NOAA), National Marine Fisheries Services (NMFS). NMFS concurred that a 50-year levee would provide adequate protection for listed fish provided they are fully effective and maintained in perpetuity or as long as open water exists in the flood plain at the site. CDFG requested the levees be constructed to protect against the 100-year flood event. The difference in the water surface elevations at the site between the 50-year and 100-year events is 0.7 feet, or 8 inches. The levees have been redesigned to provide protection from the 50-year event with 1.5 feet of freeboard, which is equivlanet to protection from the 100-year event with 0.8 feet of freeboard

Revised levee configuration is shown on Figures 12 (amended) through 16 (amended). New levee layout in relation to species of concern and wetlands is shown in Figure 14A.

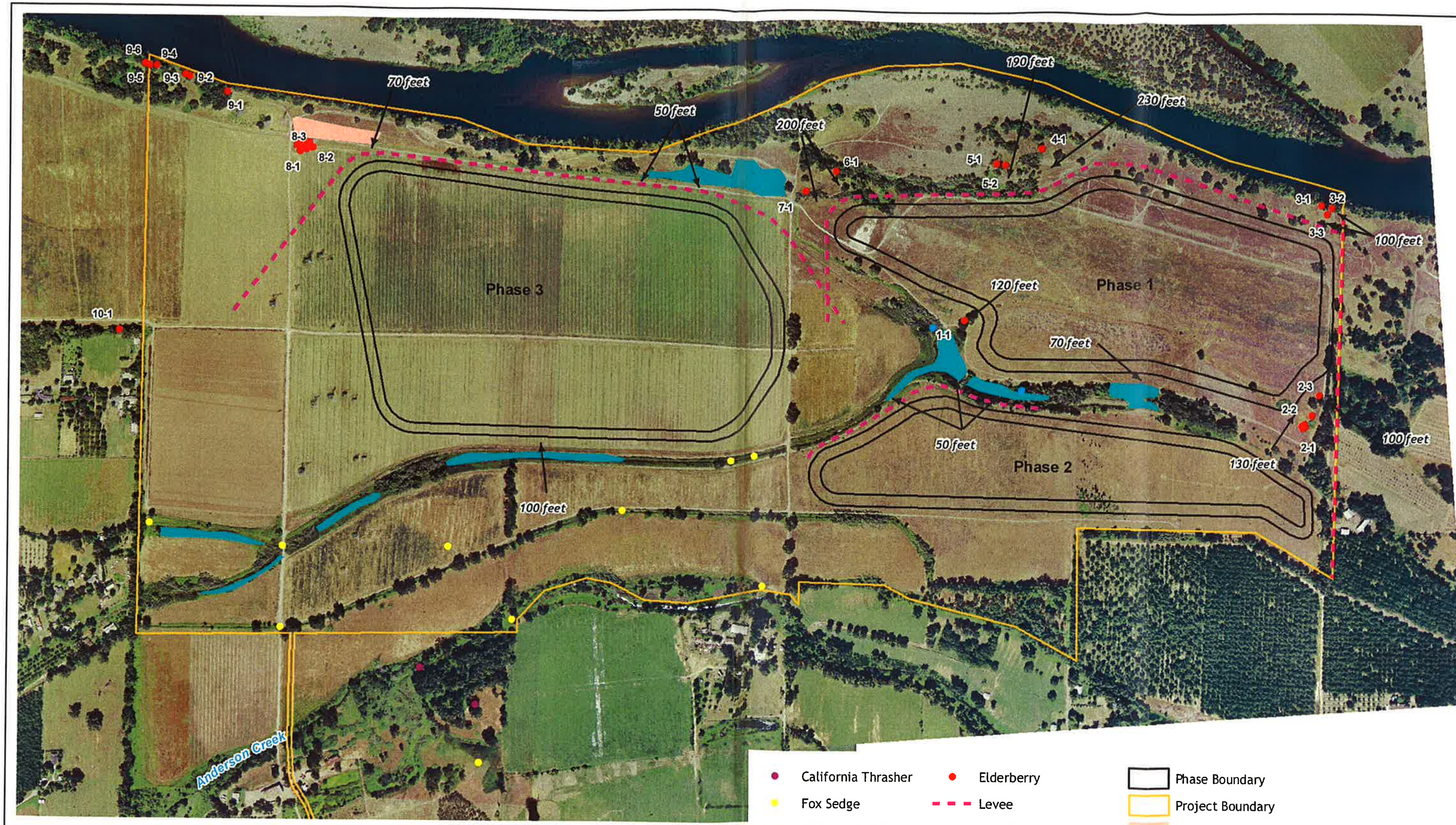
Visual Resources and Project Noise

In addition to the three fish exclusion levees described above, a fourth levee or "spur dike" would be constructed along the southwestern border of the project site. This dike would serve to provide additional flood protection for properties to the south of the project site. It would also serve to attenuate project noise and mitigate views onto the project site from adjacent properties.

Terrestrial Biological Resources

The Shasta Ranch project area encompasses approximately 990 acres of flat to gently rolling river floodplains areas, woodlands and agricultural fields. The project area contains valley oak woodland (94.97 acres), valley foothill-riparian (116.22 acres), annual grassland (425.43 acres), fresh emergent wetland (13.10 acres), eucalyptus (75.3 acres), irrigated hayfield (189.56 acres), and riverine plant communities (1.66 acres). A wetland delineation was conducted for the project area and determined that approximately 121.6 acres of jurisdictional waters occur within the project area in the form of seasonal wet meadows, intermittent pools, fresh emergent wetlands, riparian wetlands, fresh emergent/riparian wetlands, agricultural ditch wetlands, and riverine and agricultural ditch waters (North State Resources, Inc. 2004). Shasta Ranch mining operations are proposed to impact irrigated-hayfield during Phase 3 of mining operations and annual grassland during Phases 1 and 2. A small area of riparian vegetation located in Phase 2 will also be removed as a result of mining. The irrigated hayfield habitat occurs as several large alfalfa (*Medicago sativa*) fields. These fields are intensively farmed and dominated by moderate to dense growth of alfalfa. The annual grassland occurs mainly as fallow agricultural fields and areas located under a powerline easement at the western portion of the property. This habitat is characterized as a moderate to dense herbaceous layer dominated by annual grasses and forbs.

Construction avoidance measures and the implementation of setbacks will be necessary to protect sensitive or jurisdictional habitats and special-status wildlife species that occur or potentially occur within these areas. All mining operations and associated activities including levee construction will attempt to maintain a 100-foot separation from the edge of riparian habitat. The minimum setback in only a few areas will be 50 feet. Riparian habitat occurs within the floodplain areas along the Sacramento River and along agricultural ditches and drainages. Also within these areas are fresh emergent wetlands that occur as an intermixed complex with riparian vegetation. An adequate separation from fresh emergent wetlands and riparian habitat will preserve the attributes of these habitats and buffer the potential impacts of adjacent activities.



California Thrasher
Fox Sedge
White-Tailed Kite
Yellow-Breasted Chat
Elderberry
Levee
Spur Dike
Fresh Emergent Wetland
Phase Boundary
Project Boundary
Primary WWTP Sludge Disposed in Trenches

Note: Elderberry locations will be staked in the field prior to development

0 370 740 1,480 Feet

VESTRA

SOURCE: SHARRAH DUNLAP SAWYER 2006; NORTH STATE RESOURCES 2005

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FIGURE 14A
SENSITIVE SPECIES LOCATIONS
SHASTA RANCH AGGREGATE
ANDERSON, CALIFORNIA

Elderberry (*Sambucus* sp.) plants containing stems measuring 1.0 inch or greater in diameter at ground level are the host plant for the federally threatened Valley Elderberry Longhorn Beetle. Pursuant to the U.S. Fish and Wildlife Service's (USFWS) Conservation Guidelines for the Valley Elderberry Longhorn Beetle, a 100-foot setback is required to assure complete avoidance (i.e. no adverse effect) of the species. As proposed, mining activities and spur dike construction on the Shasta Ranch project site will result in activities within the required 100-foot setback from one individual elderberry plant located on or near Phase 1 of the project. Prior to any disturbance within the required 100-foot setback from the elderberry plants, the USFWS will be consulted, adequate mitigation implemented and necessary permits acquired. The USFWS will be consulted before any disturbance within the setback area is considered.

4.3 k. Public Safety

The issue of public safety shall be addressed in accordance with California Code of Regulations Section 3502 (b)(2). Fencing and signage would be installed to limit public access to the site. Future development surrounding the project site will increase public exposure to on-site hazards. Therefore, as future development occurs near the site, additional public safety measures would be installed to prevent entry to the site.

5. RECLAMATION PLAN

5.1 Reclamation Process

5.1 a. Overview of Reclamation Process

The Shasta Ranch project site encompasses approximately 660 acres, of which approximately 268 acres will be mined for aggregate material or used for processing activities. In accordance with SMARA requirements, this Shasta Ranch Project reclamation plan identifies the means by which the areas disturbed by proposed mining activities will be restored for beneficial use. For the Shasta Ranch project site, proposed reclamation activities would create aquatic habitat in the form of two ponds formed by site mining excavations, reclaimed farmland, and habitat in the form of revegetated pit side slopes, access roads, levees, and aggregate processing areas. The revegetation plan contained herein also includes provisions for the enhancement and preservation of areas of existing habitat that would be undisturbed by mining activities.

Reclamation of the project site will be carried out concurrently with proposed mining activities to the extent possible. In areas where mining activities are complete and future disturbance can be avoided, reclamation will commence.

The proposed approach to reclamation and revegetation of the project site is detailed in Section 4.3 (Revegetation and Erosion/Drainage Control Plan) along with performance criteria to assure success of the revegetation effort. In general, revegetation of the project site will be accomplished by preparing disturbed areas by tilling and/or resoiling using topsoil collected onsite during mining operations. These areas will then be transplanted and seeded using locally collected plants and seeds.

Under the proposed reclamation plan, the mining pit at Phase 1 would be converted to its original topographic elevation and use for agriculture, while reclamation would convert the mining pits at Phases 2 and 3 into ponds. These areas will serve as habitat for fish, waterfowl, and other wildlife native to the region. The ability to accomplish this end result will require following basic concepts to be implemented as part of the reclamation plan.

The key to any process that alters the present surface contours requires that stable drainage and surface conditions be established through proper grading of the site. The placement of top soil/overburden on the reclaimed areas for farmland and within the excavated areas would necessitate shaping of the surface through grading activities to develop slopes that become stable with vegetative growth. The revegetation of the site (side slopes, levees, and shorelines) would be assisted through the natural seed germination from local plants in areas surrounding the site or on the site in undisturbed areas and from the revegetation plan. Reclamation activities would occur after each successive mining phase. Thus, reclamation for Phase 1 will occur concurrent with the mining operations of Phases 2 and 3.

5.1 b. Schedule

The schedule for the interim and final reclamation will be driven by the volume of the overburden excavated during the proposed mining phases. This schedule would initially follow or occur concurrently with the mining of each phase, but would be periodically reviewed as mining progresses. Interim reclamation areas would be established after several years when mining activities would be completed and surfaces, or at the completion of a phase. Monitoring will be conducted on the interim reclaimed areas and final reclamation during the appropriate seasons. Reclamation of the project site, including monitoring activities, would be complete within 10 years of completion of mining activities.

