KRCD
Kings River Conservation District

DOCKET
07-AFC-7
DATE OCT 0 2 2008
RECD. OCT 0 2 2008

4886 East Jensen Avenue
Fresno, California 93725

Tel: 559-237-5567
Fax: 559-237-5560

www.krcd.org

October 2, 2008

Ms. Shaelyn Stratton
Project Manager
California Energy Commission
1516 Ninth Street, MS40
Sacramento, CA 95814-5512

Re: Kings River Conservation District Community Power Plant Application for Certification (07-AFC-7) Response Set #2 to CEC Data Requests #1-89 (dated January 23, 3008) and Applicable Biological Survey Reports

Dear Ms. Stratton:

Kings River Conservation District (KRCD) hereby submits the attached response set no. 2 to California Energy Commission (CEC) data requests 1-89 for the Kings River Conservation District Community Power Plant (KRCD CPP) Application for Certification (AFC). Also included are two biological survey reports which were completed for the KRCD CPP.

The KRCD CPP is a nominal 565 megawatt (MW) natural gas-fired combined cycle base load power plant to be located near the City of Parlier, in Fresno County. The attached response set no. 2 provides both initial and updated responses to specific data requests and supplements the initial data request response filing made on February 25, 2008.

As General Manager of KRCD, I hereby attest, under penalty of perjury, that the attached data request responses are true and accurate to the best of my knowledge. Please contact our consultant, Amy Cuellar of Navigant Consulting at (916) 631-3211 if you have any questions.

Sincerely,

David Orth
General Manager

DO/RS/sjs

Enclosures: As stated

File Code: 536.02.09
L08-0270

BOARD OF DIRECTORS

Division I, NORMAN B. WALDNER, Dinuba • **Division II**, MASARU YOSHIMOTO, Fowler • **Division III**, GILDO NONINI, Fresno • **Division IV**, MARK McKEAN, Riverdale • **Division V**, BRENT L. GRAHAM, Hanford
Division VI, CEIL W. HOWE, JR., Stratford • **At Large**, ALVIN J. QUIST, Fresno

OFFICERS

MARK McKEAN, President • BRENT L. GRAHAM, Vice President • DAVID ORTH, General Manager-Secretary • RANDY SHILLING, Auditor • EDWARD J. TIEDEMANN, Attorney-At-Law

APPLICATION FOR CERTIFICATION 07-AFC-7

RESPONSE SET #2
TO
CEC DATA REQUESTS #1-89 (DATED JANUARY 23, 2008)

KRCD COMMUNITY POWER PLANT

Energy for our Future

Submitted to:
CALIFORNIA ENERGY COMMISSION

October 2008

TABLE OF CONTENTS

Data Request **Page**

AIR QUALITY
AIR-3 ..... AIR-1
AIR-13 ..... AIR-2

BIOLOGICAL RESOURCES
BIO-14 ..... BIO-1

CULTURAL RESOURCES
CUL-15 ..... CUL-1
CUL-16 ..... CUL-3
CUL-17 ..... CUL-4

HAZARDOUS MATERIALS MANAGEMENT
HAZ-24 ..... HAZ-1

LAND USE
LAND-25 ..... LAND-1
LAND-31 ..... LAND-2
LAND-32 ..... LAND-3

SOCIOECONOMICS
SOCIO-48 ..... SOCIO-1
SOCIO-49 ..... SOCIO-2
SOCIO-50 ..... SOCIO-3

TRANSMISSION SYSTEM ENGINEERING
TSE-52 ..... TSE-1
TSE-53 ..... TSE-2

VISUAL RESOURCES
VIS-55 ..... VIS-1

WASTE MANAGEMENT
WASTE-58 ..... WASTE-1
WASTE-59 ..... WASTE-2
WASTE-60 ..... WASTE-3
WASTE-65 ..... WASTE-4
WASTE-66 ..... WASTE-5
WASTE-67 ..... WASTE-6
WASTE-68 ..... WASTE-7
WASTE-69 ..... WASTE-8

WATER AND SOIL RESOURCES

WATER-70 ..... WATER-1
WATER-71 ..... WATER-3
WATER-72 ..... WATER-5
WATER-74 ..... WATER-6
WATER-80 ..... WATER-7
WATER-81 ..... WATER-8
WATER-87 ..... WATER-9
WATER-88 ..... WATER-10

TRANSMISSION SYSTEM ENGINEERING – ADDITIONAL REQUESTS

TSE-1 ..... TSE-1
TSE-2 ..... TSE-2
TSE-3 ..... TSE-3

Technical Area: Air Quality

Data Request 3:
Please provide references of the cited PM2.5 emissions for the turbines, cooling tower, emergency generator, diesel fire pump, and auxiliary boiler.

Updated Response:
Enclosed as Attachment Air-1 is an excerpt from "*England, G.C., Development of Fine Particulate Emissions Factors and Speciation Profiles for Oil and Gas-fired Combustion Systems, Final Report, 2004*", as referenced in the original response to Data Request 3, which was previously submitted to the CEC on February 25, 2008. The excerpt includes Table 3-4, which provides the particulate matter 2.5 micrograms in diameter or smaller (PM2.5) emissions rate of 0.00028 pounds per million British thermal units (lbs/MMBtu) cited in the AFC for the combustion turbines, auxiliary boiler and emergency diesel generator, all of which will be fueled by natural gas. It also includes Table 3-5, which includes the PM2.5 emissions rate of 0.004 lbs/MMBtu as cited in the AFC for the diesel fire pump. Attachment Air-1 was also submitted to the CEC by electronic mail on April 3, 2008.

Technical Area: Air Quality

Data Request 13:
Please provide the cumulative impacts analysis that includes analyses of cumulative impacts for the 1-hour NO_2 and the 24-hour PM10 and PM2.5 standards.

Update Response:
As noted in the initial response to this data request (which was previously submitted on February 25, 2008), KRCD requested the information necessary to perform a cumulative impacts analysis from the San Joaquin Valley Air Pollution Control District (SJVAPCD).

On February 9, 2008 the SJVAPCD provided KRCD with a list of 31 facilities within a six mile radius of the KRCD CPP for which Authority-To-Construct (ATC) permits were issued during 2006 and 2007 (see Attachment Air-2). Emissions from facilities permitted in 2005 and earlier were included in the background concentrations used to perform the air quality impacts analysis that is provided in the KRCD CPP AFC.

On March 11, 2008 the SJVAPCD provided KRCD with additional information relating to these facilities. This additional information (see Attachment Air-3) along with follow-up and discussions with SJVAPCD personnel indicated that there are no facilities within six miles of the KRCD that emit five tons per year or more of nitrogen oxides (NOx). Therefore, there is no need to perform a cumulative analysis for NOx emissions.

As described in February 25, 2008 response to this data request, the KRCD CPP PM10 emissions impacts are below the significance level established for this pollutant. Therefore, a cumulative analysis of PM10 and PM2.5 is also not required.

ATTACHMENT AIR-1

Excerpt from "England, G.C., Development of Fine Particulate Emissions Factors and Speciation Profiles for Oil and Gas-Fired Combustion Systems, Final Report, 2004"

DEVELOPMENT OF FINE PARTICULATE EMISSION FACTORS AND SPECIATION PROFILES FOR OIL- AND GAS-FIRED COMBUSTION SYSTEMS

FINAL REPORT

American Petroleum Institute

When citing this document, please use the following citation:
England, G.C., "Development of Fine Particulate Emission Factors and Speciation Profiles for Oil and Gas-fired Combustion Systems, Final Report, 2004."

DEVELOPMENT OF FINE PARTICULATE EMISSION FACTORS AND SPECIATION PROFILES FOR OIL- AND GAS-FIRED COMBUSTION SYSTEMS

FINAL REPORT

Prepared by:
Glenn C. England
GE Energy and Environmental Research Corporation
18 Mason
Irvine, CA 92618

Prepared for:
National Petroleum Technology Office
National Energy Technology Laboratory
United States Department of Energy
(DOE Contract No. DE-FC26-00BC15327)

Gas Research Institute
California Energy Commission – Public Interest Energy Research (PIER)
New York State Energy Research and Development Authority
(GRI contract No. 8362)

American Petroleum Institute
(API Contract No. 00-0000-4303)

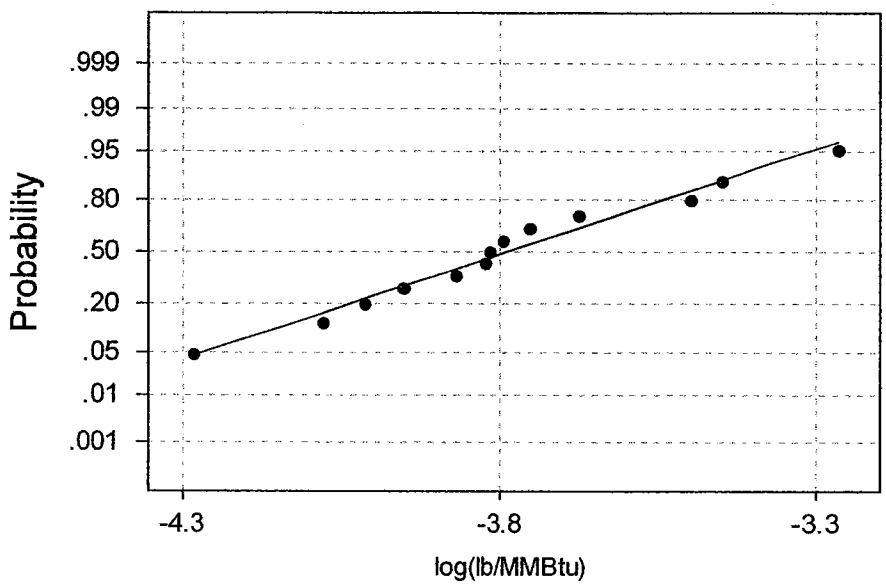
Draft (Revision 0): July 22, 2004
Final (Revision 1.0): October 20, 2004

Table 3-3. PM2.5 Mass Emission Factors for No. 6 Oil-Fired Institutional Boiler.

Source	Description	Units	Value
Site Delta (Wien et al., 2004c)	Dual Fuel-fired Institutional Boiler (No. 6 Oil)	lb/MMBtu	1.0E-02
Site Delta (Wien et al., 2004c)	Dual Fuel-fired Institutional Boiler (No. 6 Oil)	lb/MMBtu	1.8E-02
Site Delta (Wien et al., 2004c)	Dual Fuel-fired Institutional Boiler (No. 6 Oil)	lb/MMBtu	1.8E-02
Site Delta (Wien et al., 2004c)	Dual Fuel-fired Institutional Boiler (No. 6 Oil)	lb/MMBtu	1.9E-02
Average (log mean)		**lb/MMBtu**	**1.6E-02**
Uncertainty (at 95% Confidence Level), %		%	40
95% Confidence Upper Bound, lb/MMBtu		lb/MMBtu	2.1E-02
5th Percentile		lb/MMBtu	1.1E-02
95th Percentile		lb/MMBtu	1.9E-02

Gas-Fired Internal Combustion Combined Cycle and Cogeneration Plants

Results of tests from two natural gas-fired combined cycle power plants and one refinery gas-fired cogeneration plant were combined for a total set of 13 data points. All of the units are equipped with similar post-combustion air pollution controls for NO_x and carbon monoxide (CO) emissions. Two of the units employ lean premix combustion systems, while the smaller unit (Site Golf) employed water injection for NO_x control. Two of the units were tested with duct burners (supplementary firing) operating during some or all of the test runs. Two units were fired on natural gas, while the other was fired on refinery process gas. The data from Site Echo include a total of seven data points, from tests at high load and low load. All seven points were included to provide a more robust indication of dispersion, although this biases the mean and uncertainty slightly. Results from Site Echo indicated that the results are probably positively biased due to background PM2.5 in the dilution air (England, 2004). The data are not corrected since a DSB was not collected for every run at every site. The data are lognormally distributed (Figure 3-4) and no outliers were identified. Therefore, the average and uncertainty are conservative estimates of PM2.5 emissions. The average PM2.5 emission factor is 1.9×10^{-4} with an uncertainty of ±49 percent at the 95 percent confidence level (Table 3-4). The 95 percent confidence upper bound falls within the data range. It should be noted that if background PM2.5 in the dilution air is subtracted from the stack PM2.5 for Site Echo, the corrected stack PM2.5 is indistinguishable from the measured ambient PM2.5 concentration at that site.



Average: -3.79238
StDev: 0.274355
N: 13

Anderson-Darling Normality Test
A-Squared: 0.197
-Value: 0.860

Figure 3-4. Normal Probability Chart for Gas-Fired Combined Cycle and Cogeneration Power Plant PM2.5 Mass Results.

Table 3-4. PM2.5 Mass Emission Factors for Gas-Fired Combined Cycle and Cogeneration Power Plants.

Source	Description	Units	Value
Site Bravo (Wien et al., 2004a)	Natural Gas-fired Combined Cycle Power Plant with supplementary firing, oxidation catalyst and SCR (4)	lb/MMBtu	5.2E-05
Site Echo (England et al., 2004)	Natural Gas-fired Combined Cycle Power Plant with lean premix combustion system, supplementary firing, oxidation catalyst and SCR	lb/MMBtu	8.3E-05
Site Echo (England et al., 2004)	Natural Gas-fired Combined Cycle Power Plant with lean premix combustion system, supplementary firing, oxidation catalyst and SCR	lb/MMBtu	9.7E-05
Site Echo (England et al., 2004)	Natural Gas-fired Combined Cycle Power Plant with lean premix combustion system, supplementary firing, oxidation catalyst and SCR	lb/MMBtu	1.1E-04
Site Echo (England et al., 2004)	Natural Gas-fired Combined Cycle Power Plant with lean premix combustion system, supplementary firing, oxidation catalyst and SCR	lb/MMBtu	1.3E-04
Site Echo (England et al., 2004)	Natural Gas-fired Combined Cycle Power Plant with lean premix combustion system, supplementary firing, oxidation catalyst and SCR	lb/MMBtu	1.5E-04
Site Echo (England et al., 2004)	Natural Gas-fired Combined Cycle Power Plant with lean premix combustion system, supplementary firing, oxidation catalyst and SCR (5)	lb/MMBtu	1.5E-04
Site Bravo (Wien et al., 2004a)	Natural Gas-fired Combined Cycle Power Plant with lean premix combustion system, supplementary firing, oxidation catalyst and SCR (5)	lb/MMBtu	1.6E-04
Site Echo (England et al., 2004)	Natural Gas-fired Combined Cycle Power Plant with lean premix combustion system, supplementary firing, oxidation catalyst and SCR (5)	lb/MMBtu	1.8E-04
Site Golf (England and McGrath, 2004b)	Refinery Gas-fired Cogen with supplementary firing, oxidation catalyst and SCR (3)	lb/MMBtu	2.1E-04
Site Golf (England and McGrath, 2004b)	Refinery Gas-fired Cogen with supplementary firing, oxidation catalyst and SCR (3)	lb/MMBtu	3.2E-04
Site Golf (England and McGrath, 2004b)	Refinery Gas-fired Cogen with supplementary firing, oxidation catalyst and SCR (3)	lb/MMBtu	3.5E-04
Site Bravo (Wien et al., 2004a)	Natural Gas-fired Combined Cycle Power Plant with supplementary firing, oxidation catalyst and SCR (3)	lb/MMBtu	5.4E-04
Site Bravo (Wien et al., 2004a)	Natural Gas-fired Combined Cycle Power Plant with supplementary firing, oxidation catalyst and SCR (3)	lb/MMBtu	NV
Average		**lb/MMBtu**	**1.9E-04**
Uncertainty (at 95% Confidence Level), %		%	49
95% Confidence Upper Bound, lb/MMBtu (2)		lb/MMBtu	2.8E-04
5th Percentile		lb/MMBtu	7.0E-05
95th Percentile		lb/MMBtu	4.3E-04

(2) 95% confidence upper bound is calculated at the 95% confidence level using the single-tailed Student t distribution. The 95% confidence upper bound provides a plausible upper bound (i.e., it is likely actual emissions are lower) for emissions.
(3) Duct burners on.
(4) Duct burners were on for a total of approx. 30 minutes of 360 minute run.
(5) High winds interfered with dilution sampler flow. Results biased high.

Diesel Engine

Tests at Site Foxtrot included tests of a Diesel-powered backup generator with and without a catalytic DPF at two different loads (50 and 75 percent of rated load). All measurements using

two different samplers for the DPF configuration are included (the result from each sampler was averaged for each test condition). Results for 50 and 75 percent load are combined for the base configuration but not for the DPF configuration because the combined data set is neither normal nor lognormal and the difference is significant at the 95 percent confidence level (based on t-test). The highest point in the 75 percent load DPF test is an outlier; however, no valid reason was found to exclude it. The average emission factor is 0.027 lb/MMBtu without the DPF and 0.0035 to 0.0046 with the DPF (Table 3-5).

Table 3-5. PM2.5 Emission Factors for a Diesel Engine.

Source	Description	Units	Value
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine (50% load)	lb/MMBtu	2.6E-02
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine (50% load)	lb/MMBtu	2.9E-02
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine (50% load)	lb/MMBtu	2.9E-02
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine (75% load)	lb/MMBtu	3.5E-02
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine (75% load)	lb/MMBtu	2.1E-02
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine (75% load)	lb/MMBtu	2.4E-02
Average		**lb/MMBtu**	**2.7E-02**
Uncertainty (at 95% Confidence Level), %		%	35
95% Confidence Upper Bound, lb/MMBtu		lb/MMBtu	3.5E-02
5th Percentile		lb/MMBtu	2.1E-02
95th Percentile		lb/MMBtu	3.4E-02

Source	Description	Units	Value
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine with DPF (75% load)	lb/MMBtu	3.5E-03
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine with DPF (75% load)	lb/MMBtu	3.4E-03
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine with DPF (75% load)	lb/MMBtu	3.3E-03
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine with DPF (75% load)	lb/MMBtu	3.8E-03
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine with DPF (75% load)	lb/MMBtu	3.4E-03
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine with DPF (75% load)	lb/MMBtu	3.4E-03
Average		**lb/MMBtu**	**3.5E-03**
Uncertainty (at 95% Confidence Level), %		%	15
95% Confidence Upper Bound, lb/MMBtu		lb/MMBtu	4.0E-03
5th Percentile		lb/MMBtu	3.3E-03
95th Percentile		lb/MMBtu	3.7E-03

Source	Description	Units	Value
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine with DPF (50% load)	lb/MMBtu	4.7E-03
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine with DPF (50% load)	lb/MMBtu	4.6E-03
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine with DPF (50% load)	lb/MMBtu	4.7E-03
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine with DPF (50% load)	lb/MMBtu	4.0E-03
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine with DPF (50% load)	lb/MMBtu	4.8E-03
Site Foxtrot (Hernandez et al., 2004)	Diesel Engine with DPF (50% load)	lb/MMBtu	5.0E-03
Average		**lb/MMBtu**	**4.6E-03**
Uncertainty (at 95% Confidence Level), %		%	16
95% Confidence Upper Bound, lb/MMBtu		lb/MMBtu	5.4E-03
5th Percentile		lb/MMBtu	4.2E-03
95th Percentile		lb/MMBtu	5.0E-03

ATTACHMENT AIR-2

List of Authority to Construct Permits Issued
Within a 6 Mile Radius

ATC Within 6 Miles

APPs Received Between 1/1/2006 and 12/31/2007

Region C

Facility ID 169

Facility Name BUGGY BATH

Facility Type GASOLINE DISPENSING

Distance To Location 5156.392

Degrees 204.0054

Received	*Type*	*Status*	*Description*
4/26/2007	ATC	FINAL	GDF mod
2/21/2006	ATC	FINAL	modify GDF to upgrade to Phase II balance

Facility ID 196

Facility Name CALIFORNIA DRY CLEANING

Facility Type DRY CLEANING

Distance To Location 4556.413

Degrees 217.6951

Received	*Type*	*Status*	*Description*
8/28/2007	ATC	FINAL	MODIFICATION TO REPLACE EXISTING DRY CLEANING SYSTEM WITH MULTIMATIC, MODEL SL405, 40 LB CAPACITY CLOSED-LOOP, DRY-TO-DRY, PERCHLOROETHYLENE DRY CLEANING MACHINE WITH REFRIGERATED VAPOR CONDENSER AND CARBON ADSORBER.

Facility ID 403

Facility Name DARLING AND DURST, INC.

Facility Type BULK PLANT WITH GASOLINE DISPENSING

Distance To Location 5612.678

Degrees 249.353

Received	Type	Status	Description
12/17/2007	ATC	FINAL	modify bulk plant

Facility ID 450

Facility Name ECONOMY STOCK & FEED

Facility Type ANIMAL FEED PROCESSING

Distance To Location 9581.121

Degrees 345.0543

Received	Type	Status	Description
8/8/2007	ATC	FINAL	raisin cleaning and grading line served by a dust collector
10/15/2007	ATC	FINAL	modify raisin stem processing line unit -1

Facility ID 598

Facility Name GUARDIAN INDUSTRIES CORP

Facility Type GLASS MANUFACTURING

Distance To Location 5439.711

Degrees 256.6963

Received	Type	Status	Description
11/7/2006	ERC	PR-INCO	ERC Banking project for installation of new furnace with SCR.
11/14/2007	ATC	PR-INCO	the modifications of the raw material unloading and storage operation and the raw material weighing and mixing operation to replace the existing fabric filter collectors with new Flex-Kleen dust collectors
7/10/2007	TV REN	COMPLE	TV Renewal appl DROP DEAD DATE: 1/10/09
3/27/2006	MINOR	FINAL	Title V Minor Mod - Revise facility wide permit -0-2 to incorporate PSD conditions.

11/14/2007	ATC	PR-INCO	the installation of a 168 bhp diesel-fired emergency internal combustion engine powering a water pump

Facility ID *629*

Distance To Location
8031.268

Facility Name O'NEILL BEVERAGES CO LLC

Facility Type WINERY

Degrees
12.62283

Received	*Type*	*Status*	*Description*
10/22/2007	INITIAL	COMPLE	Initial TV DROP DEAD DATE: 4/19/09
8/24/2006	ATC	FINAL	routine replacement of wine and distilled spirit storage tanks
12/13/2007	ERC	PR-IN PR	ERC banking [due to installation of 2 regenerative thermal oxidizer]
12/5/2007	INHOUS	NEW PR	
10/22/2007	INITIAL	COMPLE	TV subproject
10/16/2007	ATC	FR-ASSI	modification of fourteen wine storage tanks
9/20/2006	ATC	FINAL	eight new stainless steel wine storage tanks
8/7/2006	INHOUS	FINAL	Brandy operation
7/31/2006	ATC	FINAL	Brandy facility with VOC control
11/8/2006	ATC	FINAL	installation of six new wine storage tanks

Facility ID *633*

Distance To Location
5447.655

Facility Name HMC GROUP COLD STORAGE, THE

Facility Type AGRICULTURAL PRODUCTS PROCESSING

Degrees
264.8896

Received	*Type*	*Status*	*Description*
4/11/2006	ATC	FINAL	Increase SO2 fumigation from 5 to 10 lb per day. Add another fumigation chamber using SO2 limiting daily usage to 16 lbs.
6/12/2006	ATC	FINAL	Application for emergency lpg engine

Facility ID 722

Distance To Location 5387.833

Facility Name KINGSBURG COGEN FACILITY

Facility Type COGENERATION

Degrees 260.9525

Received	Type	Status	Description
6/21/2007	AMEND	COMPL	convert ATCs C-722-6-0, -7-0, -8-0, -9-0

Facility ID 762

Distance To Location 8595.962

Facility Name CONOCOPHILLIPS COMPANY - 255663

Facility Type GASOLINE DISPENSING

Degrees 174.6325

Received	Type	Status	Description
10/5/2007	ATC	FINAL	modify GDF

Facility ID 986

Distance To Location 5750.06

Facility Name QUINN COMPANY

Facility Type INDUSTRIAL EQUIPMENT SALES

Degrees 187.3634

Received	Type	Status	Description
3/22/2006	ATC	FINAL	modify GDF
1/30/2006	ATC	FINAL	ABRASIVE BLASTING GEAR

Facility ID *1196*

Facility Name SUNMAID GROWERS OF CALIFORNIA

Facility Type AGRICULTURAL PRODUCTS PROCESSING

Distance To Location
6171.258

Degrees
264.833

Received	Type	Status	Description
10/16/2007	ATC	FINAL	installing a new 19.95 MMBtu/hr boiler and a new temporary 10.50 MMBtu/hr boiler (limited to 9 billion Btu/yr), removing one 18.8 MMBtu/hr boiler, permit unit -7-4, and modifying permit unit -10-2 to decrease annual PM10 emissions to offset the emissions
6/30/2006	ATC	FINAL	Modify dehydrator for Rule 4309 compliance.

Facility ID *1216*

Facility Name BUFORD OIL CO (TEXACO)

Facility Type GASOLINE DISPENSING

Distance To Location
9129.921

Degrees
172.0353

Received	Type	Status	Description
5/22/2007	ATC	FINAL	GDF

Facility ID *1310*

Facility Name USDA AG RESEARCH SERVICE

Facility Type AGRICULTURAL RESEARCH

Distance To Location
5326.609

Degrees
90.34959

Received	Type	Status	Description
3/2/2006	ATC	FINAL	manifold aboveground gasoline tanks

Facility ID *1551*

Distance To Location
7459.421

Facility Name DEL REY JUICE COMPANY LLC

Facility Type AGRICULTURAL PRODUCTS PROCESSING - CANNED FRUITS,

Degrees
346.8136

Received	Type	Status	Description
10/30/2006	ATC	FINAL	Install new boiler

Facility ID *1594*

Distance To Location
9542.438

Facility Name DEL MONTE FOODS #25

Facility Type AGRICULTURAL PRODUCTS PROCESSING - FRUITS/VEGETAB

Degrees
169.4281

Received	Type	Status	Description
6/4/2007	ATC	FINAL	the modification of one 71.7 MMBtu/hr boiler to install a selective catalytic reduction (SCR) system, replace the burner control system and remove fuel oil #2 as a curtailment fuel for District Rule 4306 compliance

Facility ID *1863*

Distance To Location
5838.539

Facility Name VIE-DEL COMPANY

Facility Type WINERY

Degrees
256.6611

Received	Type	Status	Description
1/31/2006	ATC	FINAL	modify boiler units -2 and -3 to retrofit with 9 ppmv low-NOx burners

Facility ID 2026

Distance To Location 4416.742

Facility Name DAVE'S LIQUOR & GAS

Facility Type GASOLINE DISPENSING

Degrees 13.05591

Received	Type	Status	Description
11/21/2006	ATC	FINAL	GDF

Facility ID 2253

Distance To Location 9349.38

Facility Name SILGAN CONTAINERS MANUFAC CORP

Facility Type CAN COATING

Degrees 170.4571

Received	Type	Status	Description
7/18/2006	ATC	FINAL	add a sanitary steel can welding line operation with powder stripe applicator and curing oven
10/12/2006	ATC	FINAL	the installation of a new can manufacturing line
10/11/2007	ATC	FINAL	add new line

Facility ID 2409

Distance To Location 5664.804

Facility Name BRITZ FERTILIZER CO

Facility Type FERTILIZER PRODUCTION

Degrees 16.19547

Received	Type	Status	Description
12/6/2006	ATC	FINAL	modify GDF

Facility ID *2934*

Distance To Location
8084.537

Facility Name SELMA AERODROME, INC.

Facility Type AIRPORTS AND AIRPORT TERMINAL SERVICES

Degrees
187.3841

Received	Type	Status	Description
11/21/2007	ATC	FINAL	gdf

Facility ID *3043*

Distance To Location
6384.417

Facility Name JOSAN & JOSAN, INC. DBA HIGHLAND TEXACO

Facility Type GASOLINE DISPENSING

Degrees
214.2536

Received	Type	Status	Description
10/5/2006	ATC	FINAL	modify GDF
6/2/2006	ATC	FINAL	Replace dispensers with Wayne Ovation 3 product

Facility ID *3652*

Distance To Location
5667.538

Facility Name USDA/ARS

Facility Type GOVERNMENT SERVICES

Degrees
16.1143

Received	Type	Status	Description
3/22/2006	ATC	FINAL	182 BHP CUMMINS MODEL 6BTA5.9-F1 DIESEL-FIRED EMERGENCY IC ENGINE POWERING A FIREWATER PUMP

Facility ID *3825*

Facility Name DIAMOND CUSTOM FURNITURE AND CABINETS

Facility Type WOOD PRODUCTS

Distance To Location 4773.912

Degrees 225.2803

Received	Type	Status	Description
5/7/2007	ATC	FINAL	WOOD WORKING GEAR PROJECT

Facility ID *4004*

Facility Name MAXCO SUPPLY INC

Facility Type COMMERCIAL PRINTING

Distance To Location 7939.594

Degrees 53.69046

Received	Type	Status	Description
3/9/2006	ATC	FINAL	cardboard flexographic printer and corrugated paper die cutters served by retech group cyclone
7/5/2006	ATC	FINAL	Modify operation and increase saw dust generation from 200 lb/day to 4000 lb/day.
7/19/2006	ATC	FINAL	Increase daily cardboard scrap collection from 15 tons to 40 tons.
8/10/2007	ATC	FINAL	modify scrap corrugated collection system to increase amount of waste collected to 80 tons per day for units -1, -5, -6, and -7; and install a new balemaster baler system for unit -2

Facility ID *4029*

Facility Name DALE BRISCO INC

Facility Type METAL MANUFACTURING

Distance To Location 8467.688

Degrees 281.2314

Received	Type	Status	Description
4/3/2006	ATC	FINAL	modify metal fabrication operation to replace plasma cutter
4/10/2006	ATC	FINAL	add two laser cutters

Facility ID *4151*

Distance To Location
2430.73

Facility Name BK SYDRAN VENTURES/BURGER KING #10836

Facility Type RESTAURANT - FAST FOOD

Degrees
25.98526

Received	Type	Status	Description
9/4/2007	ATC	FINAL	GEAR: CHARBROILER

Facility ID *4194*

Distance To Location
8617.847

Facility Name CARL'S JR #237

Facility Type RESTAURANT - FAST FOOD

Degrees
173.5177

Received	Type	Status	Description
7/10/2006	ATC	FINAL	modify charbroiler to increase the daily amount of meat cooked

Facility ID *4195*

Distance To Location
5315.098

Facility Name CARL'S JR #354

Facility Type RESTAURANT - FAST FOOD

Degrees
200.979

Received	Type	Status	Description
7/10/2006	ATC	FINAL	modify charbroiler to increase the daily amount of meat cooked

Facility ID *7113*

Facility Name SELMA MITSUBISHI

Facility Type MOTOR VEHICLE AND MOBILE EQUIPMENT COATING OPERA

Distance To Location
5483.42

Degrees
206.759

Received	*Type*	*Status*	*Description*
1/25/2006	ATC	FINAL	Motor vehicles coating operation

Facility ID *7145*

Facility Name KINGSBURG FIRE DEPT.

Facility Type PUBLIC ORDER AND SAFETY

Distance To Location
9084.543

Degrees
170.7786

Received	*Type*	*Status*	*Description*
4/6/2006	ATC	FINAL	NG ICE GEAR

Region S

Facility ID *6590*

Facility Name DANIEL CHA

Facility Type

Distance To Location
8860.767

Degrees
168.8727

Received	*Type*	*Status*	*Description*
8/23/2006	ATC	FINAL	soil vapor extraction

ATTACHMENT AIR-3

Additional Information on Facilities

Note:

Attachment B contains emissions information for 28 of the 31 facilities listed in Attachment A.

For the remaining three facilities, i.e. ID #s 598, 4195 and 6590, discussions with San Joaquin Valley Air Pollution Control District personnel on April 7, 2008 confirmed that, based on the information available, none of the facilities has an increased potential to emit five tons per year or more of nitrogen oxides.

								Lbs / Year					Lbs / Day				
sRegion	lFacilityID	lProjectID	ermitNumb	Modificatio	sStatus	VOC Only	<5 Tpy	Nox	Sox	Pm10	Co	Voc	Nox	Sox	Pm10	Co	Voc
C	169	1060519	1	4	P	X		0	0	0	0	5439	0	0	0	0	14.9
C	169	1071631	1	5	F	X		0	0	0	0	5439	0	0	0	0	14.9
C	196	1073585	2	0	P	X		0	0	0	0	0	0	0	0	0	0
C	403	1074509	1	2	F	X		0	0	0	0	2309	0	0	0	0	7.8
C	450	1073902	1	2	F		X	0	0	630	0	0	0	0	1.8	0	0
C	450	1073278	5	0	P		X	0	0	256	0	0	0	0	0.7	0	0
C	629	1062465	282	0	P		X	0	0	0	0	565330	0	0	0	0	0
C	629	1062434	282	1	P		X	2234	244	113	1251	51353	6.1	0.1	0.3	3.4	144.4
C	629	1062465	283	0	P		X	0	0	0	0	565330	0	0	0	0	0
C	629	1062434	283	1	P		X	2234	244	113	1251	51353	6.1	0.1	0.3	3.4	144.4
C	629	1062596	284	0	P	X		0	0	0	0	1161	0	0	0	0	99.2
C	629	1062596	285	0	P	X		0	0	0	0	1161	0	0	0	0	99.2
C	629	1062596	286	0	P	X		0	0	0	0	1161	0	0	0	0	99.2
C	629	1062596	287	0	P	X		0	0	0	0	1161	0	0	0	0	99.2
C	629	1062596	288	0	P	X		0	0	0	0	3033	0	0	0	0	313.9
C	629	1062791	289	0	P	X		0	0	0	0	248	0	0	0	0	39.2
C	629	1073919	289	1	V	X		0	0	0	0	3920	0	0	0	0	104.5
C	629	1062791	290	0	P	X		0	0	0	0	248	0	0	0	0	39.2
C	629	1073919	290	1	V	X		0	0	0	0	3920	0	0	0	0	104.5
C	629	1062791	291	0	P	X		0	0	0	0	248	0	0	0	0	39.2
C	629	1073919	291	1	V	X		0	0	0	0	3920	0	0	0	0	104.5
C	629	1062791	292	0	P	X		0	0	0	0	248	0	0	0	0	39.2
C	629	1073919	292	1	V	X		0	0	0	0	3920	0	0	0	0	104.5
C	629	1062791	293	0	P	X		0	0	0	0	248	0	0	0	0	39.2
C	629	1073919	293	1	V	X		0	0	0	0	3920	0	0	0	0	104.5
C	629	1062791	294	0	P	X		0	0	0	0	248	0	0	0	0	39.2
C	629	1073919	294	1	V	X		0	0	0	0	3920	0	0	0	0	104.5
C	629	1062791	295	0	P	X		0	0	0	0	248	0	0	0	0	39.2
C	629	1073919	295	1	V	X		0	0	0	0	3920	0	0	0	0	104.5
C	629	1062791	296	0	P	X		0	0	0	0	248	0	0	0	0	39.2
C	629	1073919	296	1	V	X		0	0	0	0	3920	0	0	0	0	104.5
C	629	1063344	297	0	P	X		0	0	0	0	248	0	0	0	0	39.2
C	629	1073919	297	1	V	X		0	0	0	0	3920	0	0	0	0	104.5
C	629	1063344	298	0	P	X		0	0	0	0	248	0	0	0	0	39.2
C	629	1073919	298	1	V	X		0	0	0	0	236	0	0	0	0	56.8
C	629	1063344	299	0	P	X		0	0	0	0	248	0	0	0	0	39.2
C	629	1073919	299	1	V	X		0	0	0	0	236	0	0	0	0	56.8
C	629	1063344	300	0	P	X		0	0	0	0	248	0	0	0	0	39.2
C	629	1073919	300	1	V	X		0	0	0	0	236	0	0	0	0	56.8
C	629	1063344	301	0	P	X		0	0	0	0	248	0	0	0	0	39.2
C	629	1073919	301	1	V	X		0	0	0	0	236	0	0	0	0	56.8
C	629	1063344	302	0	P	X		0	0	0	0	248	0	0	0	0	39.2
C	629	1073919	302	1	V	X		0	0	0	0	236	0	0	0	0	56.8
C	633	1061088	3	3	P		X	0	270	0	0	0	0	2.2	0	0	0
C	633	1062457	4	0	P		X	77	0	3	88	36	18.4	0	0.8	21.1	8.6
C	722	1053850	6	0	F	X		0	0	0	0	45	0	0	0	0	0.4
C	722	1053850	7	0	F	X		0	0	0	0	45	0	0	0	0	0.4
C	722	1053850	8	0	F	X		0	0	0	0	3139	0	0	0	0	8.6