5.2 Engineering Data

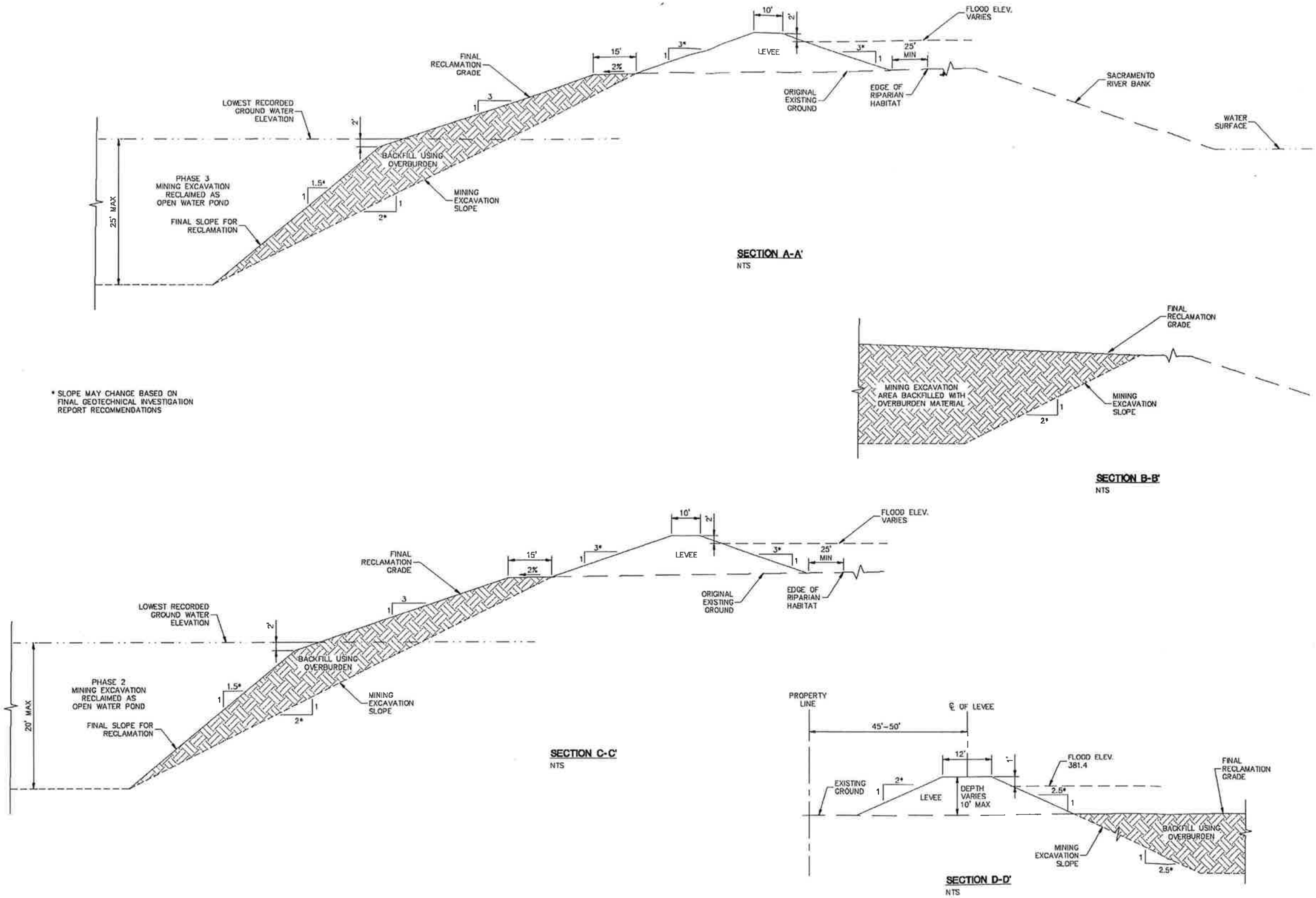
5.2 a. Final Slope of Project Area

Mining and excavation activities will create the base side slopes for the specific areas around the ponds and levees as discussed in Section 3, above. The side slopes would be a maximum of 3H:1V towards the excavation areas near ponds and levees. A 3H:1V slope would be constructed at the water fluctuation line for aquatic diversity during the reclamation phase of this project using stockpiled overburden. Below that, a 1.5H:1V or 2H:1V slope would be constructed depending on soil conditions. Please see Figure 15 for detailed cross-section of the final slope configurations planned for each phase of the reclamation plan. The stability of the slopes would be based on Slope Stability Analysis prepared for the proposed project and from application of general engineering practices to determine slopes at the varying depths of mining excavation. This analysis of existing soil characteristics and projected groundwater levels determined a general rule for a maximum slope of 2H:1V for the slope area above the water line and to a depth of five (5) feet below the water line. The maximum slope below five (5) feet from the water line could be 1.5H:1V (being the average critical gradient of the native material) depending on the soil conditions and flow of groundwater. These side slope areas will be formed using mostly native material and breaking down steep side slopes for gentler side slopes on the pond perimeters. Slope stability would be monitored throughout the mining phase of the project to ensure that underlying formations and materials would remain stable within the planned mining and reclamation slopes. As determined by the slope stability analysis, all pit slopes will need to comply with all safety factor standards as defined by SMARA.

Circulation of water in the ponds and the migration of ground water would be maintained through the neighboring native undisturbed material. These “windows” of undisturbed native materials will act as conduits for the migration of water from and to the river through the final pond configuration. As has been observed at other mining operations, water continues to pass through areas of overburden backfill, but at a slower rate than through undisturbed native material. Final slopes of the mined areas that transition to undisturbed or reclaimed areas will be sloped to match the surrounding topography of the site. The final topography of the project site upon completion of site reclamation is shown in Figure 16.

5.2 b. Reclaimed Land Use

The goal of this reclamation plan is to return the area to a stable, self-sufficient ecosystem. This system will be comprised of ponds, levees, open space areas, and an area of approximately 85 acres



EIP ASSOCIATES

Source: Sharrah Dunlap Sawyer, Inc.

FIGURE 15
FINAL RECLAMATION CROSS SECTIONS

Shasta Ranch Mining and Reclamation Plan

Project # - 10932-00

FIGURE 16
FINAL RECLAMATION
SITE TOPOGRAPHY
Shasta Ranch Mining and Reclamation Plan
Project # - 10932-00

EIP ASSOCIATES

Source: Sharrah Dunlap Sawyer, Inc.

to be returned to farmland. The ponds would add to the available habitat along the river for those species native to the area, however, the levees, as discussed above, are specifically designed to exclude migrating fish in the Sacramento River from the ponds created on the project site. This is because the inundation of the ponds during high river flows could result in entrapment of migrating fish within the excavated areas as floodwaters recede. In addition, the connection of the river to the ponds may expose Sacramento River fish to increased levels of predation from warm water species that are likely to thrive in the formed ponds.

The temporary levee to be created adjacent to Phase 1 of the mining plan will be removed upon the completion of Phase 1 mining activities. This levee is designed to provide protection of the excavation from 50-year flood events with 1.5 feet of freeboard or 100-year events with 0.8 feet of freeboard during Phase 1 mining activities. The levee will be removed upon completion of Phase 1 mining and the overburden materials used to create the levee will be used in addition to other overburden generated by excavation of the Phase 2 to backfill the Phase 1 pit. At the request of the RWQCB, material from Phase 3 will not be used to reclaim Phase 1. Backfilling of the Phase 1 pit will be done to an elevation above typical low flow groundwater elevations and that allows the restoration of farming activity. Importantly, final grading of Phase 1 will allow complete drainage of the site during high flow events without the risk of substantial entrapment of migrating fish.

As shown in Figure 16, two levees and the spur dike created during mining activities will remain in place after site reclamation is complete. The levees afford the Phase 2 and Phase 3 pits permanent protection from 50-year events with 1.5 feet of freeboard or 100-year events with 0.8 feet of freeboard while the spur dike will provide 100-year-event flood protection for the properties adjacent to and southeast of the project site. Maintenance of the levees and the spur dike will be required of the existing property owner, in perpetuity. Any future transfer of ownership of the property will be conditioned on the owner's legal commitment to maintain the levees and spur dike.

Natural recruitment of plant growth and proposed revegetation along side slopes of the ponds and levees will provide additional areas for cover, forbes, and nest sites for wildlife. The side slopes and bottoms of the ponds will have a varying contour across each reach to assist in the growth of plant and aquatic biological species.

The final configuration of pond side slopes, bottoms and levees would vary based on the nature of the aggregate mined and the depth of the material. Revegetation would place native grasses, bushes, and native trees on side slope areas that range from 2H:1V to 3H:1V. To maintain the circulation of water in the ponds, specific bank or levee areas would use native materials. The native soils would act as conduits for the migration of water through the ponds and into the groundwater. The water movement between the ponds would occur based on the influence of the Sacramento River, Anderson Creek, and ACID canal water elevations. The fluctuating water surface in the river, creek, and ACID canal would determine the direction of groundwater flow, either from the river and into the project site or vice versa.

Upon completion of mining operations, all machinery, waste, scrap and excess materials would be dismantled and removed from the site. All materials would be recycled or taken to the nearest appropriate landfill. After removal of the facility, the ground beneath the former processing facilities and access roadways that are no longer in use will be deep tilled to eliminate soil compaction from the facilities and road use. The area will be resoiled with stockpiled overburden remaining from Phase 3 mining activities to a minimum depth of 6 inches or as needed to ensure establishment of the proposed revegetation of the site. The ground would be graded to match surrounding topography and then revegetated. The reclaimed farmland shall be irrigated through the use of the on-site groundwater well and existing riparian water flow in an existing open ditch and pipeline. This source of water would be applied to the reclaimed farmland for the production of alfalfa, pumpkins, and corn, as are presently grown on the project site. During the topsoil/overburden removal process, the depth of any distinct layers would be recorded to determine the appropriate layer thickness during the reclamation process of the farmland areas. Topsoil depth would be established through the review of existing soil profile changes and observed root zone depths of existing crops.

Due to the nature of agricultural activities and the present crop rotation on the project site, the ability to address future production levels 35 years from now is difficult. The production levels for the reclaimed farmland can be based on the County average for the crop type planted in reclaimed areas. The production level would be adjusted for the final soil horizon that supports the crop root structure. Reclaimed farmland would be monitored to ensure that production levels meet these standards for at least two consecutive years.

5.2 c. Erosion and Drainage Control

Erosion would be controlled during each mining and reclamation phase. Overburden piles and soils in the mining areas would be exposed to wind and storm conditions that would require treatment with a hydroseed/mulch preparation to restore the structure of the bare soil on an as needed basis. A seed mixture would be selected so that germination occurs rapidly in the disturbed native material or stockpiled overburden. This type of application would reduce the movement of soil due to erosion from heavy rainfall.

Drainage control will occur through grading of areas surrounding the active mining area of each phase to contain drainage to that phase. Sloping of the area surrounding the open pit will direct drainage to the open mined area. This will minimize the potential for runoff of sediments to other areas of the project site. Stockpile areas will also have external swales to direct drainage flows to open mining areas or pits. Erosion control measures would be designed for not less than a 1 hour/20-year intensity storm event.

The final grading of the site is shown in Figures 15 and 16 which illustrate the slopes of the ground within the mining area and the adjacent undisturbed portions of the site. This final grading of the project site will create slopes and contours that maintain the drainage to the pits from areas previously disturbed by mining and reclamation activities. The exception is the 85-acre area, which would be reclaimed for agriculture. This area would be graded to ensure drainage to the Sacramento River in order to prevent entrapment of migrating fish during high river flow periods. Final grading will simulate pre-project conditions in the southwest portion of the project site.

This approach strives to eliminate the possibility of significant sediment runoff entering a down-gradient water body (i.e., the Sacramento River). The mining operation's Strom Water Pollution Prevention Plan (SWPPP) would be developed to meet that requirement. The distribution of any fertilizers or soil amendments used for the enhancement for revegetation would be placed to avoid contact with pond water. The applicant will conduct inspections quarterly, to ensure that the erosion control plan is being implemented and that the above measures are properly controlling erosion and sedimentation in all disturbed areas.

Shasta Ranch Aggregates will now employ widely accepted Best Management Practices (BMPs) to control erosion on the site. Primary sources of BMPs are found in:

- *Caltrans Stromwater Quality Handbook, March 2003*
- *Rehabilitation of Disturbed Lands in California, Special Publication 123, Department of Conservation 2003*

5.2 d. Economic Impacts

The regional supply of gravel is limited in the project area, and this operation will satisfy a real need in the local construction industry. The mining operation is located in a rapidly growing population area. Of the cities and towns located within the market area of Shasta County, Redding is experiencing high current and projected population growth. Shasta County experienced a growth rate of approximately 11 percent over the past decade (from 1990 to 2000), and has a current population of approximately 175,000. The Shasta County Economic Forecast from the State Department of Transportation estimates that with a growth rate of approximately 5 percent, Shasta County will have a population of approximately 230,000 by the year 2020.[xvi] The people moving to Shasta County come mostly from other areas in the United States and from more densely populated areas of California. These people are looking for a more affordable housing market. With the large increases in population expected, there also exists a need for more housing units. New roads must be built, existing roads expanded, gutters and sidewalks installed, and house foundations built to accommodate this demand.

5.3 Revegetation Plan

5.3.a Revegetation Overview

The entire project area encompasses approximately 660 acres of gently rolling river floodplain areas, woodlands, and agricultural fields. Elevations within the project site range between 375 and 390 feet above mean sea level. Current land use within the site consists of agriculture, including row crops, field crops, and cattle grazing. Implementation of the revegetation would serve to control erosion from disturbed areas of the project site, establish a diversity of habitat types in areas to be disturbed by mining and processing operations that are compatible with surrounding habitat types, preserve and enhance existing onsite wetland and riparian forest habitats, and provide long-term protection of Sacramento River fisheries from impact during project site flooding.

5.3.b. Plant Communities

Vegetation within the project site has been classified as valley oak woodland, valley foothill-riparian, fresh emergent wetland, valley foothill/fresh emergent wetland complex, annual grassland, eucalyptus, irrigated hayfield, irrigated row crops, orchard, urban, and riverine plant communities (see Figure 3). Valley oak woodlands occur scattered throughout the site along irrigation ditches, fence lines, and other areas of the project site not used for agriculture. The valley foothill-riparian and fresh emergent marsh habitats occur mainly in floodplain areas and along agricultural drainages, while the annual grassland comprises the largest portion of the project site, occurs within fallow fields and under a powerline easement on the western portion of the site.

5.3.c Special Status Plant and Wildlife Species

Reconnaissance-level biological surveys, wetland delineation, and vegetation mapping have been conducted for the entire project site. Database searches and reviews of various state and federal special-status species lists in support of these activities revealed 15 special-status plant species and 34 special-status wildlife species with the highest likelihood to occur within the project area. Incidental observations during biological surveys have identified the presence of one special status plant occurring in riparian and emergent wetland habitats on the site, fox sedge (*Carex vulpinoidea*), and nine special-status wildlife species, four of which are special-status fish species known to occur immediately adjacent to the project site in the Sacramento River. Wildlife species observed during reconnaissance-level biological surveys include Northwestern pond turtle (*Clemmys marmorata marmorata*), osprey (*Pandion haliaetus*), white-tailed kite (*Elanus leucurus*), Nuttall's woodpecker (*Picoides nuttalli*), oak titmouse (*Baeolophus inoratus*), California thrasher (*Toxostoma redivivum*), and yellow-breasted chat (*Icteria virens*). Fish species known to occur within adjacent portions of the Sacramento River include Central Valley steelhead (*Oncorhynchus mykiss*), Central Valley spring-run chinook salmon (*Oncorhynchus tshawytscha*), winter-run Chinook salmon (*Oncorhynchus tshawytscha*), and fall/late fall-run Chinook salmon (*Oncorhynchus tshawytscha*).

5.3.d Regulatory Requirements

Incorporated by reference are reclamation standards as outlined by the Surface Mining and Reclamation Act. All reclamation activities will be performed in accordance with applicable laws, codes, and regulations required by authorities having jurisdiction over such work.

5.4 Revegetation Plan and Design

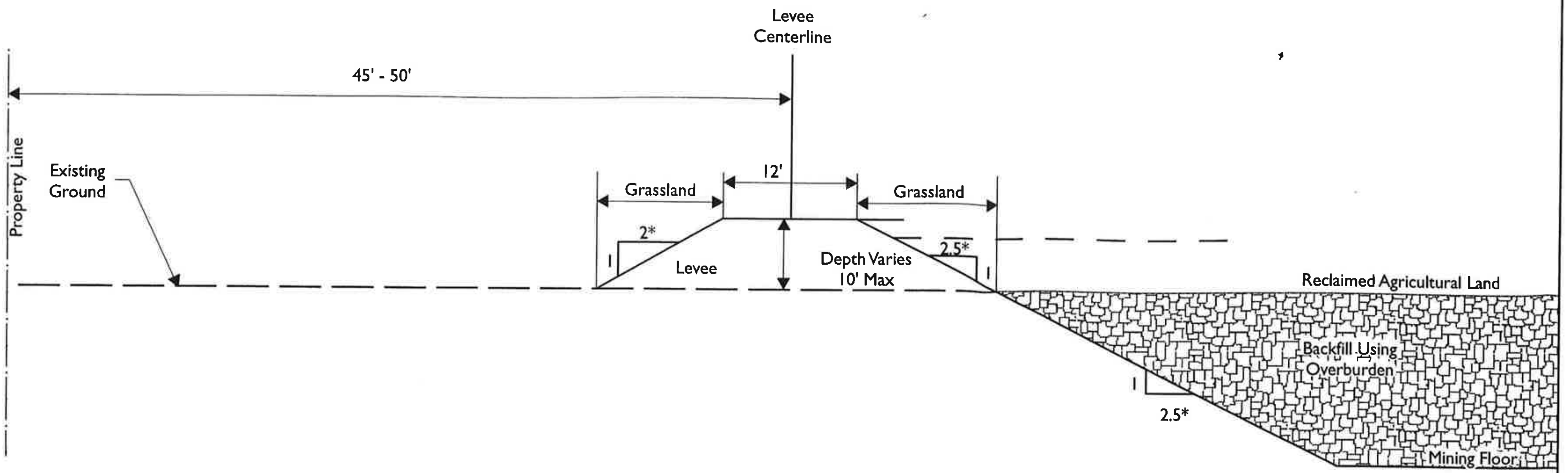
5.4.a Objectives

The final end use for the Shasta Ranch mining site is open space, including habitat for aquatic and terrestrial wildlife and agriculture. This revegetation plan is specifically designed to provide for the creation of high quality wildlife habitat that is representative of the character of the surrounding areas and of the property. In doing this, revegetation will provide for the enhancement of the aesthetic value of the area. Please see Figures 17 and 18 for cross-sections of revegetation areas and plant palettes, and Figure 19 for a plan view of each site with color-coded revegetation areas. Figure 20 shows the entire project site with final reclamation habitat types and land uses.

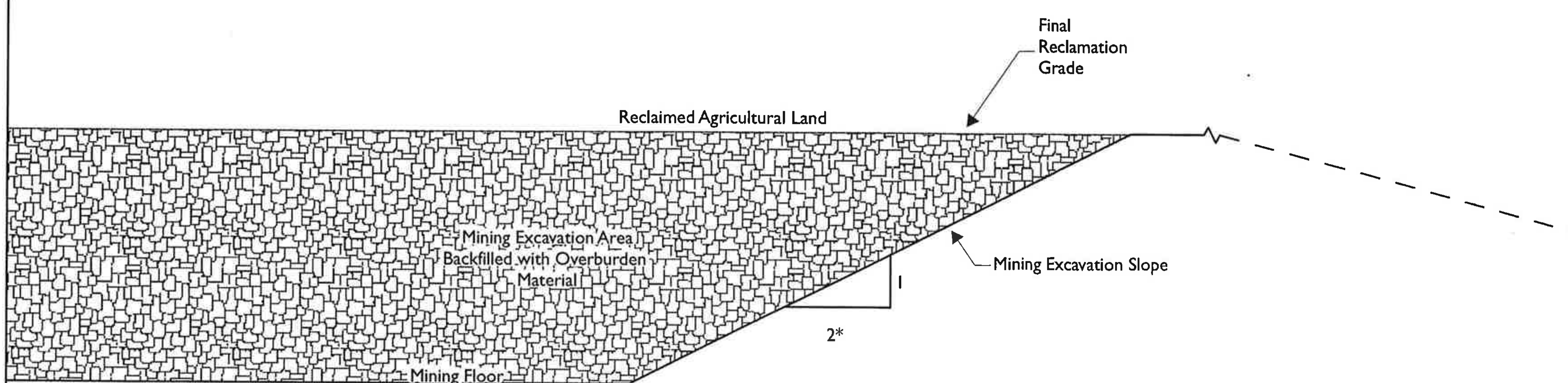
5.4.b Baseline Studies

Plants and Wildlife

Focused plant and animal surveys and inventories shall be conducted on the entire project site prior to the implementation of mining activities to assess existing vegetative conditions, establish a baseline for monitoring, and determine the presence or absence of special-status species. As described in section 4.3.c above, database searches and reviews of various state and federal special-status species lists in support of these activities revealed 15 special-status plant species and 34 special-status wildlife species with the highest likelihood to occur within the project area. Focused surveys for all potentially occurring species shall be conducted by a qualified botanist(s) and wildlife biologist(s) experienced in undertaking biological surveys and knowledgeable of the floral and faunal



Phase I Reclamation Cross Section D - D′



Phase I Reclamation Cross Section B - B′

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FIGURE 17
PHASE I
PROPOSED
RECLAMATION
CROSS SECTIONS

Shasta Ranch Mining and
Reclamation Plan
Shasta County, CA

PLANT PALETTE

Grassland	
California barley	*Hordeum californicum*
Purple needlegrass	*Nassella pulchra*
Nodding needlegrass	*Nassella cernua*
Idaho fescue	*Festuca idahoensis*
California oniongrass	*Melica californica*
Native pine bluegrass	*Poa secunda*
Western redbud	*Cercis occedentalis*
Tom cat clover	*Trifolium willdenovii*
Lupinus bicolor	*Lupinus bicolor*
California poppy	*Eschscholzia californica*
Golden yarrow	*Eriophyllum confertifolium*
White yarrow	*Achillea millifolium*
Purple owls clover	*Castelleja exerta*
Goldfields	*Lasthenia californica*
Naked buckwheat	*Eriogonum nudum*

Notes:

1. Boundary between habitats is approximate and may change based on field conditions.
2. Creation of benches or variation in the shoreline may facilitate plant establishment.
3. Erosion prevention may include wattles, bales or other technologies.

Source: Sharrah Dunlap Sawyer, Engineering, March, 2005.