C	722	1053850	9	0	F	X		0	0	0	0	10	0	0	0	0	0
C	762	1073859	1	4	F	X		0	0	0	0	6789	0	0	0	0	18.6
C	986	1060842	1	2	F	X		0	0	0	0	876	0	0	0	0	2.4
C	986	1060241	8	0	P		X	0	0	1752	0	0	0	0	4.8	0	0
C	1196	1073917	10	2	F		X	998	31	530	842	1976	9.6	0.3	5.1	8.1	19
C	**1196**	**1062215**	**12**	**1**	**P**			**7849**	**402**	**1514**	**24926**	**3280**	**51.8**	**5.7**	**4.1**	**68.3**	**9**
C	**1196**	**1073917**	**27**	**0**	**F**			**1922**	**498**	**1328**	**12932**	**961**	**5.3**	**1.4**	**3.6**	**35.4**	**2.6**
C	1196	1073917	28	0	F		X	99	26	68	666	50	2.8	0.7	1.9	18.6	1.4
C	1216	1072120	1	4	F	X		0	0	0	0	620	0	0	0	0	7.4
C	1310	1060658	3	1	P	X		0	0	0	0	876	0	0	0	0	2.4
C	**1551**	**1063252**	**5**	**0**	**F**			**3179**	**839**	**2237**	**36203**	**1236**	**8.7**	**2.3**	**6.1**	**99.2**	**3.4**
C	**1594**	**1072355**	**1**	**7**	**F**			**9518**	**1784**	**4394**	**45838**	**3128**	**26.1**	**4.9**	**12**	**125.6**	**8.6**
C	**1863**	**1060251**	**2**	**7**	**P**			**2505**	**649**	**1731**	**34164**	**1253**	**6.9**	**1.8**	**4.7**	**93.6**	**3.4**
C	**1863**	**1060251**	**3**	**2**	**P**			**2505**	**649**	**1731**	**34164**	**1253**	**6.9**	**1.8**	**4.7**	**93.6**	**3.4**
C	2026	1063489	1	2	P	X		0	0	0	0	5439	0	0	0	0	14.9
C	2253	1062340	5	0	P		X	0	0	2	0	0	0	0	0	0	0
C	2253	1063325	6	0	F		X	0	0	1	0	0	0	0	0	0	0
C	2253	1073895	7	0	F		X	0	0	1	0	0	0	0	0	0	0
C	2253	1073895	8	0	F		X	0	0	1	0	0	0	0	0	0	0
C	2409	1063629	1	1	P	X		0	0	0	0	876	0	0	0	0	2.4
C	2934	1074277	1	1	F	X		0	0	0	0	6096	0	0	0	0	16.7
C	3043	1062951	2	3	P	X		0	0	0	0	5439	0	0	0	0	14.9
C	3652	1060850	3	0	P		X	91	0	3	46	5	73	0.1	2.8	37	3.6
C	3825	1071798	1	2	F		X	0	0	6320	0	0	0	0	17.3	0	0
C	4004	1060707	1	2	P		X	0	0	11	0	358	0	0	0	0	1
C	4004	1062349	1	3	P		X	0	0	73	0	1059	0	0	0.2	0	2.9
C	4004	1073305	1	4	F		X	0	0	365	0	1059	0	0	1	0	2.9
C	**4004**	**1062233**	**2**	**2**	**P**			**424**	**102**	**15012**	**1037**	**193**	**1.2**	**0.3**	**41.1**	**2.8**	**0.5**
C	**4004**	**1073305**	**2**	**3**	**F**			**424**	**102**	**15195**	**1037**	**193**	**1.2**	**0.3**	**41.6**	**2.8**	**0.5**
C	4004	1060707	5	1	P		X	0	0	11	0	358	0	0	0	0	1
C	4004	1062349	5	2	P		X	0	0	0	0	0	0	0	0	0	0
C	4004	1073305	5	3	F		X	0	0	0	0	0	0	0	0	0	0
C	4004	1062349	6	1	P		X	0	0	0	0	0	0	0	0	0	0
C	4004	1073305	6	2	F		X	0	0	0	0	0	0	0	0	0	0
C	4004	1060707	7	0	P		X	0	0	11	0	358	0	0	0	0	1
C	4004	1062349	7	1	P		X	0	0	0	0	0	0	0	0	0	0
C	4004	1073305	7	2	F		X	0	0	0	0	0	0	0	0	0	0
C	4029	1060988	1	1	P		X	0	0	49	0	0	0	0	0.1	0	0
C	4029	1061075	5	0	F		X	0	0	2	0	0	0	0	0	0	0
C	4029	1061075	6	0	F		X	0	0	3	0	0	0	0	0	0	0
C	4151	1073638	2	0	P		X	73	0	110	0	37	0.2	0	0.3	0	0.1
C	4194	1062273	1	2	P		X	73	0	511	0	146	0.2	0	1.4	0	0.4
C	7113	1060197	1	0	P	X	X	0	0	4672	0	19966	0	0	12.8	0	54.7
C	7145	1061044	1	0	P		X	37	0	2	27	6	8.9	0.1	0.5	6.5	1.5

Technical Area: Biological Resources

Data Request 14:
Please contact the California Department of Fish and Game (CDFG) and provide a report of conversation that includes information about whether the proposed project will need to acquire a Streambed Alteration Agreement and any guidance provided by CDFG. Please also provide contact information for the CDFG staff person who provides comments, copies of any written materials provided by KRCD to CDFG related to the Streambed Alteration Agreement, an estimated schedule for the CDFG submittals and permits, and a copy of any written correspondence that CDFG provides related to the streambed issue.

Updated Response:

Streambed Alteration Agreement

As an update to the previous data request responses which were submitted on February 25, 2008, the Streambed Alteration Agreement (SAA) application has been prepared and submitted to CDFG. A copy of the SAA is included as Attachment Bio-1. The SAA was prepared to address the natural gas pipeline undercrossings of the Kings River and Cross Creek intermittent drainages.

Valley Elderberry Longhorn Beetle and Elderberry Bush Habitat

At the March 6, 2008 Data Response and Issues Identification workshop, the CEC staff biologist requested field surveys for the Valley Elderberry Longhorn Beetle (VELB) be conducted and survey results and elderberry bush habitat in the area to be mapped. The VELB was also to be included in the KRCD CPP project worker awareness program. The text below provides an update to the February 25, 2008 data request response.

On September 4, 2008, project biologists conducted surveys for the VELB and mapped the elderberry bush habitat at the Kings River where the natural gas pipeline will be bored underneath the river using horizontal directional drilling (HDD). A memo regarding the VELB surveys, findings and the elderberry bush mapping is included as Attachment Bio-2. In summary, the survey included a 600-foot wide zone on both sides of the river and all elderberry bushes were visually checked. The area surveyed included 300-feet on either side of the proposed alignment of the gas pipeline undercrossing. Three elderberry bushes were found in the riparian habitat along the east side of the Kings River. Seven elderberry bushes or clumps of bushes were found in the riparian habitat along the west side of the Kings River. The bushes

have hundreds of stems, are healthy, and occur along the upper banks of the Kings River. The locations of the elderberry bushes were recorded with a hand-held global positioning system (GPS) unit and mapped upon a project aerial map. Elderberry bushes and their stems and trunks were examined for VELP and its emergence hole evidence, but none was found. Based on the field survey work, the elderberry bushes near the Kings River undercrossing are not inhabited by the VELB.

All construction activities for the Kings River undercrossing will occur outside the riparian and elderberry bush habitat of the river. An additional 500-foot no activity buffer zone will also occur outward from the edge of the riparian habitat. Staging areas for the gas pipeline HDD are shown on the maps in the HDD Contingency Plan for Inadvertent Returns of Drilling Mud (i.e. Frac-out Plan), which is included as part of the SAA (See Attachment Bio-1). These areas all occur in actively farmed agricultural lands. The eastern staging area is a peach orchard and the western staging area is an alfalfa field. No impacts to the VELB or its elderberry bush habitat will occur as a result of the KRCD CPP.

As a precautionary measure, the VELB and its elderberry bushes will be included in a worker awareness program. Also both pre- and post-construction monitoring surveys will be conducted, and a post-construction monitoring report will be prepared.

The following preventive measures have also been added to the KRCD CPP for work in the area of the Kings River. The preventive avoidance measures are being added to those currently recommended in KRCD CPP AFC Section 8.16.4.4 and more specifically are being added to those measures identified in Section 7.14 (page 26) of the Biological Assessment for the KRCD CPP, dated November 2007:

KR #3. An educational program shall be conducted by a qualified biologist for all project managers, engineers, contractors, and construction crews prior to work to inform them of the VELB and its elderberry bush habitat in the Kings River undercrossing area, the need to avoid damaging these resources, and the possible penalties for not complying with the measure.

KR #4. Prior to construction, elderberry bushes will be flagged with yellow cautionary tape and photographs shall be taken by a qualified biologist to document the existing condition of the elderberry bushes in the Kings River undercrossing area. After completion of the construction activities, the same-direction photographs shall be taken for comparative purposes and to document post-construction conditions.

KR #5. A post-construction monitoring survey shall be conducted by a qualified biologist to evaluate the implementation of and compliance with the preventive measures. A report, including the above photographs, shall be prepared and sent to the CEC upon completion of construction.

The information on the VELB will also be included in the revised Biological Assessment, which is currently being prepared and will be submitted upon its completion.

HDD Contingency Plan for Inadvertent Returns of Drilling Mud (i.e. Frac-out Plan)

Per the request of CEC staff at the March 6, 2008 Data Response and Issues Identification Workshop, a draft Frac-out Plan was also prepared to address the Kings River and Cross Creek crossings of the natural gas pipeline which will be installed by HDD. The draft Frac-out Plan is included as part of the SAA (See Attachment Bio-1).

ATTACHMENT BIO-1

Streambed Alteration Agreement

HALSTEAD & ASSOCIATES
Environmental / Biological Consultants

296 Burgan Avenue, Clovis, CA 93611
Office (559) 298-2334; Mobile (559) 970-2875
Fax (559) 322-0769; HalsteadEnv@aol.com

Date: September 18, 2008

TO: Ms. Annette Teneboe
California Department of Fish and Game, Lake and Streambed Alteration Agreement
1234 E. Shaw Avenue
Fresno, CA 93710

RE: **Notification Application for Streambed Alteration Agreement**
KRCD's Community Power Plant Project near Parlier (Fresno County, CA)
HDD Under the Kings River & Intermittent Drainages of Cross Creek

Dear Annette:

Enclosed is a notification application to obtain a Streambed Alteration Agreement (SAA) to bore under the Kings River near Kingsburg (Fresno County) and under the 6 intermittent drainages of Cross Creek near Traver (Tulare County) using Horizontal Directional Drilling (HDD) techniques to install a 24-inch natural gas pipeline for the Kings River Conservation District's (KRCD) proposed Community Power Plant project near Parlier.

Background

The KRCD is proposing a 565 megawatt natural gas-fired power plant near the City of Parlier (Fresno County, California) and has filing an Application For Certification (AFC) with the California Energy Commission for permitting of the plant. Specifically, the plant will set upon a 20 acre parcel just northeast of the intersection of Bethel and Dinuba Avenues. A 20-acre area of a 60-acre alfalfa field adjacent to the plant site will be used as a construction yard for the project. The project involves four basic components including the power plant site, natural gas pipeline, water pipeline, and transmission lines (see attached map). Many miles of water pipeline, transmission lines, and gas pipeline are proposed for the project. The first two structures will occur in Fresno County and the gas pipeline will interconnect with an existing gas pipeline near Visalia in Tulare County and run north to the power plant site in Fresno County.

In May 2007, we conducted reconnaissance surveys to evaluate if wetlands and waters occur on or adjacent to the project site and along the water, gas, and transmission line routes. Our waters/wetlands evaluation report was forwarded to the CDFG in January 2008 with a request for guidance on permits. In March 2008, the USFWS, CEC, CDFG (Mr. Justin Sloan), and H&A toured the project sites. CDFG (Mr. Brian Erlandsen) requested that a SAA be obtained even though no project impacts will occur to resources. Our waters/wetlands evaluation report and subsequent Biological Assessment Report (November 2007) lists a multitude of preventive avoidance measures for the project. Since that report, the KRCD has decided to bore completely underneath the Cross Creek area to avoid potential impacts. Surveys and reports on the San Joaquin Kit Fox and sensitive raptors have been conducted for the project. These reports and others mentioned above have been submitted to the CDFG, Fresno Office.

HDD techniques will be used to install the 24-inch natural gas pipeline under waters/wetlands at two sites:

- Kings River near Kingsburg (1 HDD site)
  (Section 17, Township 16S, Range 23E, Reedley Quad, Fresno County)

- Cross Creek intermittent drainages south of Traver (2 HDD sites)
  (Section 34, Township 17S, Range 23E, Traver Quad, Tulare County)

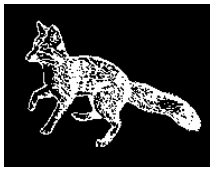
The Cross Creek area is annual grassland habitat that has six intermittent drainages, some of which are wetlands and some are waters. The gas pipeline will occur in the Road 60 right-of-way; however, private lands adjacent to the right-of-way have wetland ponds, vernal pool wetlands, the endangered Vernal Pool Tadpole Shrimp, Critical Habitats, and potentially other sensitive species too. Two HDD sites will be used to bore underneath two separate areas of Cross Creek intermittent drainages. The Kings River at the gas pipeline route is a waters and has wetland and riparian habitat along its banks.

No significant impacts will occur to sensitive species or habitats such as waters, wetlands, or riparian. We conclude this because no work or impacts will occur in the bed or bank of the waters/wetlands, the HDD work areas (three sites) have been sighted to occur on agricultural land, they are outside, away from, and do not drain into the riparian/ wetland habitat, buffer zones of at least 200 feet will occur between the HDD work areas and the outer edge of the riparian/ wetland habitat, lands surrounding the HDD work areas are actively farmed agricultural land or paved county roads, a variety of preventive avoidance measures will completely avoid all impacts, and biological surveys show that no sensitive species or habitats occur at the work sites. The buffer zones at the Kings River area will be approximately 500 feet outward from the riparian edge. The buffer zones at the two Cross Creek areas will be approximately 200 feet and 300 feet, respectively outward from the native land.

Sincerely,

Jeffrey A. & Pamela S. Halstead
Owners / Partners / Biologists

cc: Mr. Taylor Matteson (KRCD)



P.S. Please advise us on the amount of the CDFG 1602 fees . We left that section of the notification blank.

FOR DEPARTMENT USE ONLY				
Date Received	Amount Received	Amount Due	Date Complete	Notification No.
	$	$		

STATE OF CALIFORNIA

DEPARTMENT OF FISH AND GAME

NOTIFICATION OF LAKE OR STREAMBED ALTERATION

Complete EACH field, unless otherwise indicated, following the enclosed instructions and submit ALL required enclosures. Attach additional pages, if necessary.

1. APPLICANT PROPOSING PROJECT

Name	Mr. Taylor Matteson		
Business/Agency	Kings River Conservation District		
Street Address	4886 E. Jensen Avenue		
City, State, Zip	Fresno, CA 93725		
Telephone	(559) 237-5567	Fax	(559) 237-5560
Email	tmatteson@krcd.org		

2. CONTACT PERSON (*Complete only if different from applicant*)

Name			
Street Address			
City, State, Zip			
Telephone		Fax	
Email			

3. PROPERTY OWNER (*Complete only if different from applicant*)

Name	N/A		
Street Address			
City, State, Zip			
Telephone		Fax	
Email			

4. PROJECT NAME AND AGREEMENT TERM

A. Project Name	KRCD Community Power Plant: Horizontal Directional Drilling - Kings River/Cross Creek
B. Agreement Term Requested	☑ Regular (*5 years or less*) ☐ Long-term (*greater than 5 years*)

C. Project Term		D. Seasonal Work Period		E. Number of Work Days
Beginning (*year*)	Ending (*year*)	Start Date (*month/day*)	End Date (*month/day*)	
2009	2013	01/01	12/31	100.00

5. AGREEMENT TYPE

Check the applicable box. If box B, C, D, or E is checked, complete the specified attachment.

A.	☑ Standard *(Most construction projects, excluding the categories listed below)*	
B.	☐ Gravel/Sand/Rock Extraction (*Attachment A*)	*Mine I.D. Number:* _____
C.	☐ Timber Harvesting (*Attachment B*)	THP *Number:* _____
D.	☐ Water Diversion/Extraction/Impoundment (*Attachment C*)	*SWRCB Number:* _____
E.	☐ Routine Maintenance (*Attachment D*)	
F.	☐ DFG Fisheries Restoration Grant Program (FRGP)	*FRGP Contract Number:* _____
G.	☐ Master	
H.	☐ Master Timber Harvesting	

6. FEES

Please see the current fee schedule to determine the appropriate notification fee. Itemize each project's estimated cost and corresponding fee. ***Note: The Department may not process this notification until the correct fee has been received.***

	A. Project	B. Project Cost	C. Project Fee
1	HDD 24" gas pipeline under Kings River near Kingsburg	$1,000,000.00	
2	HDD 24 " gas pipeline under Cross Creek drainages (2 sites)	$1,000,000.00	
3			
4			
5			
		D. Base Fee *(if applicable)*	
		E. TOTAL FEE ENCLOSED	

7. PRIOR NOTIFICATION OR ORDER

A. Has a notification previously been submitted to, or a Lake or Streambed Alteration Agreement previously been issued by, the Department for the project described in this notification?

☐ Yes (*Provide the information below*) ☑ No

Applicant: _____ Notification Number: _____ Date: _____

B. Is this notification being submitted in response to an order, notice, or other directive ("order") by a court or administrative agency (including the Department)?

☑ No ☐ Yes (*Enclose a copy of the order, notice, or other directive. If the directive is not in writing, identify the person who directed the applicant to submit this notification and the agency he or she represents, and describe the circumstances relating to the order.*)

☐ *Continued on additional page(s)*

8. PROJECT LOCATION

A. Address or description of project location.

(Include a map that marks the location of the project with a reference to the nearest city or town, and provide driving directions from a major road or highway)

1. Kings River - Approximately 3 miles northeast of Kingsburg and just north of the Kingsburg Golf Course (Fresno County, CA). Specifically, the site occurs along Avenue 408 at the Kings River in Section 17, T16S, R23E of the Reedley 7.5 minute quadrangle map. An aerial map showing the locale and underboring route is attached.

2. Cross Creek - Approximately 3 miles south of Traver (Tulare County, CA). Specifically, the site occurs along Road 60 at two areas of Cross Creek in two separate areas. The two sites occur in Section 34, T17S, R23E of the Traver 7.5 minute quadrangle map. An aerial map showing the locales and underboring routes is attached.

☐ *Continued on additional page(s)*

B. River, stream, or lake affected by the project.	Kings River and Cross Creek intermittent drainages
C. What water body is the river, stream, or lake tributary to?	The former and remnant Tulare Lake
D. Is the river or stream segment affected by the project listed in the state or federal Wild and Scenic Rivers Acts?	☐ Yes ☑ No ☐ Unknown
E. County	Kings River - Fresno County. Cross Creek - Tulare County.

F. USGS 7.5 Minute Quad Map Name	G. Township	H. Range	I. Section	J. ¼ Section
Kings River - Reedley	16S	23E	17	
Cross Creek Drainages - Traver	17S	23E	34	

☐ *Continued on additional page(s)*

K. Meridian (*check one*) ☐ Humboldt ☑ Mt. Diablo ☐ San Bernardino

L. Assessor's Parcel Number(s)

unknown

☐ *Continued on additional page(s)*

M. Coordinates (*If available, provide at least latitude/longitude or UTM coordinates and check appropriate boxes)*

Latitude/Longitude	*Latitude:*	*Longitude:*	
	☐ Degrees/Minutes/Seconds	☐ Decimal Degrees	☐ Decimal Minutes
UTM	*Easting:*	*Northing:*	☐ Zone 10 ☐ Zone 11
Datum used for Latitude/Longitude or UTM	☐ NAD 27	☐ NAD 83 or WGS 84	

9. PROJECT CATEGORY AND WORK TYPE *(Check each box that applies)*

PROJECT CATEGORY	NEW CONSTRUCTION	REPLACE EXISTING STRUCTURE	REPAIR/MAINTAIN EXISTING STRUCTURE
Bank stabilization – bioengineering/recontouring	☐	☐	☐
Bank stabilization – rip-rap/retaining wall/gabion	☐	☐	☐
Boat dock/pier	☐	☐	☐
Boat ramp	☐	☐	☐
Bridge	☐	☐	☐
Channel clearing/vegetation management	☐	☐	☐
Culvert	☐	☐	☐
Debris basin	☐	☐	☐
Dam	☐	☐	☐
Diversion structure – weir or pump intake	☐	☐	☐
Filling of wetland, river, stream, or lake	☐	☐	☐
Geotechnical survey	☐	☐	☐
Habitat enhancement – revegetation/mitigation	☐	☐	☐
Levee	☐	☐	☐
Low water crossing	☐	☐	☐
Road/trail	☐	☐	☐
Sediment removal – pond, stream, or marina	☐	☐	☐
Storm drain outfall structure	☐	☐	☐
Temporary stream crossing	☐	☐	☐
Utility crossing : Horizontal Directional Drilling	☑	☐	☐
Jack/bore	☐	☐	☐
Open trench	☐	☐	☐
Other *(specify)*: 24" natural gas pipeline	☐	☐	☐

10. PROJECT DESCRIPTION

A. Describe the project in detail. Photographs of the project location and immediate surrounding area should be included.