* Slope may change based on final geotechnical investigation report recommendations

Not to Scale

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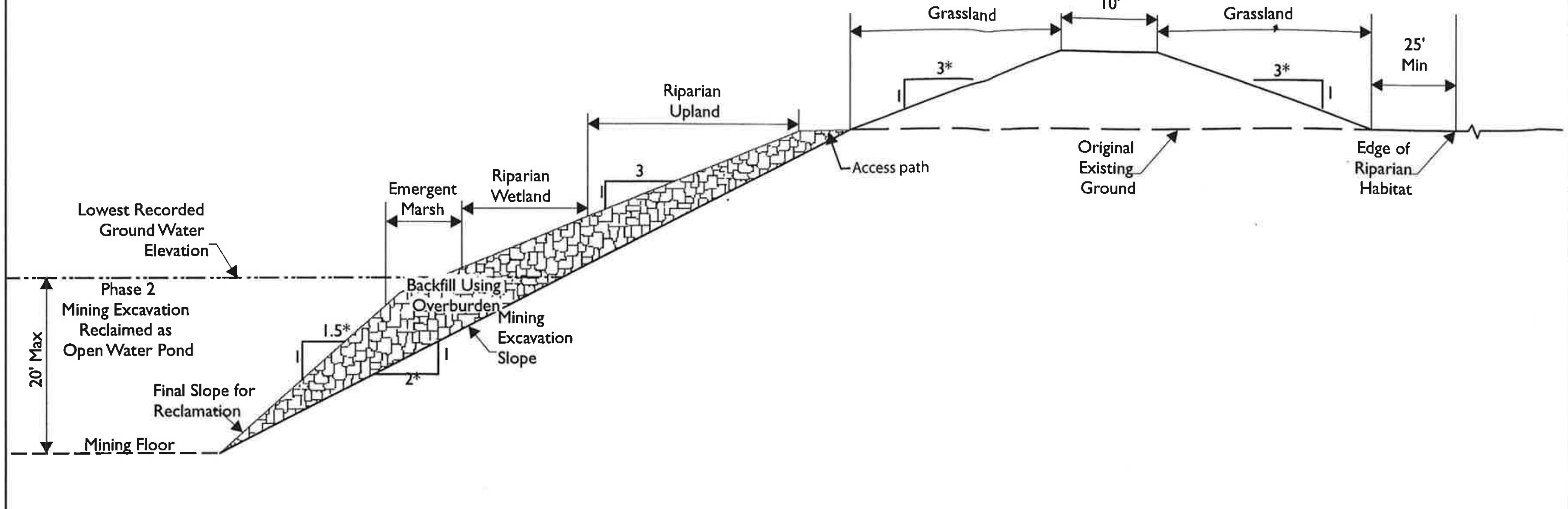
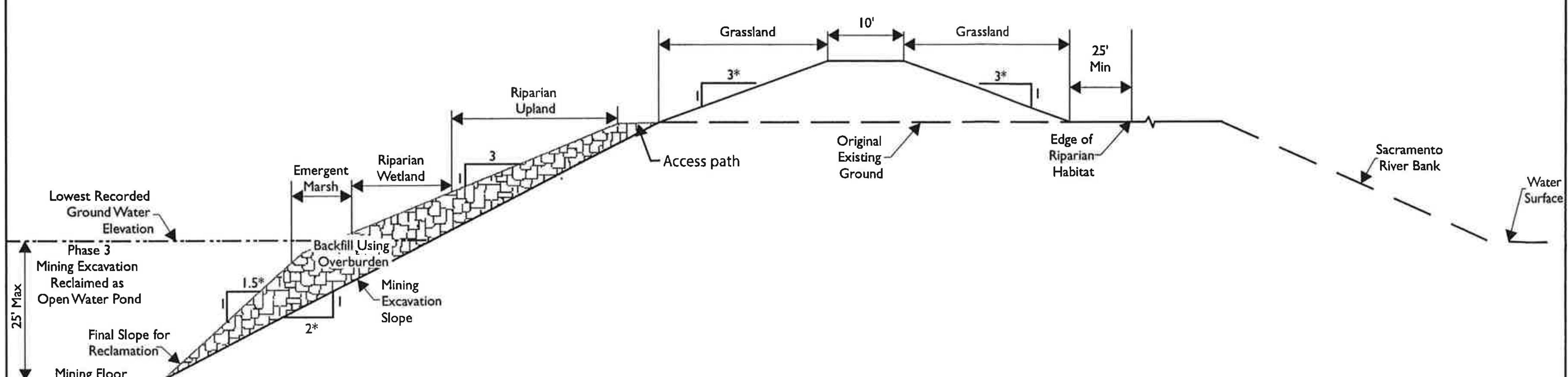
FIGURE 18
PHASE 2 AND 3 PROPOSED RECLAMATION CROSS SECTIONS

Shasta Ranch Mining and Reclamation Plan
Shasta County, CA



Phase 2 Reclamation Cross Section C - C'



Phase 3 Reclamation Cross Section A- A'

PLANT PALETTE

Common Name	Species Name
Emergent Marsh	
Soft Rush	*Juncus patens*
Santa Barbara sedge	*Carex barbarea*
Spike rush	*Eleocharis macrostachys*
Western rush	*Juncus occidentalis*
Riparian Wetland	
Black willow	*Salix gooddingii*
Narrow-leaved willow	*Salix exigua*
Fremont cottonwood	*Populus fremontii*
White alder	*Alnus rhombifolia*
California box elder	*Acer negundo*
Oregon Ash	*Fraxinus latifolia*
California wildrose	*Rosa californica*
California blackberry	*Rubus ursinus*
Riparian Upland	
Valley oak	*Quercus lobata*
Interior live oak	*Quercus wislizeni*
Black walnut	*Juglans hindsii*
California sycamore	*Platanus racemosa*
California box elder	*Acer negundo*
Blue elderberry	*Sambucus mexicana*
Western redbud	*Cercis occedentalis*
Skunkbrush	*Rhus trilobata*
Coffeeberry	*Rhamus tomentella*
Coyote brush	*Baccharis pilularis*
Grassland	
California barley	*Hordeum californicum*
Purple needlegrass	*Nassella pulchra*
Nodding needlegrass	*Nassella cernua*
Idaho fescue	*Festuca idahoensis*
California oniongrass	*Melica californica*
Native pine bluegrass	*Poa secunda*
Western redbud	*Cercis occedentalis*
Tom cat clover	*Trifolium willdenovii*
Lupinus bicolor	*Lupinus bicolor*
California poppy	*Eschscholzia californica*
Golden yarrow	*Eriophyllum confertifolium*
White yarrow	*Achillea millifolium*
Purple owls clover	*Castelleja exerta*
Goldfields	*Lasthenia californica*
Naked buckwheat	*Eriogonum nudum*

Notes:

1. Boundary between habitats is approximate and may change based on field conditions.
2. Creation of benches or variation in the shoreline may facilitate plant establishment.
3. Erosion prevention may include wattles, bales or other technologies.

Source: Sharrah Dunlap Sawyer, Engineering, Mar. 2005.

* Slope may change based on final geotechnical investigation report recommendations

Not to Scale

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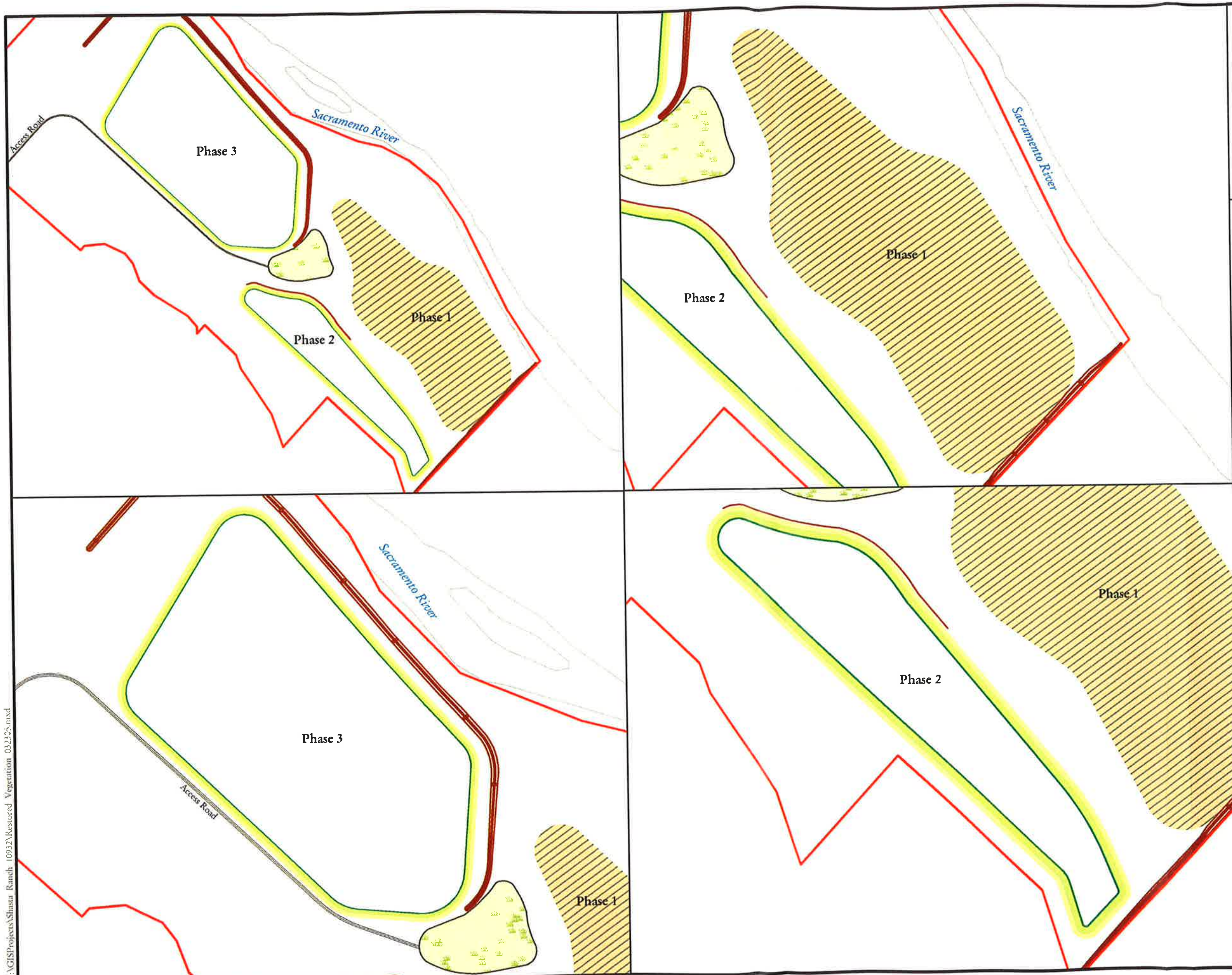

FIGURE 19 PROPOSED RECLAMATION (PLANIMETRIC VIEW)

Shasta Ranch Mining and Reclamation Plan
Shasta County, CA

- Project Boundary
- Reclaimed Agricultural Land
- Grassland
- Open Water
- Emergent Marsh
- Riparian Wetland
- Riparian Upland

N

Variable Scale

Source: Sharrah Dunlap Sawyer, Site Plan, Jan. 2005; and EIP Associates GIS Program, March 23, 2004.

Project Number 10932-00

Requested by: EC Created by: PaPr Date: 03/23/04

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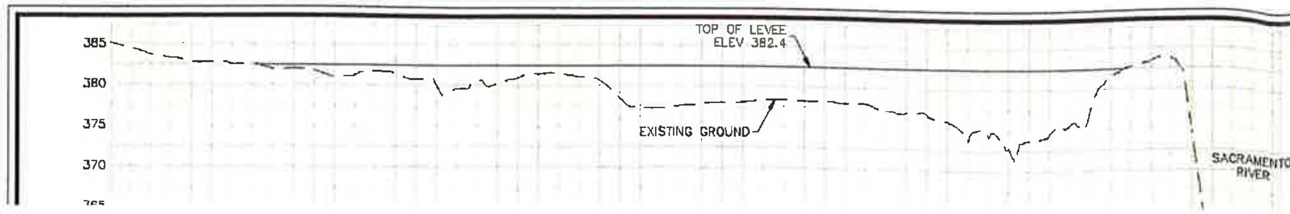

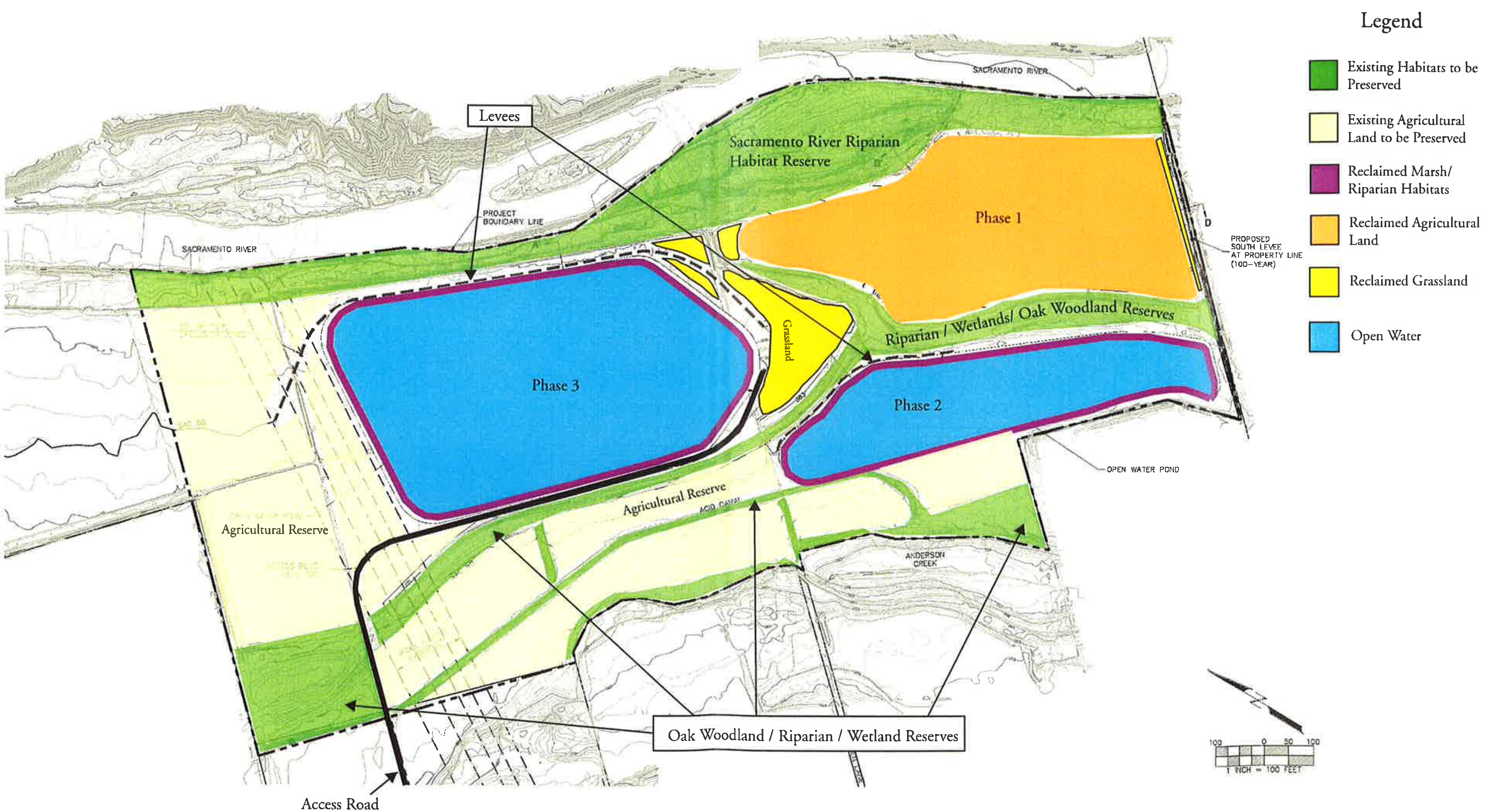

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Source: Sharrah Dunlap Sawyer, Inc.

FIGURE 20
FINAL RECLAMATION PLAN
Shasta Ranch Mining and Reclamation Plan
Project # - 10932-00

resources in the areas, including the rare, threatened, and endangered species. A complete list of plant and wildlife species observed during these surveys shall be compiled and utilized to determine planting palettes, seed sources for revegetation, and wildlife enhancement opportunities. The results of biological surveys shall also be used to compare environmental conditions before and after habitat creation to provide a measure of change in wildlife habitat and species composition occurring within the reclamation areas, as well as aid in the determination of mitigation success.

Implementation Plan

The habitat communities and their respective revegetation design are described below. Revegetation areas will consist of four different plant communities. These include emergent marsh, riparian wetland, riparian upland, and grassland. The first three habitat communities occur along a relatively wet to dry environmental gradient. These habitat-types are naturally occurring within the project area and will be the source of plant material, to the extent feasible, for revegetation efforts.

This revegetation plan is designed to improve the wildlife habitat quality of the site and the aesthetic value of the area post-mining. Habitat communities selected and their respective revegetation designs are based upon the biological characteristics of the project site and surrounding areas, site topography, and the commodity being mined (aggregate). Plant species diversity within each designed habitat community was selected to compliment the existing/preserved habitats on-site and while providing greater opportunities for utilization by wildlife. It is anticipated that the final elevations relative to groundwater levels will be the primary factor determining which habitat communities are most appropriate for a given area. Where appropriate, a diverse mix of plant species that vary in their moisture requirements will be seeded in areas likely to experience fluctuating changes in hydrology. Plant species selection, methods of establishment, planting locations, and planting densities are described below.

Emergent Marsh

Vegetation that characterizes this plant community is present where surface water persists and plants are occasionally to permanently inundated. Vegetation is dominated by the presence of robust, emergent, and often grass-like species. These wetlands are used by numerous wildlife species as a source of food and water, protection from predation, and breeding and nesting habitat. In addition to providing wildlife habitat, marsh vegetation protects shorelines from erosion and improves water quality. Water depths supporting emergent marsh vegetation typically range from 0 to 4 feet. The development of this habitat will be accomplished by creating a gentle slope just below the mean groundwater level. The creation of benches or variation is the shoreline will be considered to facilitate the establishment of emergent marsh species.

Emergent wetlands occur in several drainage and pond features within the project area and are dominated by plant species capable of naturally colonizing new habitat, including broad-leaf cattail (*Typha latifolia*), hard-stem bulrush (*Scirpus acutus*), smartweed (*Polygonum lapathifolium*), and sedges (*Cyperus* sp.), depending on the depth of standing water during the growing season. Natural colonization of emergent marsh vegetation is expected to occur in the created habitat areas. Supplemental planting with native marsh species will occur to accelerate revegetation and improve species diversity and wildlife habitat value. Table 9 includes the planting specifications for emergent marsh species.

TABLE 9 PLANTING SPECIFICATIONS FOR EMERGENT MARSH SPECIES			
Common Name	**Scientific Name**	**Type**	**Quantity**
Soft Rush	*Juncus patens*	Plug	200/acre
Santa Barbara sedge	*Carex barbarea*	Plug	200/acre
Spike rush	*Eleocharis macrostachys*	Plug	200/acre
Western rush	*Juncus occidentalis*	Plug	200/acre

<u>Riparian Wetland</u>

Vegetation that characterizes this plant community represents the transition between emergent marsh and riparian upland, and is typically associated with floodplains and gentle topography. Vegetation is dominated by the presence of plant species tolerant of saturated soils and occasional inundation. These riparian communities provide food, water, migration and dispersal corridors, and escape, nesting and thermal cover for an abundance of wildlife. The development of this habitat will be accomplished by creating gentle slopes at elevations from mean groundwater level to approximately 5 feet above it. The creation of benches or variation is the shoreline will also be considered to facilitate the establishment of riparian wetland species.

Riparian wetland habitat occurs mainly in floodplain areas and along agricultural ditches and drainages through the project area. Natural colonization of black willow (*Salix gooddingii*), narrow-leaved willow (*Salix exigua*), and Fremont cottonwood (*Populus fremontii*) is expected to occur in created habitat areas. However, willow and cottonwood cuttings will be installed to provide faster cover and to supplement natural colonization, if natural recruitment were slow to develop. Other species, including white alder (*Alnus rhombifolia*), box elder (*Acer negundo*), California sycamore (*Platanus racemosa*), Oregon ash (*Fraxinus latifolia*), California wild rose (*Rosa californica*), and California blackberry (*Rubus ursinus*) will also be planted. Plugs of native grasses such as deer grass (*Muhlenbergia rigens*), Valley blue rye (*Elymus glaucus*) and creeping wildrye (*Leymus triticoides*) may be used in the understory to improve species diversity and wildlife habitat value. Table 10 includes the planting specifications for riparian wetland species.

<u>Riparian Upland</u>

Vegetation in this community is dominated by relatively drought tolerant species such as Valley oak (*Quercus lobata*; as much as 40 percent canopy cover) with an understory of annual grasses. Like the previously describe habitat communities, riparian upland provides food and cover for many species of wildlife. The development of this habitat will be accomplished by creating gentle slopes at elevations from 5 to 20 feet above average groundwater levels.

Riparian upland habitat occurs as Valley oak woodland scattered throughout the project area along irrigation ditches, fence lines, and portions of the project area not converted to agriculatural uses. Plant species to comprise the created riparian upland habitat includes Valley oak (*Q. lobata*), interior live oak (*Q. wislizenii*), black walnut (*Juglans hindsii*), boxelder (*Acer negundo*), California sycamore (*Platanus racemosa*), Western redbud (*Cercus occidentalis*), Skunkbrush (*Rhus trilobata*), coffeeberry (*Rhamus tomentella*), and coyote brush (*Baccharis pilularis*). Blue elderberry (*Sambucus mexicana*) will be

TABLE 10 PLANTING SPECIFICATIONS FOR RIPARIAN WETLAND SPECIES					
Common Name	**Botanical Name**	**Type**	**Size**	**Quantity**	**Propagation Method**
Black willow	*Salix gooddingii*	Cutting	¾-1 inch x 2 feet	20/acre	Cutting
Narrow-leaved willow	*Salix exigua*	Cutting	¾-1 inch x 2 feet	20/acre	Cutting
California sycamore	*Platanus racemosa*	Container	Deepot	25/acre	Seed
Fremont cottonwood	*Populus fremontii*	Cutting	¾-1 inch x 2 feet	25/acre	Cutting
White alder	*Alnus rhombifolia*	Container	Deepot	40/acre	Seed
California box elder	*Acer negundo*	Container	Deepot	30/acre	Seed
Oregon Ash	*Fraxinus latifolia*	Container	Deepot	30/acre	Seed
California wildrose	*Rosa californica*	Container	Deepot	30/acre	Seed
California blackberry	*Rubus ursinus*	Container	Deepot	25/acre	Seed

planted in selected areas to provide additional habitat for the federally-threatened Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*). Table 11 includes the planting specifications for riparian upland species.

TABLE 11 PLANTING SPECIFICATIONS FOR RIPARIAN UPLAND SPECIES					
Common Name	**Botanical Name**	**Type**	**Size**	**Quantity**	**Propagation Method**
Valley oak	*Quercus lobata*	Container/Acorn	Deepot	40/acre	Seed
Interior live oak	*Quercus wislizeni*	Container/Acorn	Deepot	40/acre	Seed
Black walnut	*Juglans hindsii*	Container	Deepot	30/acre	Seed
California sycamore	*Platanus racemosa*	Container	Deepot	25/acre	Seed
California box elder	*Acer negundo*	Container	Deepot	30/acre	Seed
Blue elderberry	*Sambucus mexicana*	Container	Deepot	30/acre	Seed
Western redbud	*Cercus occidentalis*	Container	Deepot	25/acre	Seed
Skunkbrush	*Rhus trilobata*	Container	Deepot	20/acre	Seed
Coffeeberry	*Rhamus tomentella*	Container	Deepot	25/acre	Seed
Coyote brush	*Baccharis pilularis*	Container	Deepot	15/acre	Seed

Grassland

The grassland community shall consist of all other upland areas not planted with riparian species, including the levees associated with Phases 2 and 3 and the process and storage area. This habitat will be created by hydroseeding or broadcast seeding with a diverse native grass and forb seed mix. Species were selected for this mix based on drought tolerances, exposure adaptations, and soil requirements. Table 12 includes the planting specifications for native grassland species.