- **Include any structures (e.g., rip-rap, culverts, or channel clearing) that will be placed, built, or completed in or near the stream, river, or lake.**
- **Specify the type and volume of materials that will be used.**
- **If water will be diverted or drafted, specify the purpose or use.**

Enclose diagrams, drawings, plans, and/or maps that provide all of the following: site specific construction details; the dimensions of each structure and/or extent of each activity in the bed, channel, bank or floodplain; an overview of the entire project area (i.e., "bird's-eye view") showing the location of each structure and/or activity, significant area features, and where the equipment/machinery will enter and exit the project area.

The KRCD plans to bore under the Kings River near Kingsburg (Fresno County) and under the 6 intermittent drainages of Cross Creek near Traver (Tulare County) at two sites using Horizontal Directional Drilling (HDD) techniques to install a 24-inch natural gas pipeline for the KRCD's proposed Community Power Plant near Parlier.

The HDD work sites have been sighted to occur on agricultural land, they are outside, away from, and do not drain into riparian/wetland habitat, buffer zones of at least 200 feet will occur between the HDD work areas and the outer edge of the riparian/wetland habitat, lands surrounding the HDD work areas are actively farmed agricultural land or paved county roads, and a variety of preventive avoidance measures will completely avoid all impacts. The buffer zones at the Kings River area will be approximately 500 feet. The buffer zones at the two Cross Creek, areas will be approximately 200 feet and 300 feet for each site.

☐ *Continued on additional page(s)*

B. Specify the equipment and machinery that will be used to complete the project.

Standard horizontal directional drilling equipment. Trucks will be used to haul in the HDD equipment and pipe for the pipeline. A front-end loader or crane will be used to move the pipe. A front-end loader may be used to grade the 150' x 150' work areas.

☐ *Continued on additional page(s)*

C. Will water be present during the proposed work period (specified in box 4.D) in the stream, river, or lake (specified in box 8.B).	☑ Yes ☐ No (*Skip to box 11*)
D. Will the proposed project require work in the wetted portion of the channel?	☐ Yes (*Enclose a plan to divert water around work site*) ☑ No

11. PROJECT IMPACTS

A. Describe impacts to the bed, channel, and bank of the river, stream, or lake, and the associated riparian habitat. Specify the dimensions of the modifications in length (linear feet) and area (square feet or acres) and the type and volume of material (cubic yards) that will be moved, displaced, or otherwise disturbed, if applicable.

No significant impacts will occur to sensitive species or habitats such as waters, wetlands, or riparian. We conclude this because of the reasons stated for Question #10.

☐ *Continued on additional page(s)*

B. Will the project affect any vegetation? ☑ Yes (*Complete the tables below*) ☐ No

Vegetation Type	Temporary Impact	Permanent Impact
Actively farmed row crops (5 bore areas)	Linear feet: _____ Total area: 5 acres	Linear feet: _____ Total area: _____
Actively farmed peach orchard (1 bore area)	Linear feet: _____ Total area: 1 acre	Linear feet: _____ Total area: _____

Tree Species	Number of Trees to be Removed	Trunk Diameter (range)
No native trees or vegetation will be impacted	0	

☐ *Continued on additional page(s)*

C. Are any special status animal or plant species, or habitat that could support such species, known to be present on or near the project site?

☑ Yes *(List each species and/or describe the habitat below)* ☐ No ☐ Unknown

Kings River - waters, wetland, and riparian. Cross Creek - waters, wetlands, T&E species. Work is outside these areas.

☐ *Continued on additional page(s)*

D. Identify the source(s) of information that supports a "yes" or "no" answer above in Box 11.C.

CNDDB. Recent biological surveys for waters, wetlands, and T&E species for the project.
A Biological Assessment Report has been prepared for the project and is on-file at CDFG (Mr. Justin Sloan).

☐ *Continued on additional page(s)*

E. Has a biological study been completed for the project site?

☑ Yes (*Enclose the biological study*) ☐ No

Note: A biological assessment or study may be required to evaluate potential project impacts on biological resources.

F. Has a hydrological study been completed for the project or project site?

☐ Yes (*Enclose the hydrological study*) ☑ No

Note: A hydrological study or other information on site hydraulics (e.g., flows, channel characteristics, and/or flood recurrence intervals) may be required to evaluate potential project impacts on hydrology.

12. MEASURES TO PROTECT FISH, WILDIFE, AND PLANT RESOURCES

A. Describe the techniques that will be used to prevent sediment from entering watercourses during and after construction.

HDD work sites have been sighted to occur on agricultural land, they are outside, away from, and do not drain into riparian/wetland habitat, buffer zones of at least 200 feet will occur between the HDD work areas and the outer edge of the riparian/wetland habitat, lands surrounding the HDD work areas are actively farmed agricultural land or paved county roads, and a variety of preventive avoidance measures will completely avoid all impacts. The buffer zones at the Kings River area will be approximately 500 feet. The buffer zones at the two Cross Creek, areas will be approximately 200 feet and 300 feet for each site.

A Frac-out Plan has been developed in case of the inadvertent return of drilling mud during the HDD (copy attached).

☐ *Continued on additional page(s)*

B. Describe project avoidance and/or minimization measures to protect fish, wildlife, and plant resources.

A variety of preventive avoidance measures are incorporated into the project that will completely avoid all impacts.

The preventive avoidance measures for the HDD work areas are attached.

☑ *Continued on additional page(s)*

C. Describe any project mitigation and/or compensation measures to protect fish, wildlife, and plant resources.

None. No significant impacts will occur to sensitive species or habitats such as waters, wetlands, or riparian.

☐ *Continued on additional page(s)*

13. PERMITS

List any local, state, and federal permits required for the project and check the corresponding box(es). Enclose a copy of each permit that has been issued.

A. Application for Certification - California Energy Commission ☑ Applied ☐ Issued

B. Biological Assessment Report - USFWS request for no impacts ruling ☑ Applied ☐ Issued

C. _____ ☐ Applied ☐ Issued

D. Unknown whether ☐ local, ☐ state, or ☐ federal permit is needed for the project. (*Check each box that applies*)

☐ *Continued on additional page(s)*

14. ENVIRONMENTAL REVIEW

A. Has a draft or final document been prepared for the project pursuant to the California Environmental Quality Act (CEQA), National Environmental Protection Act (NEPA), California Endangered Species Act (CESA) and/or federal Endangered Species Act (ESA)?

☑ Yes (*Check the box for each CEQA, NEPA, CESA, and ESA document that has been prepared and enclose a copy of each*)

☐ No (*Check the box for each CEQA, NEPA, CESA, and ESA document listed below that will be or is being prepared*)

☐ Notice of Exemption	☐ Mitigated Negative Declaration	☐ NEPA document (*type*): _____
☐ Initial Study	☑ Environmental Impact Report	☐ CESA document (*type*): _____
☐ Negative Declaration	☐ Notice of Determination (*Enclose*)	☐ ESA document (*type*): _____
☐ THP/ NTMP	☐ Mitigation, Monitoring, Reporting Plan	

B. State Clearinghouse Number (*if applicable*)	07-AFC-7		
C. Has a CEQA lead agency been determined?	☑ Yes (*Complete boxes D, E, and F*)	☐ No (*Skip to box 14.G*)	
D. CEQA Lead Agency	California Energy Commission		
E. Contact Person	Mr. Brian McCollough	F. Telephone Number	(916) 654-1648

G. If the project described in this notification is part of a larger project or plan, briefly describe that larger project or plan.

The KRCD is proposing a 565 megawatt natural gas-fired power plant near the City of Parlier (Fresno County, CA) and has filed an Application for Certification with the California Energy Commission for permitting of the plant. The project involves four basic components including the power plant site, natural gas pipeline, water pipeline, and transmission lines (see attached map). Many miles of water pipeline, transmission lines, and gas pipeline are proposed for the project. The first two structures will occur in Fresno County and the gas pipeline will interconnect with an existing gas pipeline near Visalia in Tulare County and run north to the power plant site in Fresno County.

☐ *Continued on additional page(s)*

H. Has an environmental filing fee (Fish and Game Code section 711.4) been paid?

☐ Yes (*Enclose proof of payment*) ☑ No (*Briefly explain below the reason a filing fee has not been paid*)

Unknown what the fees will be charged and the amount.

Note: If a filing fee is required, the Department may not finalize a Lake or Streambed Alteration Agreement until the filing fee is paid.

15. SITE INSPECTION

Check one box only.

☑ In the event the Department determines that a site inspection is necessary, I hereby authorize a Department representative to enter the property where the project described in this notification will take place at any reasonable time, and hereby certify that I am authorized to grant the Department such entry.

☐ I request the Department to first contact (*insert name*) _____ at (*insert telephone number*) _____ to schedule a date and time to enter the property where the project described in this notification will take place. I understand that this may delay the Department's determination as to whether a Lake or Streambed Alteration Agreement is required and/or the Department's issuance of a draft agreement pursuant to this notification.

16. DIGITAL FORMAT

Is any of the information included as part of the notification available in digital format (i.e., CD, DVD, etc.)?

☑ Yes (Please enclose the information via digital media with the completed notification form)

☐ No

17. SIGNATURE

I hereby certify that to the best of my knowledge the information in this notification is true and correct and that I am authorized to sign this notification as, or on behalf of, the applicant. I understand that if any information in this notification is found to be untrue or incorrect, the Department may suspend processing this notification or suspend or revoke any draft or final Lake or Streambed Alteration Agreement issued pursuant to this notification. I understand also that if any information in this notification is found to be untrue or incorrect and the project described in this notification has already begun, I and/or the applicant may be subject to civil or criminal prosecution. I understand that this notification applies only to the project(s) described herein and that I and/or the applicant may be subject to civil or criminal prosecution for undertaking any project not described herein unless the Department has been separately notified of that project in accordance with Fish and Game Code section 1602 or 1611.

Jeff. Halstead
Biological Consultant to KRCD

Signature of Applicant or Applicant's Authorized Representative

9/16/08

Date

Jeffrey A. Halstead

Print Name

298-2334
HalsteadEnv@aol.com

Horizontal Directional Drilling (HDD) Contingency Plan for Inadvertent Returns of Drilling Mud

Kings River Conservation District's Community Power Plant near Parlier (Fresno & Tulare Counties)

The Horizontal Directional Drilling (HDD) construction method will be used to place the pipe for the natural gas service lateral supplying the KRCD Community Power Plant (CPP) at crossings under the Kings River (Fresno County, CA) and at Cross Creek (Tulare County, CA). The HDD construction method is much less intrusive than the traditional open-cut trenching, in particular through sensitive habitats and waterways. The HDD method has been chosen to install the natural gas pipeline at these areas to avoid any impacts to sensitive habitats, plants, and wildlife and to protect and preserve the environmental resources.

HDD requires a drilling lubricant or "mud", slurry of bentonite clay, to enable and maintain the bore tunnel. Quantities of the drilling fluid escaping from the bore hole can damage sensitive habitat. The bentonite slurry is non-toxic, but can potentially smother aquatic plants, benthic invertebrates, fish and their eggs, and upland habitats if excessive amounts are discharged.

The pipeline construction contractor will be required to implement the strategies discussed below during HDD activities to minimize the potential for inadvertent returns or "frac-outs" of drilling fluids. These strategies include preventative measures as well as effective containment and clean-up actions if a "frac-out" were to occur. The pipeline construction contractor will be required by the contract to prepare a drilling plan and obtain its approval by the Construction Manager and permitting authorities detailing procedures for preventing loss of drilling mud and mitigating any mud loss incidents that do occur.

HDD Locations and Methods

The pipeline alignment extends from an existing Southern California Gas Company pipeline south of Highway 198 west of Visalia, CA in a northerly direction to the site of the KRCD Community Power Plant near Parlier, CA. Three HDD installations are planned. One will occur under the Kings River near Kingsburg and the other two will occur under the intermittent drainages and native land of Cross Creek west of Highway 99 south of Traver, CA. Standard HDD methods will be used to install the pipeline under the waterways to avoid potential impacts to these sensitive habitats and their sensitive plant and wildlife resources.

Site 1: Kings River Crossing

The HDD operation will require the set up of pads on both ends of the bore tunnel under the Kings River (See attached map, Page 1 of 3). The pads will be approximately 150 by 150 feet in size. Most likely, the entrance of the drill will be located west of the river, with the welded segments of pipe to be placed under the river in an easterly direction. The entrance pad will be approximately 500 feet outside and away from the Kings River riparian zone, and will be located in a leveled and actively farmed alfalfa field. The exit pad will be approximately 500 feet outside and away from the Kings River riparian zone, and will be located in an actively farmed peach orchard. The depth of the pipeline under the Kings River is proposed to be 75 feet under the river bottom.

Site 2: Cross Creek Channels

The HDD operation will require the set up of pads on both ends of the bore tunnel under the Cross Creek area in each of two locales known as 1) the northern Cross Creek area and 2) the southern Cross Creek area. Each of the areas is described below.

Northern Cross Creek Area. -The northern area involves installation of the pipe under an isolated intermittent drainage of Cross Creek (See attached map, Page 2 of 3). The drainage runs under the Santa Fe Railroad tracks and Highway 99 from the east and then empties into a small, dead-end, farm water-regulation pond. The HDD operation will require set up pads on both ends of the bore tunnel under the Kings River (See attached map, Page 2 of 3). The pads will be approximately 150 by 150 feet in size. Most likely, the entrance of the drill will be located south of the drainage, with the welded segments of pipe to be placed under the river in a northerly direction. The entrance pad will be approximately 175 feet or more away from the drainage and pond, and will be located in a leveled, actively farmed, and currently disced field. The exit pad will be approximately 175 feet or more away from the drainage and pond, and will be located in a leveled, actively farmed, and currently disced field. The depth of the pipeline under the drainage is proposed to be at least 35 feet under the deepest Cross Creek drainage bottom.

Southern Cross Creek Area. - The southern area involves installation of the pipe under a 3,000-foot wide, native land area of Cross Creek that has five intermittent drainages, sensitive wildlife and plant resources, waters, wetlands, and critical habitats for sensitive species and habitats. The HDD operation will require set up pads on both ends of the bore tunnel under the native land (See attached map, Page 3 of 3). The pads will be approximately 150 by 150 feet in size. Most likely, the entrance of the drill will be located south of the native land, with the welded segments of pipe to be placed under the native land in a northerly direction. The entrance pad will be at least 300 feet outside and away from the native land, and will be located in a leveled, actively farmed, and currently disced field. The exit pad will be at least 300 feet outside and away from the native land, and will be located in a leveled, actively farmed, and currently disced field. The depth of the pipeline under the native land is proposed to be at least 35 feet under the deepest Cross Creek drainage bottom. This area of Cross Creek is under jurisdiction of the California Reclamation Board and their minimum depth for drilling under the creek is 30 feet.

Environmental Concerns

The HDD construction method is much less intrusive than the traditional open-cut trenching, in particular through sensitive habitats and waterways. However, the use of HDD includes the potential for spills of drilling mud, “frac-outs” which are a concern when they occur in or near sensitive habitats and waterways. When they occur, frac-outs typically surface near the entrance and/or exit points of the HDD operation. The likelihood of frac-out decreases as the depth of the bore head increases. Inadvertent returns along the pipeline alignment are most likely to occur within 150 feet at either end of the HDD segment where the pipe depth is at its shallowest. The preliminary design profile for the gas pipeline at the Kings River shows it at a depth of approximately 75 feet below Kings River bottom and with setbacks consisting of 200 and 500 feet from the river’s riparian habitat. The preliminary design profile for the gas pipeline at the Cross Creek area shows it at a depth of approximately 35 feet below the deepest drainage bottom, and with setbacks consisting of at least 300 outside and away from either side of the native land. The designed drilling profiles will be established based on geotechnical data collected at each site and will minimize the possibility of frac-outs occurring within areas of sensitive habitat.

Preventive Measures

The following measures primarily focus on prevention of inadvertent returns of drilling mud. These measures include:

- Planning the HDD profile and drilling pressures using site-specific geotechnical data;
- monitoring the location of the drill head with a guidance system;
- monitoring drilling fluid pressure at all times;
- sizing (slowly moving the drill stem forward and backward to better keep track of any potential fracture locations);

Geotechnical borings will provide information regarding proper pipe depth as dictated by the soil strata characterization. The borings will be made in the road right-of-way and just off the pipeline alignment and grouted so as not to create potential frac-out opportunities. The approximate pressures that the soil will bear at various depths will be calculated and will be observed by the HDD contractor in developing a drilling plan. Also, the entrance and exit bore holes at the sites will be grouted after the pipe is installed to prevent water movements thru the soil and the hardpan layers.

A guidance system will be used to track the location of the subsurface drill head. The Tru-Tracker guidance system may be used. Tru-Tracker utilizes a length of wire (the size of home extension cord) placed on opposite sides of the HDD alignment. The alignment is surveyed on-foot by a team of 2 to 3 people. Small amounts of vegetation (i.e., bushes and vines) may be disturbed and/or removed during the survey process in order to lay the cable in a direct line. No trees greater than three inches diameter will be removed and no elderberry bushes will be removed or trimmed. At the Cross Creed area, no vegetation will be removed as the area is road right-of-way. A biologist will be present during this work and survey in front of the team to assess the potential for active bird nests or other relevant wildlife and habitat avoidance issues. Temporary surveyor stakes are placed strategically along the alignment to anchor the Tracker wires. The alignment will be accessed throughout the drilling operation to monitor for frac-outs.

Remedial Action

If a “frac-out” does occur, the contractor will:

(1) Cease pumping of drilling fluids,

(2) notify the on-site Biological Monitor and drilling representative,

(3) Contain and collect any drilling fluid which has surfaced on the ground,

(4) Re-size the hole to displace any objects or restrictions that may prevent the drilling fluid from returning to the entry pit (this requires swabbing the drilled hole and pumping fluid in order to clear any obstructions), and

(5) Proceed with drilling operations. The pressure of water/soil above the pipe keeps excess mud from escaping through the fracture.

The amount of drilling mud that could be lost in the event of an inadvertent return depends on the size of the fracture and amount of head pressure. Diligent monitoring, early detection, and quick response will ensure that the amount of escaping mud will be kept to a minimum.

Frac-Out Control and Clean-Up Measures

A Biological Monitor will be on site during HDD operations, conducting inspections for frac-outs. The drill rig operator will monitor the operation for loss of drilling fluid pressure and volume. A loss in pressure is typically an indication that the drilling mud has escaped the bore tunnel and may have or may soon frac-out on the surface. Remedial actions will be implemented if a frac-out is observed or a loss in pressure is detected. Along with the Biological Monitor, the HDD crew will be responsible for

continuously observing the alignment for indications of frac-outs.