5.5 Habitat Enhancement

Structures that enhance or facilitate interim habitat use shall be created for birds and other terrestrial and aquatic species. Structures which provide shade, shelter and food, including nesting boxes, platforms, rock piles, bird houses, brush/log piles, and similar structure, are known to attract diverse wildlife. Within open water features, submerged logs and branches placed horizontally into the water and securely anchored provide shoreline cover, rearing and refuge habitat for fish, and basking areas for pond turtles and other species. The type and placement of these structures shall be dependent upon the wildlife species observed on-site, or with the potential to occur in the project area. Special consideration shall be given to rare, threatened, and endangered species including, but not limited to the Northwestern pond turtle, osprey, and tricolored blackbird.

TABLE 12

PLANTING SPECIFICATIONS FOR NATIVE GRASSLAND SPECIES

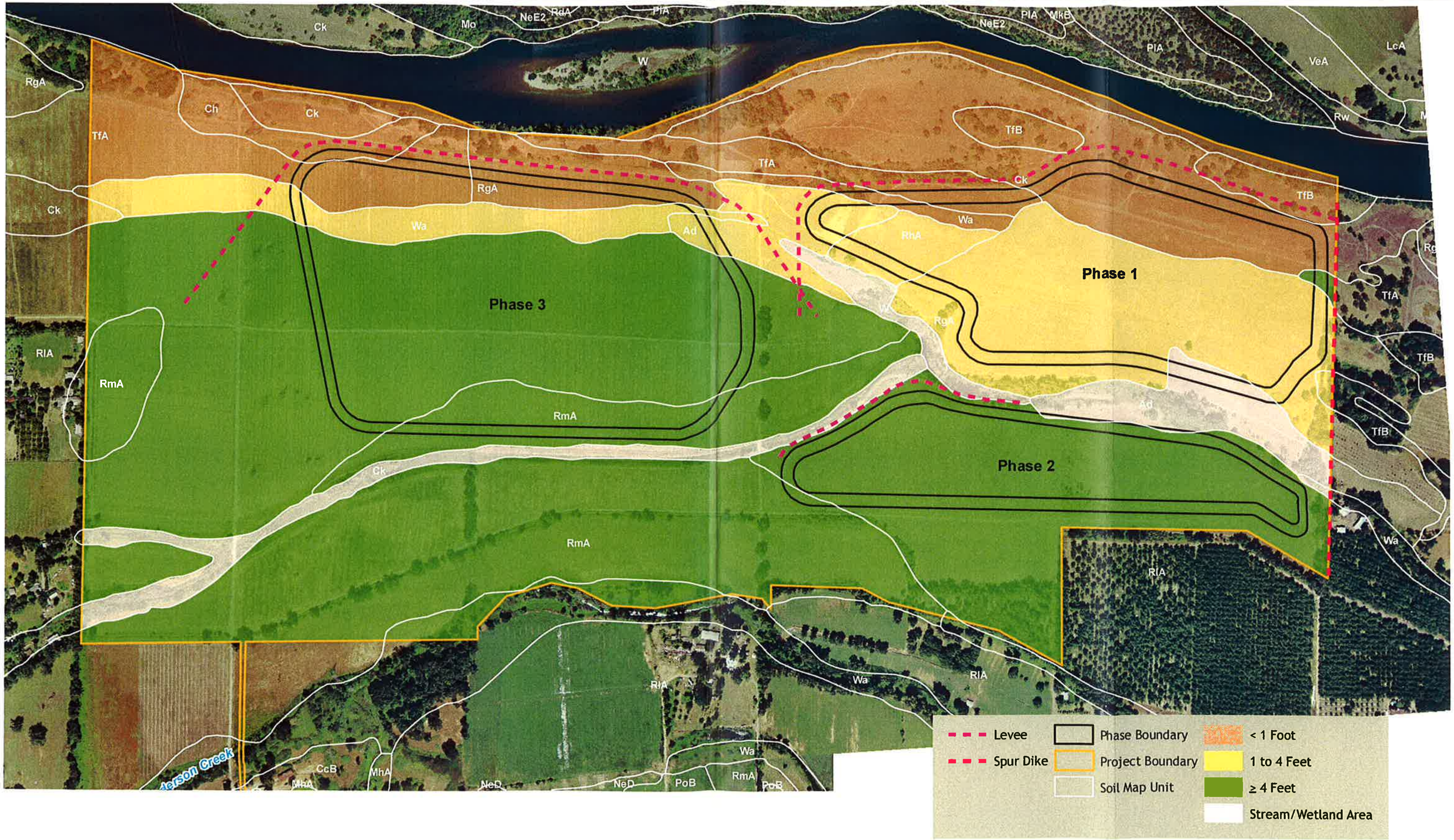
Common Name	Scientific Name	Type	PLS# per Acre
California barley	*Hordeum californicum*	Seed	9.0
Purple needlegrass	*Nassella pulchra*	Seed	7.0
Nodding needlegrass	*Nassella cernua*	Seed	5.0
Idaho fescue	*Festuca idahoensis*	Seed	4.0
California oniongrass	*Melica californica*	Seed	3.0
Native pine bluegrass	*Poa secunda*	Seed	3.0
Tom cat clover	*Trifolium wildenovii*	Seed	2.0
Lupinus bicolor	*Lupinus bicolor*	Seed	3.0
California poppy	*Eschscholzia californica*	Seed	1.5
Golden yarrow	*Eriophyllum confertifolium*	Seed	0.75
White yarrow	*Achillea millifolium*	Seed	1.0
Purple owls clover	*Castelleja exerta*	Seed	.50
Goldfields	*Lasthenia californica*	Seed	.75
Naked buckwheat	*Eriogonum nudum*	Seed	.50

In addition to the above mentioned structures, establishment of host plant species within the reclamation site may facilitate colonization of habitat specialists. Blue elderberry (*Sambucus mexicana*) bushes shall be planted in clumps along the upland riparian corridor to provide potential habitat for the federally-threatened Valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*).

5.6 Topsoil Replacement and Erosion Control

The Reclamation Plan presented a schedule for reclamation. Reclamation activities intend to follow this schedule. Reclamation and mining will minimize disturbed areas and have been designed to achieve maximum revegetation success.

Topsoil resources have been inventoried at the site, as required in CCR 3711(b). Approximately 12 inches of topsoil covers the Phase 1 area, 18 to 24 inches cover the Phase 2 area, and 8 to 10 feet cover the Phase 3 area. Figure 20A has been added to show areas of topsoil depth and storage areas. Sufficient topsoil is available on site to revegetate all areas to be reclaimed. Additional stockpiles of growth media are not required. Topsoil will be redistributed in a manner that results in a stable, uniform soil thickness across reclaimed areas, consistent with approved land use and drainage.



Feet
0 380 760 1,520

Note: Top soil storage will be determined in the field during operations if necessary

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SOURCE: USGS 2006

FIGURE 20A
ESTIMATED SOIL DEPTHS
SHASTA RANCH AGGREGATE
ANDERSON, CALIFORNIA

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Upon completion of the grading operations for the excavation and embankment slopes and other areas, topsoil that has been stockpiled shall be replaced to a uniform depth of not less that 15 cm (6 inches) and compacted or stabilized in a manner that retains the material in place on slopes, but will not inhibit or prevent plants from becoming established. Topsoil shall be moved and/or worked when the soil is dry to help prevent compaction, smearing, and disturbance to slopes when they are wet or muddy. In addition, plant and soil microbial propagules are in a resistant state when the soil is dry and are better able to survive the moving and contouring processes.

Prior to planting any reclamation area, an analysis of the physical and chemical composition of the planting soils shall be undertaken. Because topsoils to be planted will be stockpiled for some period of time, and stockpiling is known to alter the chemical, physical, and biological components of soil, soil testing shall be completed before planting activities commence. Soil characteristics have direct and important effects on the successful establishment of plant communities, and thus, the sustainability, invasibility (by exotic species), resiliency, and productivity of the reclaimed habitat. Soil collected from 0 to 120 cm shall be tested for texture, bulk density, organic matter content, and plant nutrient availability (e.g. nitrogen, phosphorus, and potassium). Results of these tests shall help determine potential limiting factors for plant growth and establishment, and the necessity to include soil amendments as part of the revegetation process.

The use of erosion control measures will be necessary to help keep soils in place during the early phase of plant establishment. Erosion control methods shall include, but are not limited to the use of straw mulches and/or the use of biotechnical controls such as straw and willow wattles. Only certified weed-free straw mulch will be sprayed onto slopes in upland areas and either glued down with a tackifier or punched into the substrate. Wattles will be installed along contour on slopes after seeding and straw mulch application, but prior to containerized plant installation. Wattles will be installed along contour every 20 feet, thus reducing slope length. Willow wattles in particular shall be used to stabilize those soils in the riparian wetland zone subject to inundation.

5.7 Plant Procurement and Installation Procedures

A variety of different plant materials and planting methods may be used in restoration of these four habitat-types. The most common plant materials used are seeds, container-grown plants, and cutting. The specific planting method will depend upon the materials that are available. When determining the type of plant material and planting methods, consideration is given to species characteristics, site conditions, and project goals.

All planting efforts will occur between November and March to take advantage of seasonal rains. For this to occur, scheduling of revegetation efforts will include time for the collection of seeds and grow-out of those species in the nursery. This will require at least one year lead-time. Seeds grown in the nursery may also require a hardening-off period if the nursery environment differs from the site.

The following are various technical specifications regarding plant materials and their installation. Contingent upon the results of the Test Plot Study, amendments to soil prior to or during the time of planting may be required. The addition of organic matter, such as compost, may greatly benefit the restoration site.

5.7.a Natural Colonization

Natural colonization is the process where existing conditions are suitable to support plant establishment and growth without human intervention. Although this process is often difficult and very slow under disturbed conditions, some natural colonization of desired vegetation is expected to occur in areas of the project site. Seed sources provided by adjacent undisturbed areas could produce volunteers of a variety of wetland and riparian species, given the appropriate hydrological conditions in the reclamation areas. The natural revegetation of target species would be encouraged and allowed to occur. Where soils are inundated or moist through most of the year, cattails, sedges, and rushes are expected to colonize emergent marsh zones and willows and cottonwoods are expected to colonize riparian wetland zones.

5.7.b Planting Seeds (Native grasses and wildflowers)

Naturalized annual grasses and exotic species are likely to colonize much of the area post-mining, especially due to their dominance on the project site. However, several native grass and wildflower species will be planted to increase native plant diversity. All seeding shall be carried out in November-December, after the first wetting rain has moistened the ground.

Seed will be ordered from a reputable supplier that collected seed from, or grew-out seed from, a source as close to the project site as possible. Seed will be properly labeled as genus, species, subspecies, variety, and source and will be handled and packed in a manner that ensures the purity and viability of the materials. Weed seed will not exceed 0.5 percent of the pure live seed and inert material. Seeding rates will be given in pounds of pure live seed (PLS) per acre. The seed mix will be measured and packaged by the seed supplier. Seed will be delivered to the site tagged and labeled in accordance with State Agriculture Code. Clearance from the County Agricultural Commissioner will be obtained before planting seed delivered from outside the county in which they are to be planted.

Prior to seeding, planting areas shall be lightly disked or harrowed, if necessary, to loosen the soil. Proper seed-soil contact is a necessity. Seeds will then be hydroseeded onto the soil or broadcast using a belly grinder, depending on the size and constraints of the area. Seeding rates reported herein are appropriate for hydroseeding. Hydroseeding uses less seed than broadcasting. If broadcast seeding is more appropriate for an area, seeding rates will be adjusted. After seeding, areas shall be covered with straw mulch blown or broadcast over the area and applied with a tackifier. Straw much shall be applied at a rate of 2.0 tons/acre within 24 hours after seeding.

5.7.c Plugs

Plugs of emergent marsh species shall be installed upright into previously dug pits in the substrate. Plugs and the accompanying soil shall be incorporated firmly into the pits and there shall be no air spaces in the soil surrounding individual plants or plugs.

5.7.d Installation of Containerized Plants/Seedlings

Propagated stock grown from seed collected on-site, or from adjacent or nearby areas shall be used for riparian wetland/upland creation. No more than 30 percent of any individual plant or cluster of individuals will be harvested for propagation. Should seed be limited for desirable species, container stock of those species shall be purchased from a local native plant nursery. Clearance from the County Agricultural Commissioner shall be obtained before installing plants delivered from outside the county in which they are to be planted.

Riparian species to be planted will be healthy, vigorous, well-formed, and free from disease, windburn and environmental stress. Planting locations will be staked in the field prior to plant installation. Plants will be randomly staggered within their respective planting zones to avoid straight rows and to create naturally appearing plant associations. Adjustments to the planting design will be made as determined necessary to meet field conditions.

Plants will be installed in November or December, after the first wetting rain has moistened the ground. Plants will be placed into holes dug to a size twice the width and three times the depth of their container. If weedy species are present within the planting area, a circle at least 3 feet in diameter around each planting location will be cleared of all vegetation prior to plant installation. Compacted soil at the bottom and sides of the hole will be loosened. A slow release, balanced fertilizer will be added to each planting hole. The hole will be partially filled with water and excavated soil and allowed to completely drain. Plants will be removed from the container and the sides of the root ball lightly scarified (to promote root development). Plants will be placed in the planting holes so that the crown of the plant is at ground level. Excavated soil will be used to fill the bottom of each hole to achieve the proper planting level and to backfill the remaining space around the root ball. A watering basin will be made around each plant. Immediately after installation, plants will be sufficiently watered to reach the lower roots. Mulch will be placed within the watering basins of all planting holes to a depth of 2-4 inches thick. Wire cages or tree shelters will be used to protect young plants against herbivory. If deemed necessary (particularly for larger container plant), plants will be staked to prevent damaging movements.

5.7.e Cuttings of Riparian Species

Willow and cottonwood species can be successfully propagated on-site from live, freshly obtained cuttings of vegetatively producing species. Cuttings will be collected from plants on-site, or from adjacent or nearby areas. No more than 30 percent of any individual plant or cluster of individuals shall be harvested for propagation. Cuttings shall be taken from live stems during the late fall and winter (November – February) when plants are dormant and planted immediately, or shortly after (when stored properly). Planting locations will be staked in the field prior to plant installation. Cuttings will be randomly staggered within the riparian wetland zones to avoid straight rows and to create naturally appearing plant associations. Adjustments to the planting design will be made as determined necessary to meet field conditions.

Each cutting will be ¾ to 1-inch in diameter and a minimum of 24 inches long. First- and second-year stems work the best. All small branches will be cleanly removed and the bark left in tact. The lower end will be cut at an angle and the top end will be cut flat in a manner that does not leave any frayed edges. Cuttings can be prepared and bundled up to a week in advance of installation if stems can be stored immersed in water. Willows will not be stored longer than one week and alders longer than 2 months. Individual or bundles of cuttings will be treated with a rooting hormone and fungicide immediately prior to planting. Cuttings will be inserted into soft ground by hand so that the angled end is placed in the ground and a minimum of ¾ of the stake in buried. On gravelly or compacted soil, planting holes will be prepared using an augur or reinforcing bar to avoid damaging the bark upon planting. The stake will completely fill the hole since air pockets can lead to premature drying and failure of the planting. Soil surrounding the stake will be firmly tamped in place after installation to eliminate any air pockets. If stakes split upon installation, they will be removed and replaced. All cuttings will be watered after installation to eliminate any air spaces that would cause desiccation.

5.7.f Collection and Planting of Acorns

Oaks can be established successfully from acorns planted directly into the soil. Planting will be undertaken from early November, after the first wetting rain has moistened the soil. Planting locations will be staked in the field prior to plant installation. Acorns will be randomly staggered within the riparian upland zone to avoid straight rows and to create naturally appearing plant associations. Adjustments to the planting design will be made as determined necessary to meet field conditions.

Acorns will be collected from trees on the project site, or from adjacent or nearby areas (and within 500 feet of the project site's elevation). When acorns start dropping to the ground (fall season), most of the acorns remaining on the tree are ripe. Acorns will be picked directly from the tree. The largest acorns will be selected, and those with obvious cracks, holes, or damage from rodents or worms will be avoided. Acorns will be stored under refrigeration in heavy-duty zip-closure bags until planting.

A few days before scheduled planting, the desired quantity of acorns will be removed from cold storage and place in a plastic bucket filled with cold water. The acorns will be soaked for a few hours. The unhealthy seeds will float, and the solid seeds will sink to the bottom. The floaters will be discarded. The remaining healthy acorns will be dried (about 1 hour at room temperature) before replacing them in the bags. Bags will be refrigerated again until planting.

Holes will be dug no more than 2 inches deep with 1 inch of soil covering the acorn above ground level. At each planting location, 3 to 4 acorns spaced about 6 to 8 inches apart will be planted to increase the chances of at least one successful seedling being present at that location. Only one acorn will be planted in each hole. Tree shelters will be installed around each acorn for protection and enhanced growth.

5.8 Irrigation

During the first and usually second years after planting, woodland and some of the riparian wetland plants may require supplemental water to help reduce mortality. The irrigation system will be drip system installed to utilize the on-site groundwater resource. Water will be applied deeply, to one to two feet, in the outer two-thirds of the root zone. The watering regime will be monitored regularly and will be adjusted as deemed necessary to assure acceptable seedling survival rates. Irrigation will not be used during the rainy winter months. The goal of irrigation is to add enough water to aid in plant establishment without making the plants dependent upon the additional water in the long-term. The frequency of irrigation will be reduced gradually to ensure successful weaning of the plants from artificial watering. Vegetation will be self-sustaining without irrigation for a period of two years prior to the release of the financial assurances.

5.9 Maintenance During the Monitoring Period

Maintenance of the reclaimed sites during the early stages of plant establishment is essential to the attainment of reclamation objectives and performance criteria. The revegetation areas will be maintained in good condition through regular monitoring to detect problems before they affect the attainment of performance criteria. Maintenance measures include invasive species control, erosion control, irrigation system maintenance, herbivory control, trash removal, and habitat protection. Each of these issues is addressed separately in the maintenance plan included below.

5.9.a Invasive Species

Areas planted with native species will be weeded between the months of April and August using the best available method. Herbicide treatment for invasive species that cannot be eradicated through manual or mechanical removal (e.g. exotic thistles, blackberry, Bermuda grass, etc.) will be permitted as needed. The method of herbicide application will control for the overuse of such chemicals, including wicking of individual plants or the mixing of brightly colored dyes with herbicide so that application is visible. Invasive species will be removed before they produce seed. All flowering stalks of invasive species will be removed from the reclamation site.

5.9.b Erosion Control

During the first two years of plant establishment, vegetative cover may not be adequate to prevent soil erosion. If erosion occurs, areas will be identified and measures to prevent further erosion implemented as soon as possible. Erosion control measures may include the addition of mulches, wattles, bales or replanting, depending on the site conditions.

5.9.c Irrigation System Maintenance

Inspection and maintenance of the irrigation system in the riparian wetland and riparian upland areas will be conducted twice annually.

5.9.d Herbivory Control

To reduce herbivore damage to young plants, wire cylinder cages will be installed around individual plantings as necessary. Cages should be large enough to allow two years of new growth before they can be browsed. Should ground dwelling rodents also cause damage to plants, tree shelters will be installed two to four inches into the ground. Consideration will also be given to the installation of tree shelters in weed infested areas requiring chemical herbicide applications, as tree shelters may protect plants from herbicide drift. Plants will be monitored for herbivory during routine maintenance visits. Cages and tree shelters will not interfere with plant growth.

5.9.e Supplemental Planting

Annual maintenance activities will include supplemental planting of riparian wetland and upland species to attain the standards described in the performance criteria, and/or to replace those individuals lost as a result of some severe disturbance.

5.9.f Trash removal

The reclamation site shall be cleared of trash as determined necessary and measures shall be taken to prevent further dumping.

5.9.g Habitat Protection

Fences will be constructed around the reclamation site to protect the sensitive areas from human activity. Signage describing the site as a sensitive resource will also be posted in appropriate areas. Inspection and maintenance of fences, gates, and signage will be conducted twice annually.

5.10 Restoration Monitoring Program

5.10.a Monitoring Period

Monitoring by a qualified biologist will be conducted following completion of habitat creation until performance criteria have been met for two consecutive years having no human intervention. Corrective or remedial actions will be undertaken if success criteria are not attained in a given monitoring year.

5.10.b Reference Sites

Success of the revegetation plan shall be judged based upon the effectiveness of the vegetation for improving wildlife habitat and the ecological and aesthetic value of the area, and by comparing quantified measures of vegetation cover, density, and species richness of revegetated areas to similar parameters of naturally occurring vegetation within the larger project area. Data from reference areas shall be used as a standard for comparison. Reference areas shall be established in each habitat-type: freshwater marsh, riparian wetland, oak woodland and grassland.

5.10.c Vegetation Monitoring

Vegetation monitoring protocols have been developed separately for each of the habitat types created. Vegetation surveys will be conducted once annually when dominant vegetation has matured and both early and late season species can be correctly identified. Surveys shall be conducted by a botanist(s) experienced in undertaking floristic field surveys and knowledgeable of plant taxonomy and ecology. The results of vegetation surveys will be used to compare site conditions over the maintenance and monitoring period. Acreages for each habitat type will be updated annually through field measurements. A list of all species present will also be collected for each habitat community.

Emergent Marsh

Habitat will be evaluated using quadrats (1-m^2) to determine species diversity and cover. A minimum of 15 sample points (or a sample size sufficient to produce at least an 80 percent confidence level) will be established within revegetation areas. A stratified random sampling design will be employed. Data collection points will be mapped using GPS.

Riparian Wetland

Habitat will be evaluated by both direct counting of planted species and using larger quadrats (10-m^2) to monitor cover and canopy closure. Individual trees and shrubs will also be inspected for percent survival, health, weed competition, herbivory, drought stress, and other factors. The beginning and end points of transects will be mapped using GPS.

Riparian Upland

Habitat will be evaluated by direct counting of planted species. Individual trees and shrubs will also be inspected for percent survival, health, weed competition, herbivory, drought stress, and other factors. Because of the slower growth rates of upland species, canopy cover in this community will not be evaluated. The 5-year monitoring period should be sufficient to determine whether these species will continue to mature into a self-sustaining vegetation community.

Grassland

Habitat shall be evaluated using quadrats (1-m^2) to determine species diversity and cover. A stratified random sampling design shall be employed. Data collection points shall be mapped using GPS.

Standard data log sheets for all habitat types shall be established and used throughout the monitoring period. The data sheets shall include a section to record ambient site conditions at the time of monitoring (date, time, weather, and special condition) and standard data to be collected for each parameter to be monitored.

5.10.d Wildlife Monitoring

Observations of wildlife or their signs (e.g. tracks or scat) will be recorded whenever encountered, during maintenance monitoring and vegetation surveys. A list of all wildlife species observed will be compiled and summarized in order to compare site conditions over the maintenance and monitoring period. Wildlife observations will be conducted by a biologist(s) knowledgeable of wildlife taxonomy and community ecology.

5.10.e Photo Monitoring

A photographic record of the site will be kept from the time of habitat creation through the end of the monitoring program. Selection of permanent photo stations will provide appropriate views and orientations for a comprehensive assessment of the progress of revegetation efforts over the monitoring period. Photos will be taken in late-spring or early summer at the height of the growing season. Additional photographs of natural recruitment, disturbance, or special conditions will be taken as needed. Photos will be included in the annual monitoring report.