Containment materials such as sand bags, silt fencing, hay bales, and vacuum pumps will be required to be onsite before drilling begins. The Biological Monitor will inspect the pad locations and determine if additional materials are needed to protect sensitive habitats. Silt fencing will be used to define the construction zone limits of the HDD pad locations and to control any sediment from leaving the construction site. Hay bales, sand bags, silt fencing and/or earthen berms will be used to surround and contain drilling mud at the pad sites and in frac-out locations. If a frac-out occurs relatively close to the drilling rig the fluid shall be contained and pumped back to the drilling location with portable pumps for re-use. In areas further away or where pumping back to the drilling rig is not feasible a mobile vacuum pump or vacuum truck will be used collect the drilling mud from the containment area. The mud will then be recycled and sent to the return pit or storage tank. The vacuum truck will be confined to areas of agricultural land or roads, and will not drive within the Cross Creek native land. The crew will walk to the spill area and extend the hose to reach the containment area.

If a frac-out occurs within any of the sensitive habitats along the alignment, the situation will be handled as outlined in the protection/preventative measures. If the release of drilling mud continues and attempts to clear the drilled path are not successful the drill string shall be withdrawn to a point where a new drill path can be established along either a different alignment and/or depth, additional measures will be implemented to ensure containment of the drilling mud. Hay bales, sand bags, and/or silt fencing will be used to contain frac-outs within the sensitive habitats or waterways. The relatively slow and shallow summer water flows in the region should allow for the effective use of these measures. Once the containment measures are in place, the drilling mud can then be pumped into a vacuum truck and taken off-site or recycled to the drill rig return pit. If necessary, an isolation/containment environment, such as an underwater boom and curtain, may be used to contain the mud to be removed. If the fracture becomes excessively large, a spill response team with underwater divers would be called in to contain and clean up the frac-out; however, the waterways are expected to be 1-foot in depth or less at the time (dry season) of HDD activities. The phone numbers of the Biological Monitor and spill response teams will be kept at both HDD pad sites.

Frac-out locations will be restored if the disturbance is significant. If revegetation is necessary it will be done with native species common to the area. The areas will be seeded or planted, depending on the size and location of the disturbed area. The applicable resource and regulatory agencies will be consulted if such an event occurs.

General On-Site Materials Checklist

Types and amounts of materials needed on-site for each HDD shall be identified in the contractors drilling plan. The following is a general list that should cover most HDD project situations:

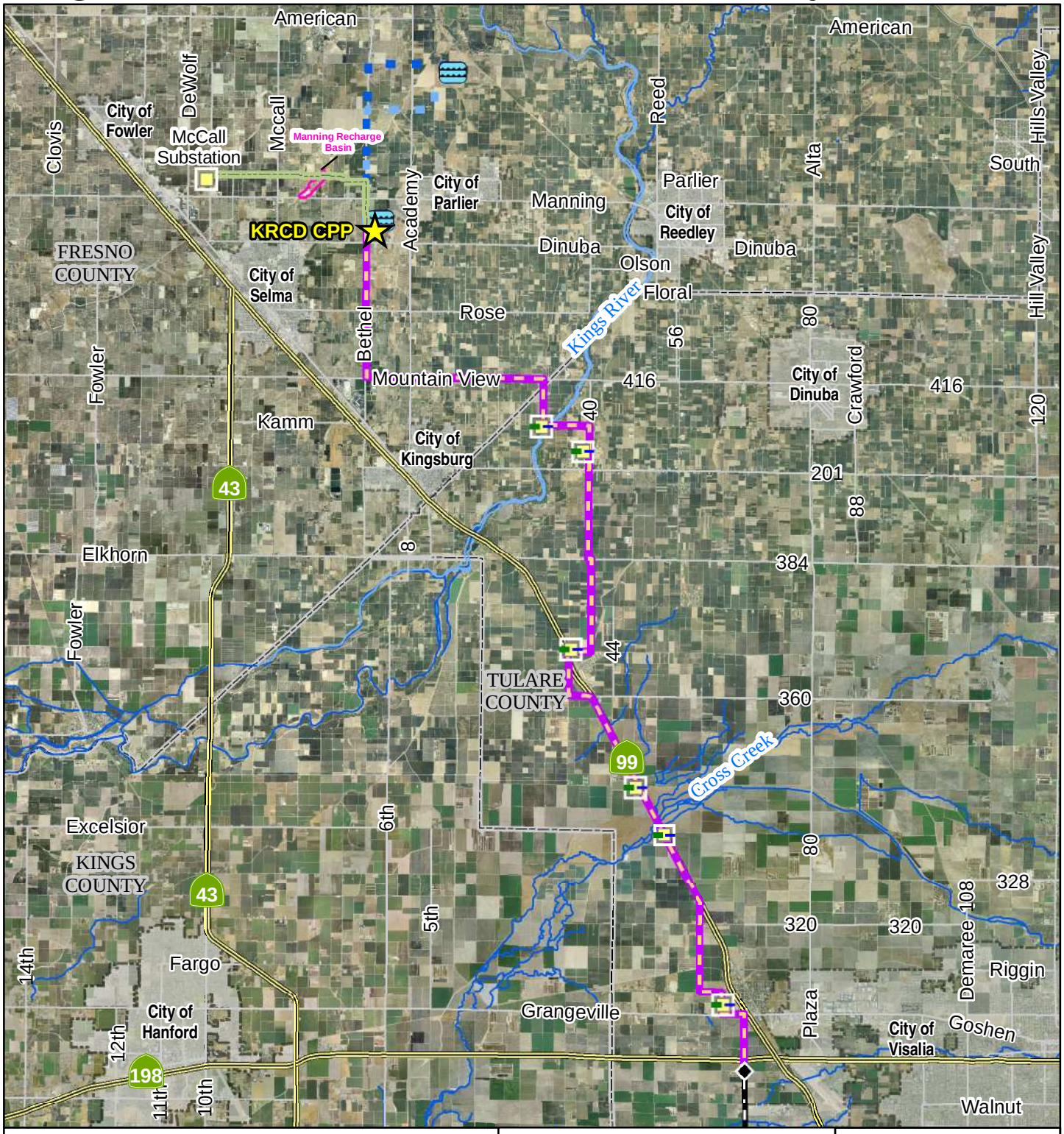
- Industrial grade PVC mesh fencing with steel T-posts
- Large diameter standing pipe material (such as 55-gallon open ended drums, heavy PVC/CMP pipe or culvert type material)
- Heavy weight clean gravel or sand filled bags (recommend minimum of 100)
- Silt fencing (recommend minimum of 300-feet)
- Straw bales
- Straw log or wattles (100 feet recommended)
- Geotech filter bags, 10-by-12-foot size or equivalent

- Several 5-gallon plastic buckets
- Shovels (flat blade and round nose)
- Wide heavy duty push broom
- Absorbent pads and plastic sheeting for placement beneath motorized equipment
- Vacuum hose (100-feet minimum)
- Portable pumps
- Vacuum trucks on stand by (800 and 3000-gallon capacity)
- Baker tanks as needed

Agency Contacts

If a frac-out occurs and is in an area under the jurisdiction of resource and regulatory agencies, they will be notified in accordance with the conditions of the permits by the Biological Monitor within 24 hours of the spill. The agencies (in particular CDFG) may inspect the spill area and suggest alternative containment and clean up measures. Temporary stoppage of drilling activities, spill containment, and clean up will be initiated as soon as a frac-out occurs and will not wait for CDFG notification. Drilling may resume once the biological monitor determines containment and clean up efforts are adequate for protection of biological resources.

Kings River Conservation District Community Power Plant



KRCD Community Power Plant
Freeway
Major Street
City Boundary
County Boundary Line
Substation
Proposed Transmission Line
Waste Water Percolation Ponds
Proposed Water Supply Pipeline - Option 1
Proposed Water Supply Pipeline - Option 2
Natural Gas Connection Point
Proposed Natural Gas Staging / HDD Area
Proposed Natural Gas Pipeline
SoCal Gas 7000 Line
Manning Recharge Basin

Power Plant Overview

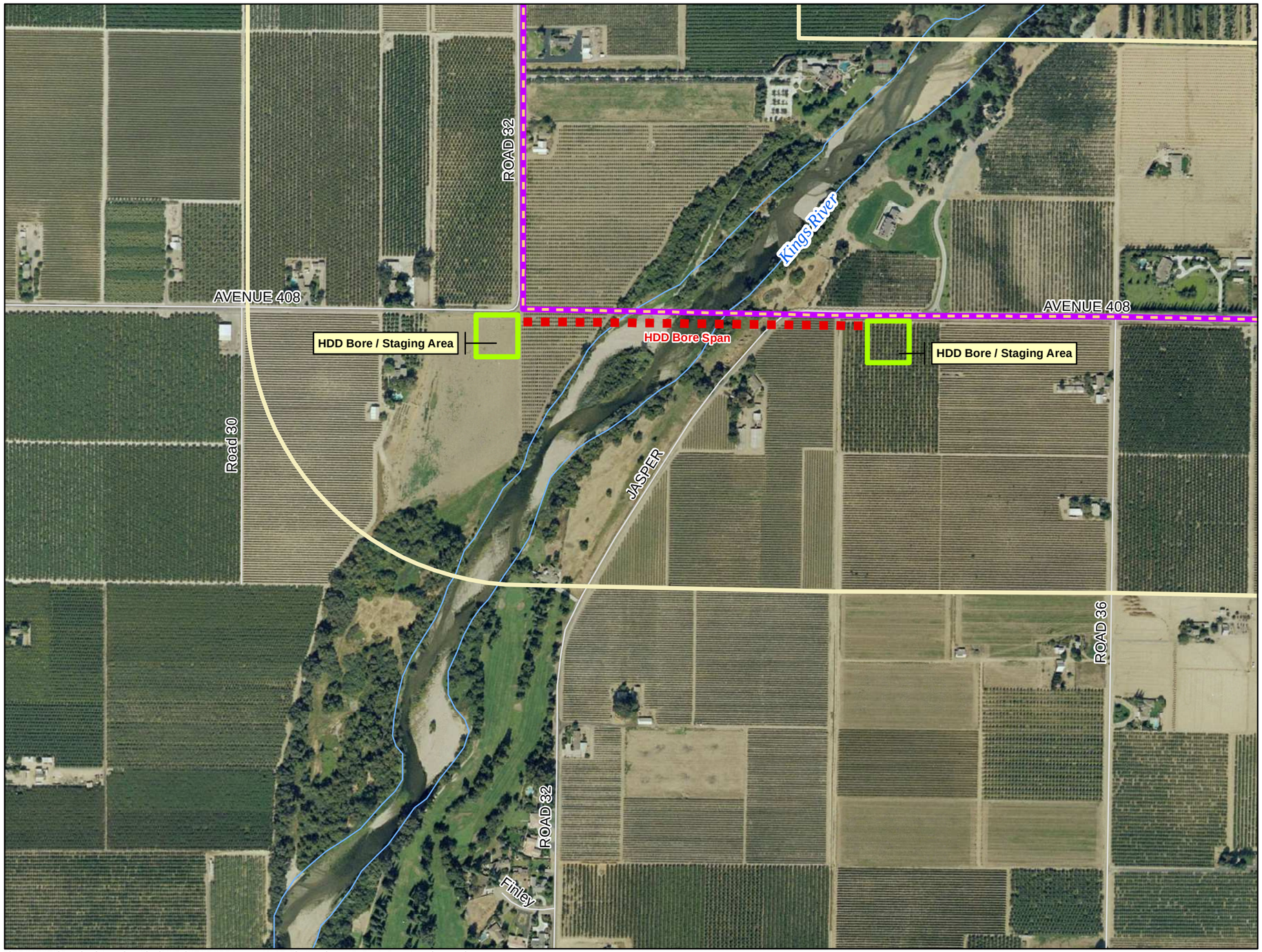
N 0 1 2 3 4 5 Miles

1:200,000 Scale

KRCD Community Power Plant

Energy for our Future

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Horizontal Directional Drilling
(HDD) Contingency Plan
"Frac-Out Plan"

HDD Bore Work / Staging Area Page 1 of 3

- HDD Bore / Laydown Area
- HDD Bore Span
- Linears 1/4 Mile Buffer
- Proposed Natural Gas Pipeline
- Freeway
- Street
- Railroad
- Waterway
- County Boundary
- City Boundary

NOTE: Potable Water and Sewer Connections are on the project site.

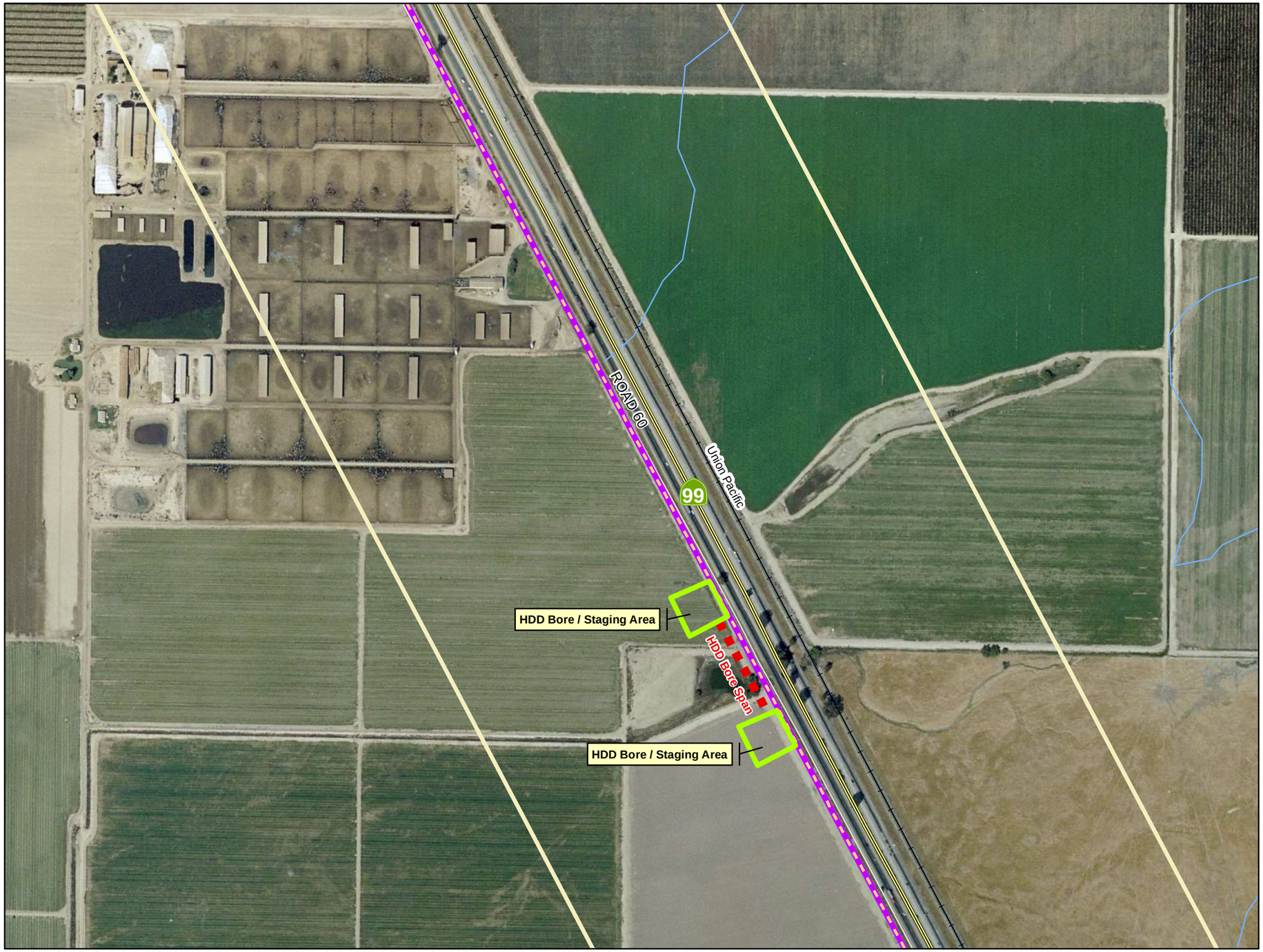
N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Bio-SupplementB_Rev1_Bore_Locations.mxd

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Horizontal Directional Drilling
(HDD) Contingency Plan
"Frac-Out Plan"

HDD Bore Work / Staging Area Page 2 of 3

- HDD Bore / Laydown Area
- HDD Bore Span
- Linears 1/4 Mile Buffer
- Proposed Natural Gas Pipeline
- Freeway
- Street
- Railroad
- Waterway
- County Boundary
- City Boundary

NOTE: Potable Water and Sewer Connections are on the project site.

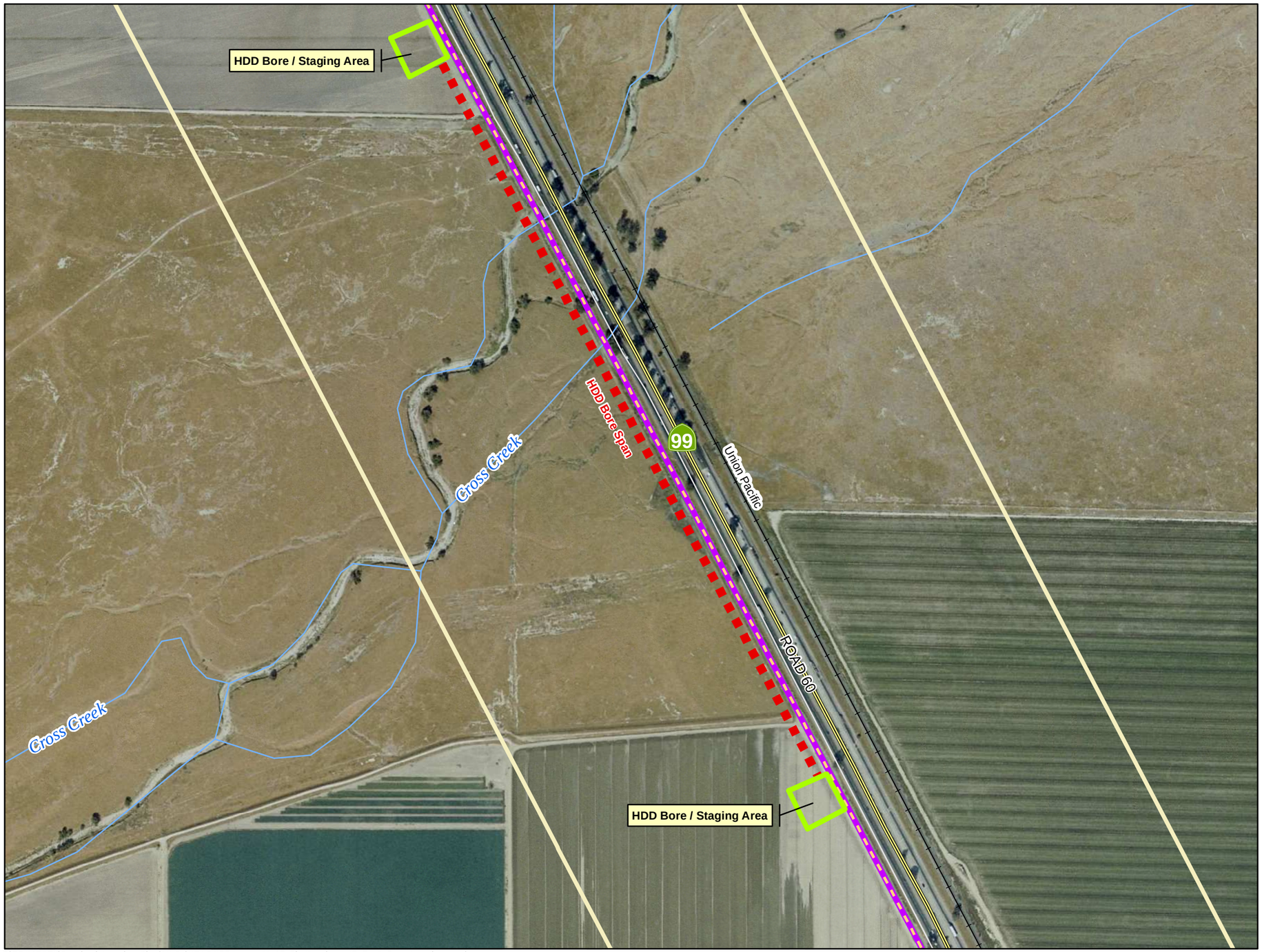
N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Bio-SupplementB_Rev1_Bore_Locations.mxd

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Horizontal Directional Drilling
(HDD) Contingency Plan
"Frac-Out Plan"

HDD Bore Work / Staging Area Page 3 of 3

- HDD Bore / Laydown Area
- HDD Bore Span
- Linears 1/4 Mile Buffer
- Proposed Natural Gas Pipeline
- Freeway
- Street
- Railroad
- Waterway
- County Boundary
- City Boundary

NOTE: Potable Water and Sewer Connections are on the project site.

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Bio-SupplementB_Rev1_Bore_Locations.mxd

Examples of (HDD) Staging Areas at the Kings River. Photos by H&A in September 2008.

Examples of (HDD) Staging Areas at Cross Creek. Photos by H&A in

September 2008.

Examples of (HDD) Staging Areas at Cross Creek. Photos by H&A in September 2008.

Preventive Avoidance Measures for Impact Avoidance for HDD Work
Kings River Conservation District - Community Power Plant Project

To avoid impacts to sensitive species, sensitive habitats, and critical habitats for the HDD work, the following preventive avoidance measures are incorporated into the project and will be implemented to avoid and reduce project-related impacts to biological resources to less than significant levels and to ensure the project is not likely to adversely affect such resources. Through the implementation of the preventive avoidance measures denoted below, no take of or significant impacts will occur to sensitive species, sensitive habitats, or critical habitats, and project impacts to biological resources will be less than significant and not likely to adversely affect them. Preventive avoidance measures are presented below for the two sensitive areas where HDD work will occur.

Waters and Wetlands

Two sensitive areas with waters, wetlands, and riparian occur in the project action area where HDD work will occur: (1) Kings River near the City of Kingsburg and (2) Cross Creek near the City of Traver. Measures for each of the two areas are presented below.

Cross Creek Area

The project has been designed so that the pipeline will be bored and run underneath the intermittent drainages. Six intermittent drainages occur in the Cross Creek area that will be underbored by the pipeline. Some of these drainages are wetlands and some are waters. Regardless of their classification, measures are incorporated into the project to avoid and protect them. Also, a couple wetland drainage ponds and vernal pool wetlands occur on private land adjacent to the gas pipeline footprint along Road 60. In one of the wetland ponds, the endangered Vernal Pool Tadpole Shrimp was observed. The preventive measures below will protect and preserve the intermittent drainages, wetlands, waters, critical habitats, endangered shrimp resources, and other potential sensitive species in the Cross Creek area.

CC #1. The gas pipeline shall be bored and installed underneath all intermittent drainages using HDD construction techniques to avoid impacting the integrity and hydrology of the channels. Thus, the channels and their waters and/or wetland habitats will be completely avoided. The equipment use and construction areas shall occur in designated bore areas in agricultural land outside and away from sensitive lands and their sensitive biological resources.

CC #2. A buffer zone of at least 200 feet of no equipment/construction activities shall occur on

either side of the two HDD bore areas where HDD construction techniques will be used. The zone shall be measured outward from the top bank of the channel. A qualified biologist shall assist the engineers and construction crews in flagging and staking the buffer zones prior to construction activities.

CC #3. All construction activities near the Cross Creek area shall occur within the designed HDD work areas.

CC #4. An educational program shall be conducted by a qualified biologist for all project managers, engineers, contractors, and construction crews prior to work to informed them of the wetlands, waters, and wildlife resources on the adjacent private land, the need to avoid damaging any pools, drainages, ponds, and/or the endangered tadpole shrimp, and the possible penalties for not complying with these measures.

CC #5. Orange silt-fence approximately 3 feet in height shall be installed around the HDD work areas prior to and during construction activities in that area. The bottom of the fence shall be buried in the ground approximately 6 inches in depth and the length of the fence shall be securely staked. A qualified biologist shall assist the engineers and construction crews in flagging and staking the location of the fencing prior to construction activities.

CC #6. Signs denoting the adjacent lands as sensitive wetland, waters, and wildlife habitat shall be posted at 100-foot intervals along the silt fence. Signs shall be functional and maintained during construction activities in that area.

CC #7. A qualified biologist shall be on-site at all times during construction in the Cross Creek area and visually view and inspect that the measures are implemented.

CC #8. Drainage culverts and intermittent drainages in the Cross Creek area shall not be altered and will remain at their existing grade to maintain the hydrology and integrity of channels and pools on the adjacent private land.

CC #9. Runoff from the construction zone shall be captured via trenches or other structures and and drained away from the adjacent private lands to prevent their contamination.

CC #10. Equipment, materials and supplies, and substances such as fuels, oil, fluids, chemicals, and other such substances which could cause contamination shall not be stored in the

Cross Creek area.

CC #11. Standard dust prevention measures (such as use of water spray trucks) shall be implemented during construction in the Cross Creek area to prevent and reduce dust.

CC #12. Upon completion of construction, all project-related fencing and signs shall be removed from the Cross Creek area.

CC #13. Prior to construction, photographs shall be taken by a qualified biologist to document the existing condition of the intermittent drainages, ponds, and vernal pool wetlands. After the completion of construction activities, the same-direction photographs shall be taken for comparative purposes and to document post-construction conditions.

CC #14. A post-construction monitoring survey shall be conducted by a qualified biologist to evaluate the implementation of and compliance with the measures. A report, including the above photographs, shall be prepared and sent to the California Energy Commission upon completion of construction.

CC #15. If intermittent drainages, wetland habitat, or the endangered tadpole shrimp are accidentally impacted, state and federal resource and regulatory agencies having jurisdiction over the impacted resource shall be consulted.

Kings River

The project has been designed so that the pipeline will be bored and run underneath the Kings River using HDD techniques to protect and preserve biological resources. Sensitive species do not occur near the Kings River crossing area. Below are preventive avoidance measures to protect and preserve the Kings River and the wetland and riparian habitat along its banks.

KR #1. The gas pipeline shall be bored and installed under the Kings River using HDD techniques to avoid impacting the integrity and hydrology of the river. Thus, the river and its waters, wetland, and riparian habitats will be completely avoided. The equipment use and construction areas will occur in designed HDD work areas in agricultural lands.

KR #2. A 500-foot buffer zone of no equipment/construction activities shall occur on either side of the river where HDD techniques will be used. This buffer zone will avoid all elderberry bushes along the river that are potential habitat for the federally threatened

Valley Elderberry Longhorn Beetle. The zone will be measured outward from the outer edge of the river's riparian habitat. A qualified biologist will assist the engineers and construction crews in flagging and staking the buffer zones.

KR #3. An educational program shall be conducted by a qualified biologist for all project managers, engineers, contractors, and construction crews prior to work to inform them of the VELB and its elderberry bush habitat in the Kings River undercrossing area, the need to avoid damaging these resources, and the possible penalties or not complying with the measure.

KR #4. Prior to construction, elderberry bushes will be flagged with yellow cautionary tape and photographs shall be taken by a qualified biologist to document the existing condition of the elderberry bushes in the Kings River undercrossing area. After completion of the construction activities, the same-direction photographs shall be taken for comparative purposes and to document post-construction conditions.

KR #5. A post-construction monitoring survey shall be conducted by a qualified biologist to evaluate the implementation of and compliance with the preventive measures. A report, including the above photographs, shall be prepared and sent to the CEC upon completion of construction.

ATTACHMENT BIO-2

Valley Elderberry Longhorn Beetle Survey Results

HALSTEAD & ASSOCIATES
Environmental / Biological Consultants
296 Burgan Avenue, Clovis, CA 93611
Office (559) 298-2334; Mobile (559) 970-2875
Fax (559) 322-0769; HalsteadEnv@aol.com

Memo

Date: September 9, 2008

To: Mr. Taylor Matteson (Kings River Conservation District)

Reg: **Valley Elderberry Longhorn Beetle Surveys and Elderberry Bush Mapping for the Natural Gas Pipeline Underboring of the Kings River near Kingsburg (Kings River Conservation District's Community Power Plant Project near Parlier)**

At the March 6, 2008 Data Response and Issues Identification workshop, the California Energy Commission (CEC) staff biologist Mr. Brian McCullough requested that field surveys for the Valley Elderberry Longhorn Beetle (VELB) be conducted, survey results reported, and that elderberry bush habitat be mapped where the natural gas pipeline with be bored and installed under the river using horizontal directional drilling (HDD) techniques. The river underboring site is located approximately 3 miles northeast of Kingsburg and just north of the Kingsburg Golf Course (Fresno County, California). Specifically, the site occurs along Avenue 408 at the Kings River in Section 17, Township 16S, Range 23E, of the Reedley 7.5 minute quadrangle map of the U. S. Geological Survey. An aerial map showing the pipeline underboring route and the HDD work/laydown areas is attached. This memo presents the results of our findings for the VELB survey and the elderberry bush mapping as requested by the CEC.

On September 4, 2008, Mr. Jeff Halstead and Mr. Andrew Roberts of Halstead & Associates conducted the requested surveys for the VELB and mapped elderberry bush habitat at the Kings River underboring area. The survey included a 600-foot wide zone on both sides of the river and all elderberry bushes were visually checked. The area surveyed included 300 feet on either side of the proposed alignment of the gas pipeline. Three elderberry bushes where found in riparian habitat along the east side of the Kings River. Seven elderberry bushes or clumps of bushes where found in riparian habitat along the west side of the Kings River. The bushes have hundreds of stems, are healthy, and occur upon the upper banks of the river. A table describing the elderberry bushes and their locations is attached. The location of the elderberry bushes were recorded with a hand-held GPS unit and mapped upon a project aerial map. A map showing the location of the elderberry bushes is attached. Elderberry bushes

and their stems and trunks were examined for the VELB and its emergence hole evidence, but none were found. We conclude that the elderberry bushes near the Kings River underboring area are not inhabited by the VELB.

All construction activities for the Kings River underboring will occur outside of and away from the riparian and elderberry bush habitat of the river. An additional 500-foot no activity buffer zone will also occur outward from the edge of the riparian habitat. HDD work areas or laydown areas are shown on an attached map, and they occur in actively farmed agricultural lands. The eastern HDD work area or laydown area is a peach orchard and the western HDD work area or laydown area is an alfalfa field. Lands surround the HDD work areas are actively farmed agricultural land. We conclude that no impacts to the VELB or its elderberry bush habitat will occur as a result of the KRCD CPP.

Sincerely,

Jeffrey A. & Pamela S. Halstead
Owners/Partners/Biologists

cc: Ms. Amy Cuellar (Navigant Consulting, Inc.)

Description of Elderberry Bushes at KRCD's CPP Gas Pipeline Undercrossing of the Kings River (Near Kingsburg, Fresno County, California)

Bush Identity #	Bush Height (feet)	Bush Length (feet)	Bush Width (feet)	No. Stems 1 - 3 " Diameter	No. Stems > 3 - 5 " Diameter	No. Stems > 5 " Diameter	Beetle Exit Holes / #	Bush Growth Form	Bush Health *	Bush Location (Longitude)	Bush Location (Latitude)
1	30	50	50	100	40	20	--	clump	fair	119° 29.945' W	36° 31.926' N
2	6	5	5	3	--	--	--	bush	excellent	119° 29.982' W	36° 31.900' N
3	20	20	20	20	4	--	--	bush	fair	119° 29.991' W	36° 31.883" N
4	8	6	6	3	--	--	--	bush	fair	119° 30.095' W	36° 31.943' N
5	20	30	45	20	12	8	--	clump	fair	119° 30.099' W	36° 31.938" N
6	20	45	30	25	12	8	--	clump	fair	119° 30.113' W	36° 31.924' N
7	15	15	15	10	1	1	--	bush	fair	119° 30.125' W	36° 31.911' N
8	15	24	15	10	4	1	--	bush	fair	119° 30.122' W	36° 31.912' N
9	12	10	10	10	--	--	--	bush	fair	119° 30.126' W	36° 31.910' N
10	18	42	45	15	5	4	--	clump	fair	119° 30.130' W	36° 31.903' N

Kings River Conservation District Community Power Plant

Z:\PROJECTS\Baseload_Location_Sites\MXD's\KRCDCPP Layout 11x17_Bio-SupplementB_Rev1_Bore_Locations.mxd

KRCD COMMUNITY POWER PLANT

Energy for our Future

Horizontal Directional Drilling (HDD) Contingency Plan "Frac-Out Plan"

HDD Bore Work / Staging Area Page 1 of 3

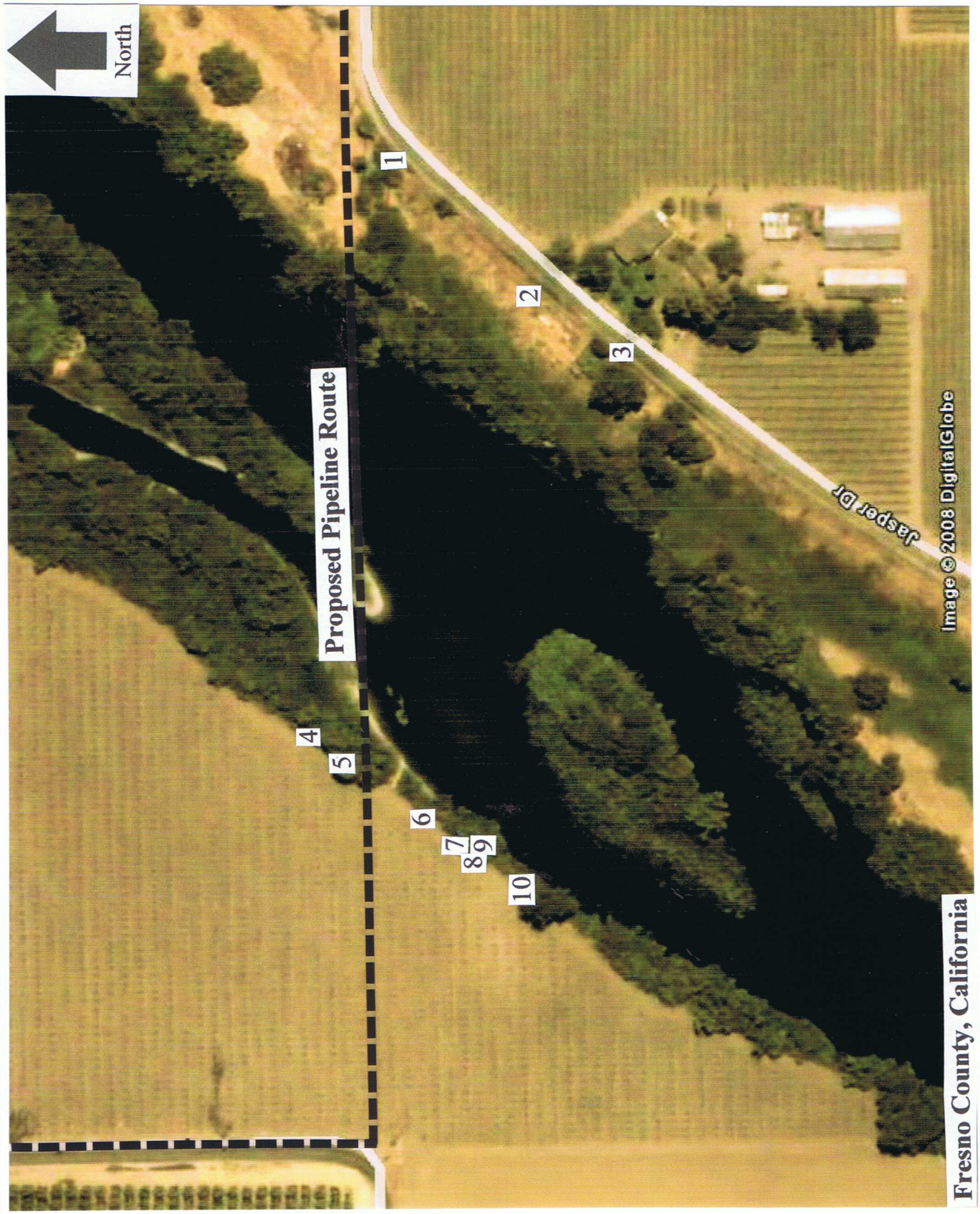
- HDD Bore / Laydown Area
- HDD Bore Span
- Linears 1/4 Mile Buffer
- Proposed Natural Gas Pipeline
- Freeway
- Street
- Railroad
- Waterway
- County Boundary
- City Boundary

NOTE: Potable Water and Sewer Connections are on the project site.

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet



HALSTEAD & ASSOCIATES
Endangered Species / Environmental Consultants
296 Burgan Avenue, Clovis, CA 93611

Elderberry Bush Location Map

Technical Area: Cultural Resources

Data Request 15:
Please provide descriptions of the anticipated maximum lateral and vertical extents of the ground disturbance that may result from the construction, operation, and maintenance of the main plant facility, the new natural gas pipeline, the new electric transmission line, the water supply line from Lincoln Ponds at the Sanger Wastewater Treatment Plant (WWTP), the water supply line from the Parlier WWTP into the adjacent main plant facility, and the new main plant facility wells.

Updated Response:
There was a typographical error in the response to Data Request 15, which was previously submitted to the CEC on February 25, 2008. The statement which read "Foundations will be approximately 20 feet in depth and five feet in diameter.", should read "Foundations will be approximately ***five*** feet in depth and ***20*** feet in diameter."

The following text supplements the original response to this data request, which was submitted to the CEC on February 25, 2008.

Project Site
Lateral ground disturbance at the KRCD CPP project site will include the entire area inside of the plant site boundary. As noted in AFC Chapter 2, Project Description, some areas of the facility will be paved, some will have gravel, some will contain equipment or buildings, and some will have the vineyard removed and replaced with native grasses and vegetation. Vertical disturbance will vary by location. The areas near the large equipment (Combustion Turbines, Steam Turbine, Heat Recovery Steam Generators, pipe rack, and large tanks – also known as the Power Block) will be excavated to a depth of approximately five feet. Areas outside of the Power Block will generally be excavated to a depth of one foot under roadways and slab-on-grade structures, and four feet under heavier structures and buildings.