5.10.f Monitoring Report

By December 1 of each monitoring year, a report will be prepared containing the results of the monitoring and an assessment of the data. Included will be a summary of those performance criteria attained and those for which corrective measures were undertaken to achieve compliance.

Photographic and other evidence (i.e. maps, laboratory reports, etc.) will be used to support the final assessment. Raw data and maintenance log sheets will also be included as appendices.

5.10.g Performance Criteria

Performance criteria have been developed for each habitat community created. Should the evaluation of performance criteria reveal that revegetated areas are significantly behind in their target percentages, the reasons for insufficient plant germination and/or growth will be determined and appropriate remedial actions shall be undertaken to meet the established criteria. These could include planting additional material of the species, or substitutions of other species better suited to the sites failing to attain desired performance criteria. Remedial actions will be applied to all areas requiring them, not merely to the monitored plots.

Emergent Marsh

- Attainment of at least 50 percent relative cover of native hydrophytic vegetation (obligate or facultative wetland species) in year 1. Attainment of at least 50 percent absolute cover of native hydrophytic vegetation in year 3. Attainment of at least 80 percent absolute cover of native hydrophytic vegetation in year 5.

- Establish a minimum of 5 native wetland species, including those species which were planted, as well as species that may be volunteers.

- Invasive species shall not compose greater than 10 percent of the cover in any year.

Riparian Wetland

- Riparian wetland species will maintain an 80 percent survival of the initial plantings in year 1, 70 percent in year 2, and 60 percent in years 3-5. If survival drops below these numbers, plants will be replaced the following winter. Plants installed in addition to the originally specified numbers, or native plants established through natural colonization will count as surviving plants.

- Attain at least 50 percent absolute cover of native riparian vegetation in years 3-5, including those species which were planted, as well as species that may be volunteers.

- Establish a minimum of 6 native riparian species, including those species which were planted, as well as species that may be volunteers.

- Invasive species shall not compose greater than 10 percent of the cover in any year.

Riparian Upland

- Riparian upland species will maintain an 80 percent survival of the initial plantings in year 1, 70 percent in year 2, and 60 percent in years 3-5. If survival drops below these numbers, plants shall be replaced the following winter.

- Establish a minimum of 6 native riparian upland species.
- Invasive exotic species will not compose greater than 10 percent of the cover in any year.

Grassland

- Attain at least 30 percent cover of native or naturalized herbaceous species in year 1. Attain at least 50 percent cover by year 3. Attain at least 70 percent cover by year 5.
- Invasive exotic species will not compose greater than 10 percent of the cover in any year.

Wildlife

Created marsh, riparian, and woodland habitat will be characterized by the use of native fauna associated with these ecosystems. The habitat will also be characterized by the presence of pollinator and dispersal mechanisms, predator-prey associations, and/or other biological interactions. The presence of such interactions will be determined through vegetation and wildlife surveys.

5.11 Experimental Test Plots

The purpose of experimental test plots is to investigate on a small scale those revegetation practices that will work best when the reclamation plan is fully implemented. The Shasta Ranch pilot study will be designed to demonstrate the feasibility of riparian plant community establishment through the examination of revegetation methods and management practices on a small, representative site prior to full-scale implementation. Consequently, test plot successes and failures will help determine the most appropriate methods to ensure that reclamation objectives are met. These methods will be used to enhance the habitat quality of the remaining portions of the property upon completion of mining activities.

Implementation of the Shasta Ranch pilot study will be undertaken upon completion of Phase 1 extraction, or when appropriate areas become available (i.e. when mining operations have concluded one area and is ready for reclamation). Areas for testing revegetation methods will represent each vegetation type and aspect/elevation that would be represented where reclamation is to take place. This may require stratifying the site in order to determine the most appropriate test plot areas.

5.11.a Test Plot Placement

As a pilot reclamation test project, Shasta Ranch shall designate separate areas for testing that represent each of substrate types, vegetation types and aspect/elevation types that would be represented where reclamation is to take place. Test plots shall be placed within areas that are homogenous. This will require stratifying the site in order to determine the appropriate test plot areas.

5.11.b Treatments

Various treatments will be established to test the effectiveness of planting techniques, topsoil depths, irrigation, and soil amendments. Planting techniques to be tested may include cuttings, containerized plants, plugs and seed. Topsoil depths to be tested will depend upon the actual amount of topsoil salvaged. Should a growth media need to be created for revegetation, various components of that growth media will also be tested. For example, combinations of topsoil, sediments, chipped or shredded vegetation (organic matter), and soil amendments. Irrigation rates may vary to determine the most effective application of water. Soil amendments to be tested may include compost, fertilizer and lime, depending on the results of soil testing. Control plots are an important part of the experimental design in the test areas. Some plots in the test areas will have no treatments in order to determine what would happen on the site if there were no active restoration or intervention.

5.11.c Plot Layout

Test plots will be established within the area on a grid system, using a randomized block design. Treatments will be randomly assigned to a plot, and each treatment will be replicated three times. Plants will be randomly assigned their positions within the plots and their locations mapped for monitoring purposes. A buffer will be established around each plot so that treatments in different plots do not contaminate adjacent plots. Buffers will be used by monitoring personnel to reduce trampling and compaction within the plots. The final experimental design and subsequent monitoring of the test plots will be undertaken by a qualified biologist or reclamation specialist.

5.11.d Plant Species, Procurement and Installation

Plant species to be used in the testing areas will represent those to be used in the large-scale revegetation plan (Tables 1 through 4). Plant materials may include cuttings, container-grown plants, plugs and/or seed. Plant procurement and installation shall be conducted as previously described in Plant Procurement and Installation Procedures. If at any time during the pilot study it becomes evident that changes or adjustments to planting methods are needed to assure successful plant establishment, these changes will be implemented immediately and for subsequent revegetation efforts.

5.11.e Test Plot Study Monitoring Program

Monitoring of test plots will provide the opportunity for adjustments or refinement of the proposed revegetation program prior to large-scale implementation. Monitoring by a qualified biologist shall be conducted annually each spring for a period no less than 5 years prior to any scheduled large-scale application. By September 1 of each year, a monitoring report will be prepared and submitted to the County for review. The monitoring report will contain the results of monitoring, an assessment of the data collected, any corrective measures that were undertaken, photographs and log sheets. The methods used in the data collection are described below.

5.11.f Vegetation and Wildlife Monitoring

Vegetation monitoring will be conducted separately for each habitat type. Individual plantings will be direct counted and inspected for growth, health, weed competition, water stress, herbivory, and other factors. The condition or health of each plant will be ranked on a scale of 0 to 4 where

0=dead, 1=severe decline/nearly dead, 2=stressed/moderate defects, 3=stable/fair health, and 4=heathly/good growth. Height will also be categorized into 5 rankings: < 2 feet, 2-4 feet, 4-6 feet, 6-8 feet, 8-10 feet, and >10 feet. Consideration will be given to the seasonal characteristics and individual growth patterns of different species when determining the condition or health of each plant.

Seeding of grassland areas and natural recruitment in wetland zones will also be assessed qualitatively. Species composition and cover estimates for each test plot will be recorded. A list of all species present will be updated annually for each of the habitat types in the pilot study.

Observations of wildlife and their signs will be recorded when encountered. A list of all wildlife species present will also be updated annually for each of the habitat types in the pilot study.

5.11.g Photo Monitoring

Photographs will be taken from various locations throughout the site preparation, revegetation and monitoring phases. Permanent photo stations will be established to document changes in habitat development over successive monitoring periods. Photographs of individual plants and habitat communities will also be included.

5.11.h Performance Criteria

It is anticipated that yearly remedial actions will be taken as certain treatments are determined to be more of less successful than others. Remedial actions may include planting additional material of a species, substitutions of other species better suited to site conditions, and/or additional applications of successful treatments. The pilot study program will be considered an overall success if after 5 years the following conditions have been met:

- minimum of 60 percent survival of all container plants and cuttings;
- attain at least 70 percent cover of grassland species;
- no greater than 10 percent cover of invasive species (in any given year); and
- plants are in good health and have produced new growth (in any given year).

5.11.i Areas Excluded from Revegetation

The excavated pits for Phases 2 and 3 are expected to maintain relatively stable open water lake habitats. Thus, revegetation is restricted to upland habitats surrounding the lakes. Consistent with existing conditions on site and adjacent areas, most of the upland areas in the Shasta Ranch project site will be reclaimed for wildlife habitat and agricultural uses. Finally, the network of access roads required to provide access needed to carry out the initial revegetation work as well as future maintenance and monitoring are not proposed for revegetation.

5.11.k Natural Regeneration

Some natural regeneration will inevitably occur within portions of the project area. Seed sources provided by nearby vegetation will produce volunteers of a variety of indigenous species. This natural revegetation of desired species will be encouraged and allowed to occur. If undesirable species not native to this area begin to invade (i.e., giant reed), such that they become a threat to the establishment of desirable native species, eradication of these species either by hand, mechanical means, control burning, use of herbicides, or a combination there of, shall be done. This determination shall be made by the qualified individual that prepares the annual monitoring report.

5.12 Financial Assurance

A financial assurance estimate and the estimated reclamation costs were prepared by the project applicant and included in Appendix H. The financial assurance is based on the disturbance of 15 acres per year, annual movement of 150,000 cubic yards of material, replacement of stockpiled overburden for farmland, sloping and grading of excavated areas. The project area does not have any permanent equipment or facilities for removal during the life of the project, therefore that section has no figures shown for reclamation costs. These figures will be updated throughout the project at a schedule set by DMG. The information will be supplied to the County of Shasta for their on going compliance monitoring of the project. Tullis, Inc. hereby states that they accept the responsibility for reclaiming the land in accordance with this reclamation plan, pursuant to Section2772 (c) (10) of the Public Resources Code.

ENDNOTES

i. California Department of Conservation, Division of Mines and Geology, Mineral Land Classification of Alluvial Sand and Gravel, Crushed Stone, Volcanic Cinders, Limestone, and Diatomite with Shasta County, California, DMG Open-File Report 97-03, 1997, Plates 3 and 4 and Pages 24 and 52.

ii. Kleinfelder, Inc., Geotechnical Investigation Report, Proposed Shasta Ranch Quarry, Anderson, California, March 29, 2005.

iii. Kleinfelder, Inc., Geotechnical Investigation Report, Proposed Shasta Ranch Quarry, Anderson, California, March 29, 2005.

iv. California Department of Conservation, Division of Mines and Geology, Mineral Land Classification of Alluvial Sand and Gravel, Crushed Stone, Volcanic Cinders, Limestone, and Diatomite with Shasta County, California, DMG Open-File Report 97-03, 1997, Pages xi, 47, and 56.

v. Kleinfelder, Inc., Geotechnical Investigation Report, Proposed Shasta Ranch Quarry, Anderson, California, March 29, 2005.

vi. Kleinfelder, Inc., Geotechnical Investigation Report, Proposed Shasta Ranch Quarry, Anderson, California, March 29, 2005.

vii. North State Resources, Inc., Shasta Ranch Project, Biological Characterization Report, August 2004.

viii. North State Resources, Inc., Shasta Ranch Project, Biological Characterization Report, August 2004.

ix. Jensen & Associates, Archaeological Inventory Survey, Proposed Shasta Ranches Development Project, August 16, 2004.

x. Jensen & Associates, Archaeological Inventory Survey, Proposed Shasta Ranches Development Project, August 16, 2004.

xii. Jensen & Associates, Archaeological Inventory Survey, Proposed Shasta Ranches Development Project, August 16, 2004.

xvi. State Department of Transportation, Division of Transportation Planning, *Shasta County Economic Forecast*, April 11, 2003, Pages 1 and 2.

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EPA. 2003b. Chapter 9, Toxicity Equivalency Factors (TEF) for Dioxin and Related Compounds. 2003 NAS Review Draft, Dioxin Reassessment.

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