Transmission Line
Seven angle points have been identified along the proposed transmission line route from McCall substation to the project site. Four of these are large angle points are needed to avoid properties and three are large angle points needed to enter McCall Substation from the south side to access PG&E's 230-kV bay. Ground disturbance in the McCall substation area will be approximately 100 feet square for each location. Impacts due to construction near McCall will be minimal.

Each of the four areas along the route where the line turns north exiting the plant site, and then west, then north and finally west again to avoid impacts to properties and agricultural usage will require an area of 100 feet square to erect the structure and install insulators and hardware. In addition, an area of approximately 50 feet by 150 feet in each direction will be disturbed to allow the placement of conductor stringing equipment needed to install the conductors and shield wire.

Also of note is the area where the line crosses under the existing PG&E 230-kV lines. The right of way needed for this undercrossing will be approximately 200 feet here as the line separates in two circuits to provide clearance under the existing lines. The area of disturbance at each of these two locations will be 100 feet by 200 feet. Considerable construction activity will occur at each of the large angle points and the two crossing sites to install structures, hardware, insulators, and conductors. The construction contractor will be required to restore these areas after construction to meet environmental restoration needs and land owner concerns. The current transmission line route alignment is being evaluated as part of KRCD CPP Supplement B, which is expected in be submitted to the CEC in October 2008.

Technical Area: Cultural Resources

Data Request 16:
To facilitate the completion of the cultural resources inventory for the proposed project:

a) Please describe and provide maps (scale of 1:24,000) for each portion of the required survey area, including construction staging areas and linear facility corridors, that the applicant has been unable to survey at the surface.
b) Please provide a schedule for the completion of the surface survey of the required survey area.
c) Please provide a plan for surveying the private property in the required survey area to which the applicant has had no access.

Updated Response:
KRCD CPP AFC Section 8.14, Cultural Resources, subsection 8.14.3.2 discusses the initial process where KRCD attempted to obtain permission from private landowners to complete field surveys for the preparation of the AFC. As follow-up to this initial effort, KRCD sent out additional permission request letters to landowners in May and June 2008. In response to these additional letters, KRCD obtained site access to an additional eight parcels adjacent to the proposed transmission line route and one parcel along the proposed gas pipeline route. Results of field surveys for these additional areas will be included in Supplement B, which is scheduled to be submitted in October 2008.

Attachment Cul-1 shows the survey area, including construction staging areas and linear facility corridors, that KRCD has been unable to survey at the surface.

KRCD will continue to work with landowners to gain site access necessary to complete cultural resource surveys. As additional access is obtained, additional cultural resource surveys will be completed and the CEC will be updated accordingly.

Technical Area: Cultural Resources

Data Request 17:
With regard more specifically to the completion of the cultural resource inventory for the proposed natural gas lateral:

a) Please provide the widths of the rights-of-way (ROWs) along the roadways where the construction of the new natural gas pipeline is proposed.
b) Please also describe the variations in the general physical and biological character of each such ROW.
c) Explain how the results of the applicant's ROW pedestrian surveys are reliable indices of the archaeological deposits that may be beneath the roadways.
d) Discuss the appropriateness of subsurface testing of the ROWs for any such deposits.

Updated Response:
As previously stated in the response to Data Request 17, which was submitted to the CEC on February 25, 2008, subsurface testing of the ROW would not be appropriate as it would necessitate cutting concrete along the existing roadways and driveway entrances for those areas which had limited or no surface mineral soil. There is always a remote chance that undetected cultural resources are buried within a project area. Construction crews will have cultural resources awareness training prior to project development and an archaeologist will be on call should an unanticipated discovery occur as a result of project construction. In addition, initial subsurface construction work in sensitive archaeological areas (such as those in proximity to the Kings River and other stream crossings) will be monitored by a qualified archaeologist to ensure that potentially buried resources will be protected.

At the April 3, 2008 Data Response and Issues Identification Continuation Workshop, the CEC offered a compromise to their initial request for subsurface testing along the gas pipeline right-of-way (ROW). The compromise offered would reduce the scope of the subsurface testing to the conducting of a geoarchaeological study in the areas where the gas pipeline alignment crosses the Kings River and Cross Creek.

KRCD does not believe that conducting the geoarchaeological study in the areas of stream crossings is appropriate at this time. Geomorphological context review and prospecting for buried Late Pleistocene and Holocene archaeological deposits that has been conducted at least since the 1980s. In some circumstances, literature research can provide important information

from which to more carefully plan ground disturbing activities in ways that will minimize damage to buried archaeological resources, if any such resources are encountered. However, prospecting for buried archaeological sites, even in areas with high potential for buried deposits, is an expensive and usually futile attempt to find a proverbial needle in a haystack, assuming such "needles" exist. Alternative and more practical precautions are proposed for minimizing the potential for damage to archaeological sites in the area of the KRCD CPP.

The following discussion provides several reasons why we believe alternative approaches to the CEC compromise are satisfactory and more reasonable for the protection of potentially buried archeological resources.

Related Project Examples

Prospecting for buried archaeological sites has rarely proven successful in our experience. For example, construction in the early 1990s of the PGT-PG&E 36-inch gas pipeline from the California-Oregon border to Fresno County involved dozens of river and stream crossings. One of the methods of archaeological site inventory was backhoe prospecting for buried archaeological sites at stream and river crossings along the west edge of the Sacramento and San Joaquin valleys in advance of construction. Although the pipeline traversed hundreds of miles of land in the Central Valley and involved extensive backhoe prospecting for buried archaeological sites, we believe very few such sites were identified.

More recently, there was also extensive subsurface testing conducted for the Lower Northwest Interceptor Project, where large (greater than 12 inch diameter) auger bores were installed every 100 feet along the 20-mile route. Each auger bore was drilled in small increments and removed soils were wet screened through 1/8-inch hardware cloth, procedures normally reserved only for detailed hand excavation in known archaeological sites. This auger prospecting program took about six weeks to complete, involved 308 bore holes, and costs many tens of thousands of dollars. No archaeological items were discovered.

Caltrans has also conducted geomorphological prospecting studies for several years, and Pacific Legacy has served as prime contractor for several such studies, including:

- backhoe testing Canebrake Creek in Kern County;
- geomorphological investigations along Cherry Avenue in Western Kern County;
- subsurface survey on the Indian Wells Canyon Fan, Kern County;
- Amador Bypass study to identify buried archaeological sites;
- Island Park Six-Lane Project in Fresno County; and

- Savage Way Widening Project in western Calaveras County.

Considerable costs have attended these studies, which are a small sampling of such studies by Caltrans in recent years. In our experience subsurface prospecting for buried archaeological sites rarely results in positive findings.

In the case of the Island Park Six-Lane project, Pacific Legacy conducted a geomorphological study to examine the potential and test for buried archaeological deposits. The study occurred nearly 30 miles north of the KRCD, but in similar topographic and depositional contexts along Highway 99 and crossing the San Joaquin River. That study found that Late Pleistocene to Early Holocene (25,000 to 9,000 years old) deposits were deposited as inset sediment forming terraces on alluvial fans, while even younger (less than 9,000 years old) Post-Modesto Formation deposits associated with archaeological sites may be found in terraces or sand and gravel within modern river channels. Twelve backhoe trenches were excavated at areas with the greatest potential for buried archaeological deposits within the channel of the San Joaquin River, but no buried archaeological deposits were discovered.

The only project listed above that resulted in the discovery of a buried deposit was the Savage Way Project, which discovered a prehistoric site covered by a thin layer of colluvium that likely related to the construction of a house pad on a hillslope. Thus, the site was not buried by natural processes and was serendipitously discovered. Had construction not lightly covered the site, it would have been surface exposed and probably discovered during a traditional surface survey.

Cost of Testing and Likelihood of Discovery

While geomorphological overviews and sensitivity studies can be valuable in determining the locations for monitoring or other precautions during construction, the efficacy of subsurface prospecting has not been demonstrated in our experience. There may be rare examples where buried archaeological sites have been discovered by subsurface prospecting. The question is whether a rare success supports the method and cost.

As noted in the AFC, some of the KRCD CPP objectives include providing the greater Fresno area, with additional reliable and inexpensive in-area gas-fired generation that will help meet the expected electrical demand growth in the greater Fresno area and providing energy at reduced cost to local residents. Electricity from the project will be sold at prices lower than those that will be charged by an investor-owned utility or power producer because KRCD is a local resource agency that can access low-cost, tax-exempt financing. KRCD as a multi-county

special district public agency cannot easily justify spending public money for extensive subsurface testing that has a low likelihood of providing any valuable results.

Streambed Impacts

KRCD is currently proposing to Horizontal Direction Drill (HDD) underneath the Kings River and Cross Creek to avoid potential impacts to the streambed, bank and surrounding riparian areas. This method of construction involves initial vertical excavation, then horizontal boring beneath the water course. The HDD is likely to result in limited destruction of archaeological deposits as the boring plunges vertically and then travels under any deposit that may be buried. The volume of damage to archaeological deposits from such methods may be smaller than that created during backhoe prospecting for buried sites. The process of subsurface prospecting for buried archaeological resources may be more damaging to those resources than the project itself, depending on construction methods. Searching for buried deposits usually involves backhoe trenches 18-36 inches wide and as deep as pipeline trenches. If buried prehistoric deposits are discovered by backhoe prospecting, then several cubic meters (yards) of archaeological deposit can be destroyed.

Also, prior to conducting any studies in the streambeds, KRCD would need to consult with and possibly obtain permits from the California Department of Fish and Game, US Fish and Wildlife Service, US Army Corps of Engineers and the Regional Water Quality Control Board. The prospect of conducting subsurface testing in the streambed could cause biological impacts that would be have been avoided by installing the pipeline by the HDD method.

Alternative Approaches

We believe we have provided more than a reasonable and good faith effort to identify cultural resources of concern. Also the mitigation measures proposed in the KRCD CPP AFC in combination with expected CEC Conditions of Certification (COC) sufficiently address the potential discovery of unexpected buried cultural resources discovered during construction in the remote chance such resources even exist.

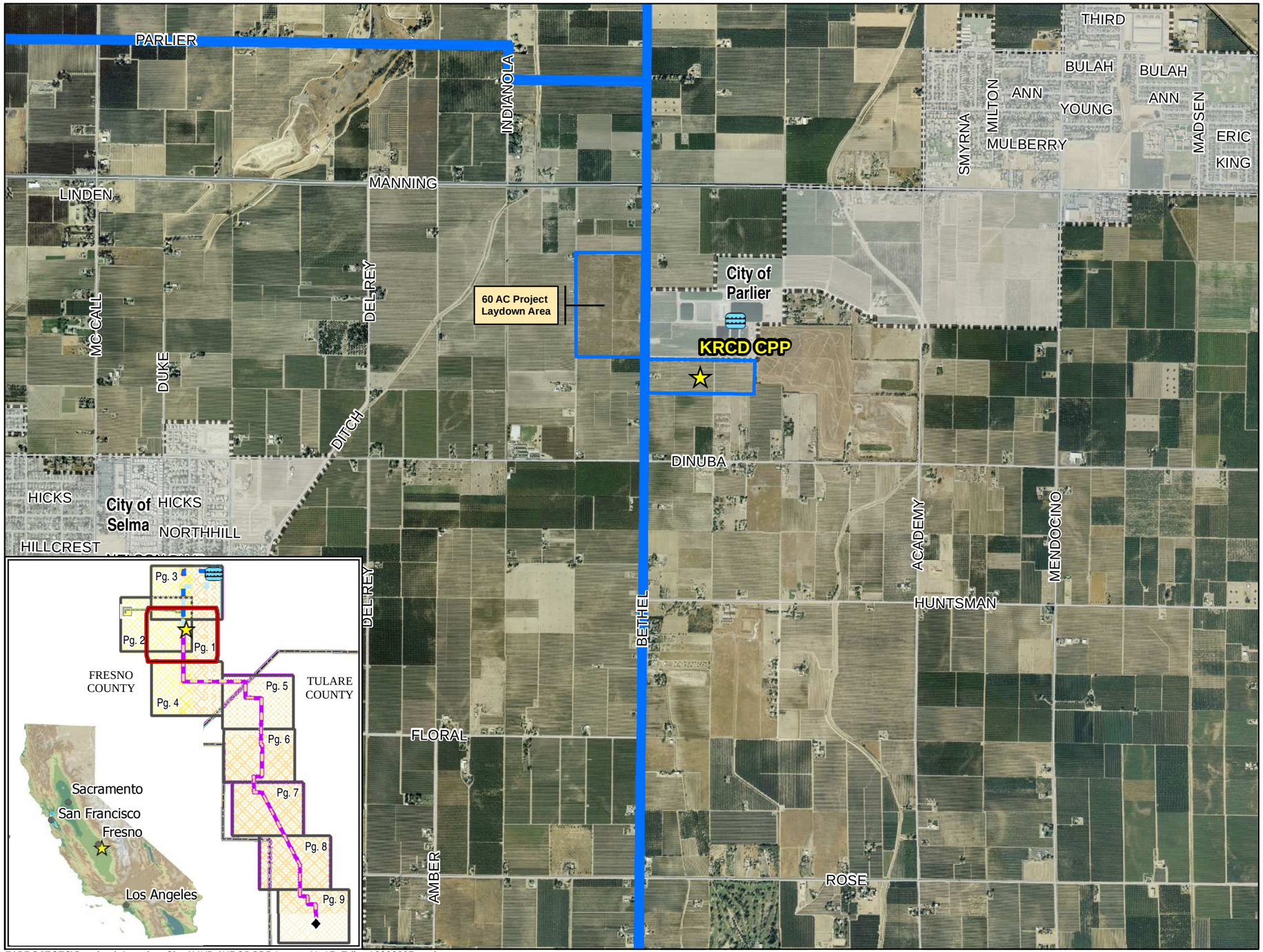
As a proposed alternative to the CEC compromise position described above, KRCD would propose to conduct a geomorphological study as an aspect of the natural gas pipeline construction. A 26-mile trench provides an opportunity to examine and document a long soil cross-section in Fresno County, contributing valuable information to an understanding of valley landforms and the potential for buried archaeological sites in similar depositional contexts.

KRCD would accept a COC which requires that a geomorphological study must be conducted along the natural gas pipeline route along with an accompanying discovery and treatment plan.

ATTACHMENT CUL-1

Maps of Surveyed Versus Unsurveyed Areas

Kings River Conservation District Community Power Plant



Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_10302007.mxd

KRCD COMMUNITY POWER PLANT

Energy for our Future

KRCD CPP Project Survey Coverage

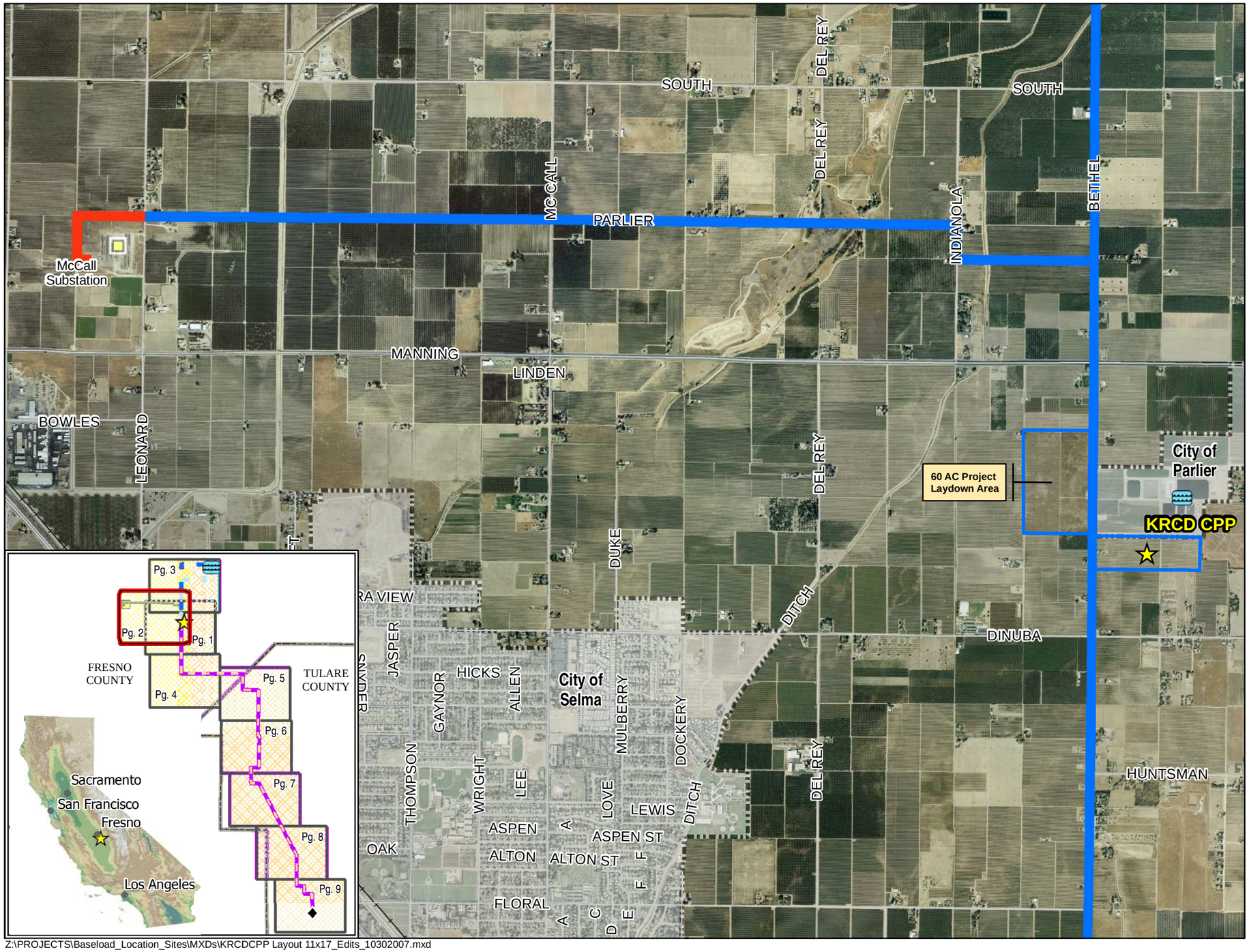
Page: 1 of 9

- KRCD Community Power Plant
- Substation
- Waste Water Percolation Ponds
- Surveyed Project Area
- Unsurveyed Project Area
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Kings River Conservation District Community Power Plant



Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_10302007.mxd

KRCD COMMUNITY POWER PLANT

Energy for our Future

KRCD CPP Project Survey Coverage

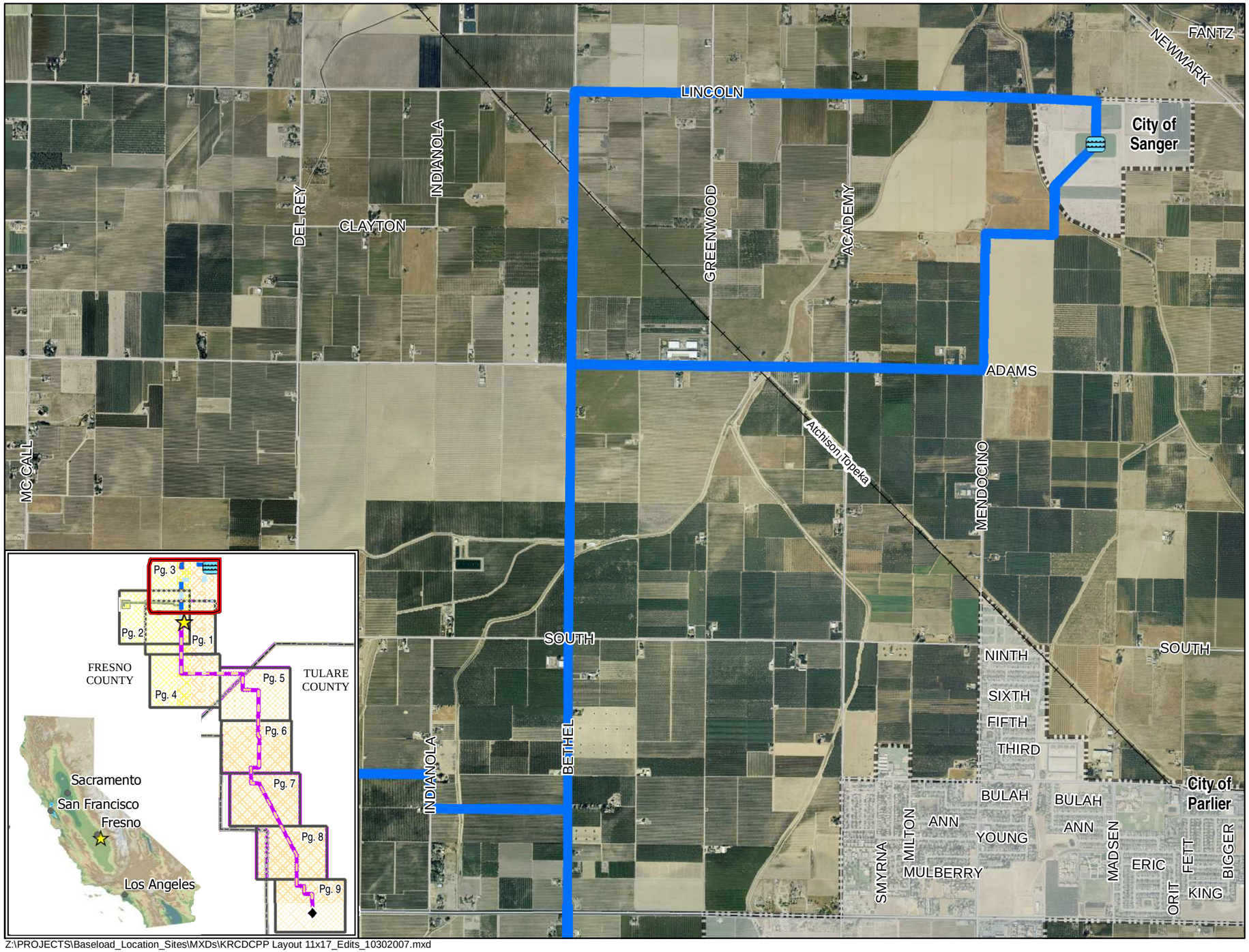
Page: 2 of 9

- KRCD Community Power Plant
- Substation
- Waste Water Percolation Ponds
- Surveyed Project Area
- Unsurveyed Project Area
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Kings River Conservation District Community Power Plant



Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_10302007.mxd

KRCD COMMUNITY POWER PLANT

Energy for our Future

KRCD CPP Project Survey Coverage

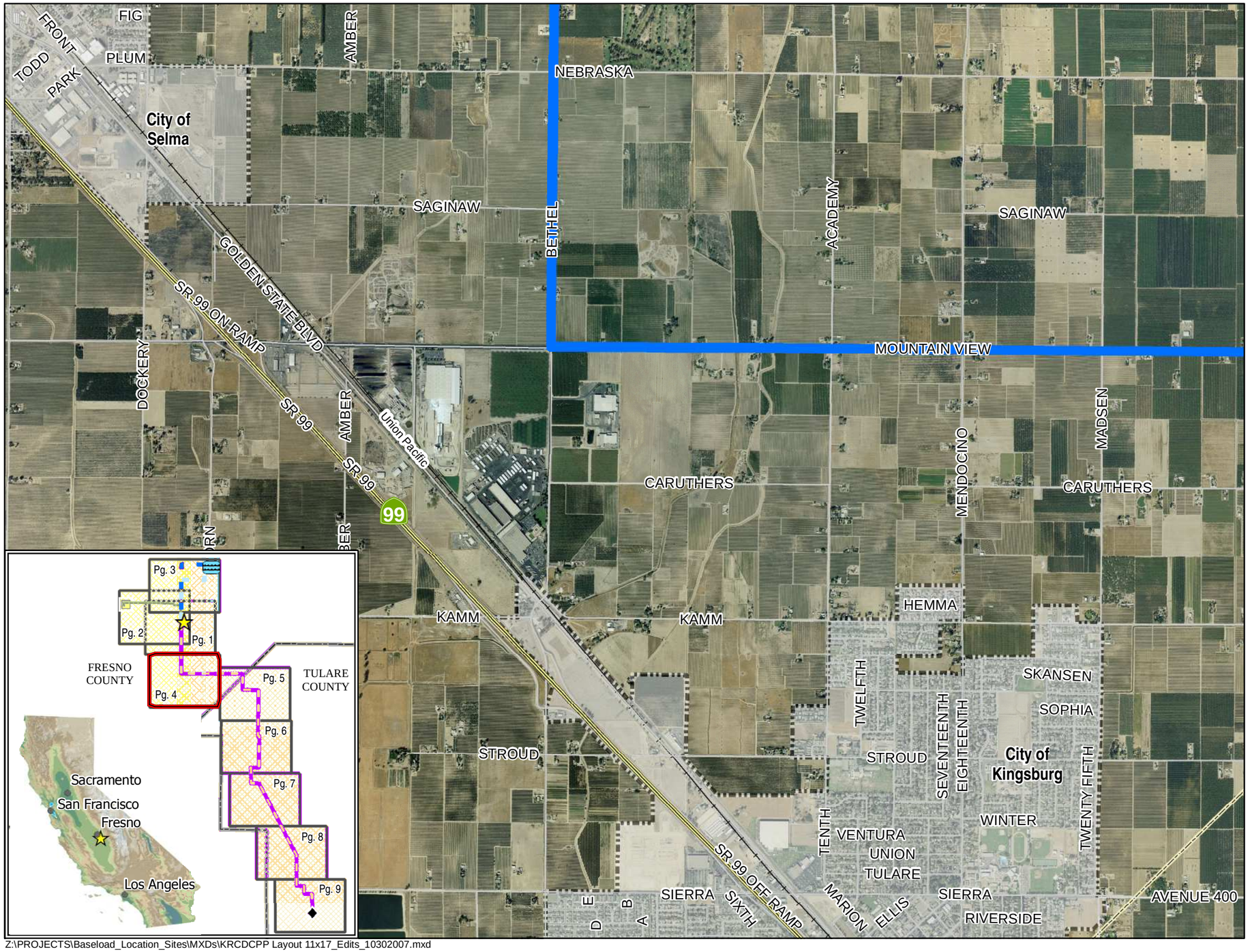
Page: 3 of 9

- KRCD Community Power Plant
- Substation
- Waste Water Percolation Ponds
- Surveyed Project Area
- Unsurveyed Project Area
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

KRCD CPP Project Survey Coverage

Page: 4 of 9

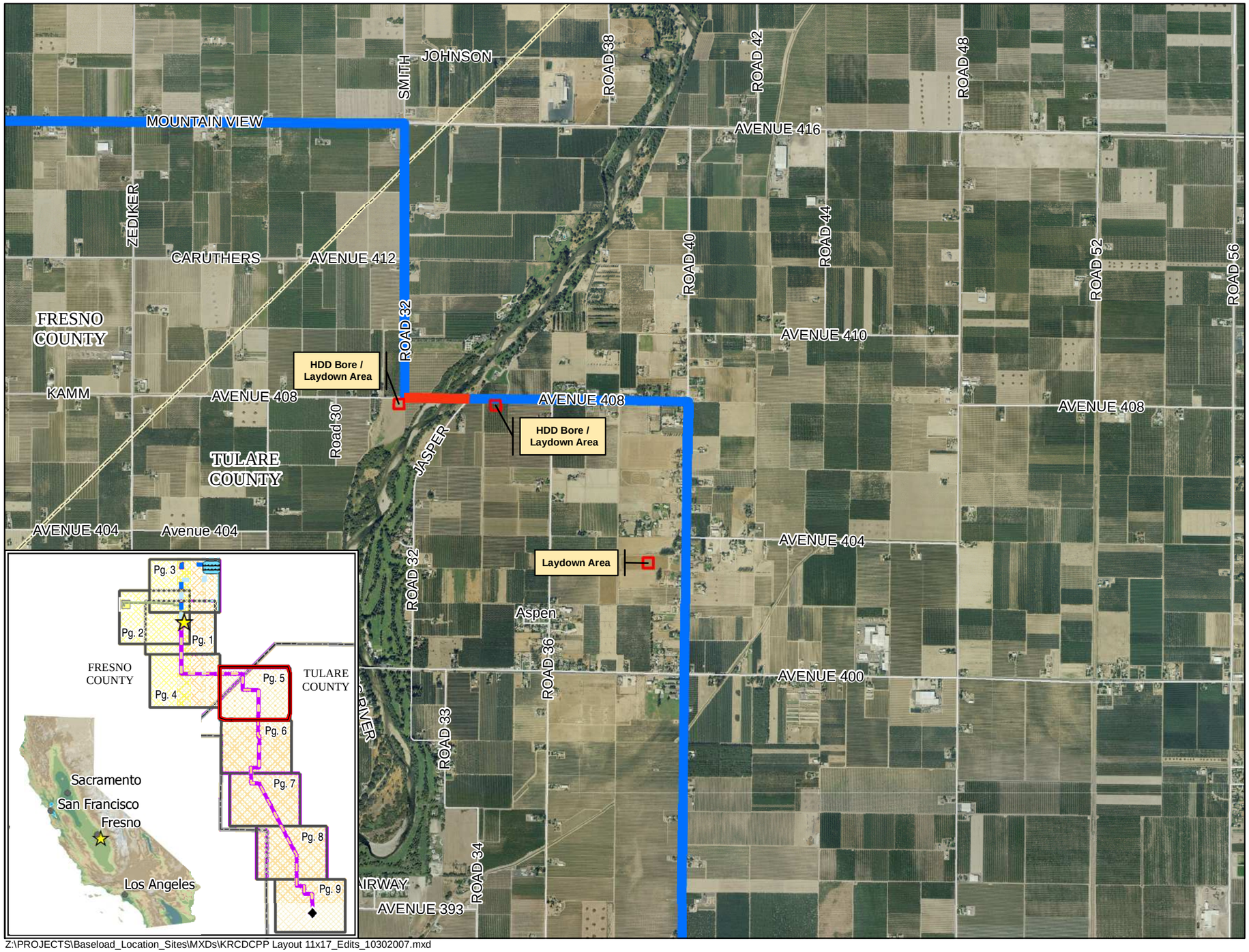
- KRCD Community Power Plant
- Substation
- Waste Water Percolation Ponds
- Surveyed Project Area
- Unsurveyed Project Area
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_10302007.mxd

Kings River Conservation District Community Power Plant



Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_10302007.mxd

KRCD COMMUNITY POWER PLANT

Energy for our Future

KRCD CPP Project Survey Coverage

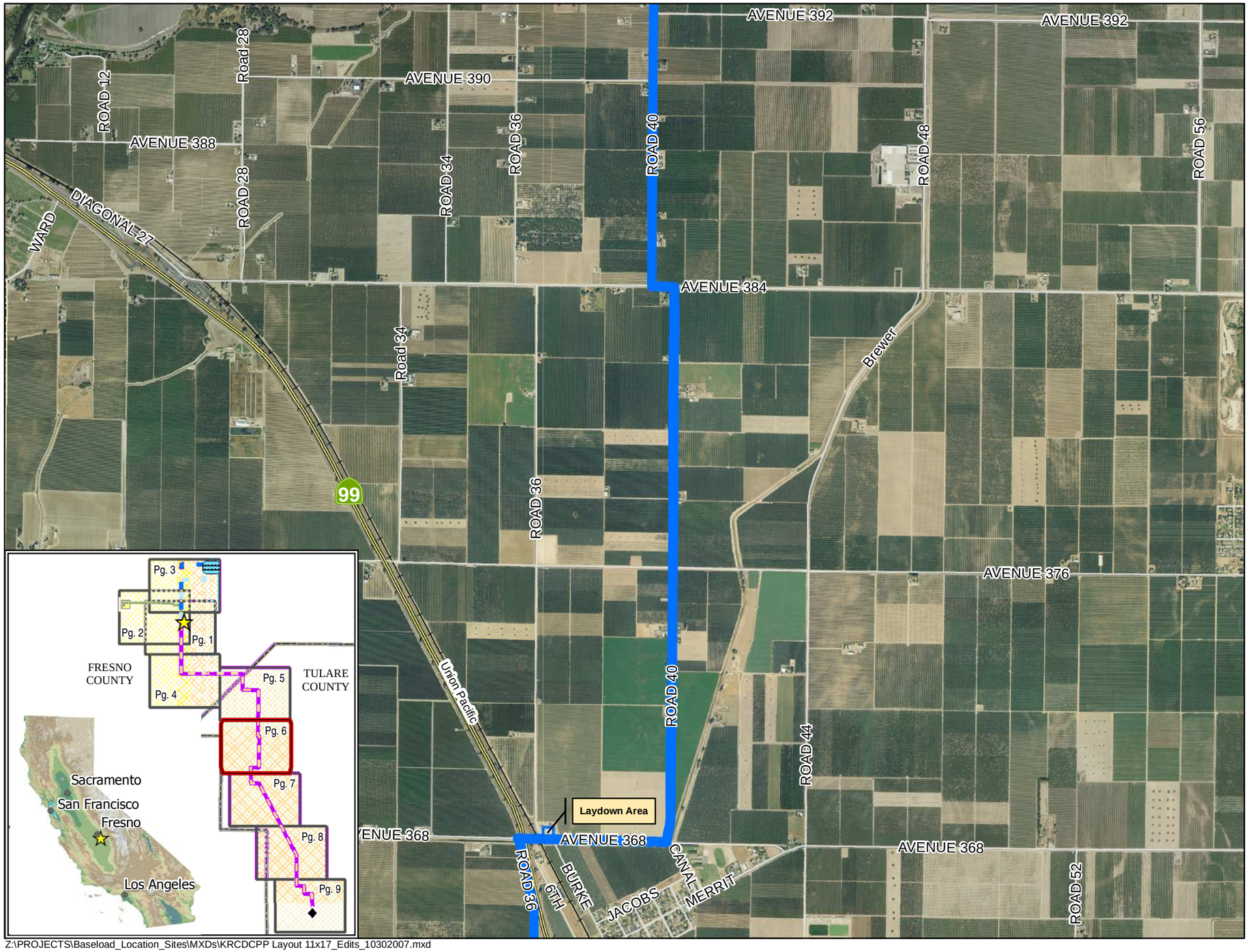
Page: 5 of 9

- KRCD Community Power Plant
- Substation
- Waste Water Percolation Ponds
- Surveyed Project Area
- Unsurveyed Project Area
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

KRCD CPP Project Survey Coverage

Page: 6 of 9

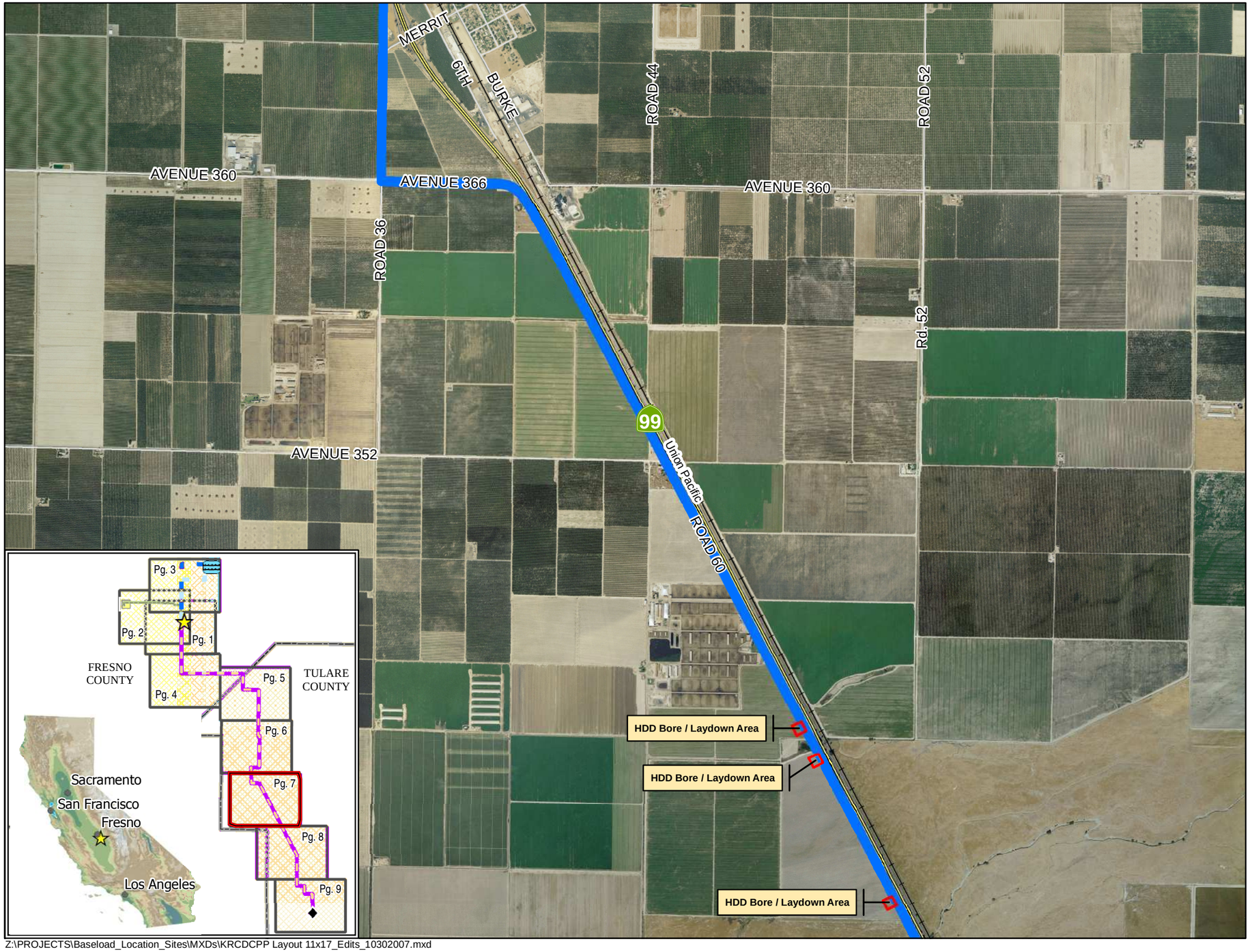
- KRCD Community Power Plant
- Substation
- Waste Water Percolation Ponds
- Surveyed Project Area
- Unsurveyed Project Area
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_10302007.mxd

Kings River Conservation District Community Power Plant



Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_10302007.mxd

KRCD COMMUNITY POWER PLANT

Energy for our Future

KRCD CPP Project Survey Coverage

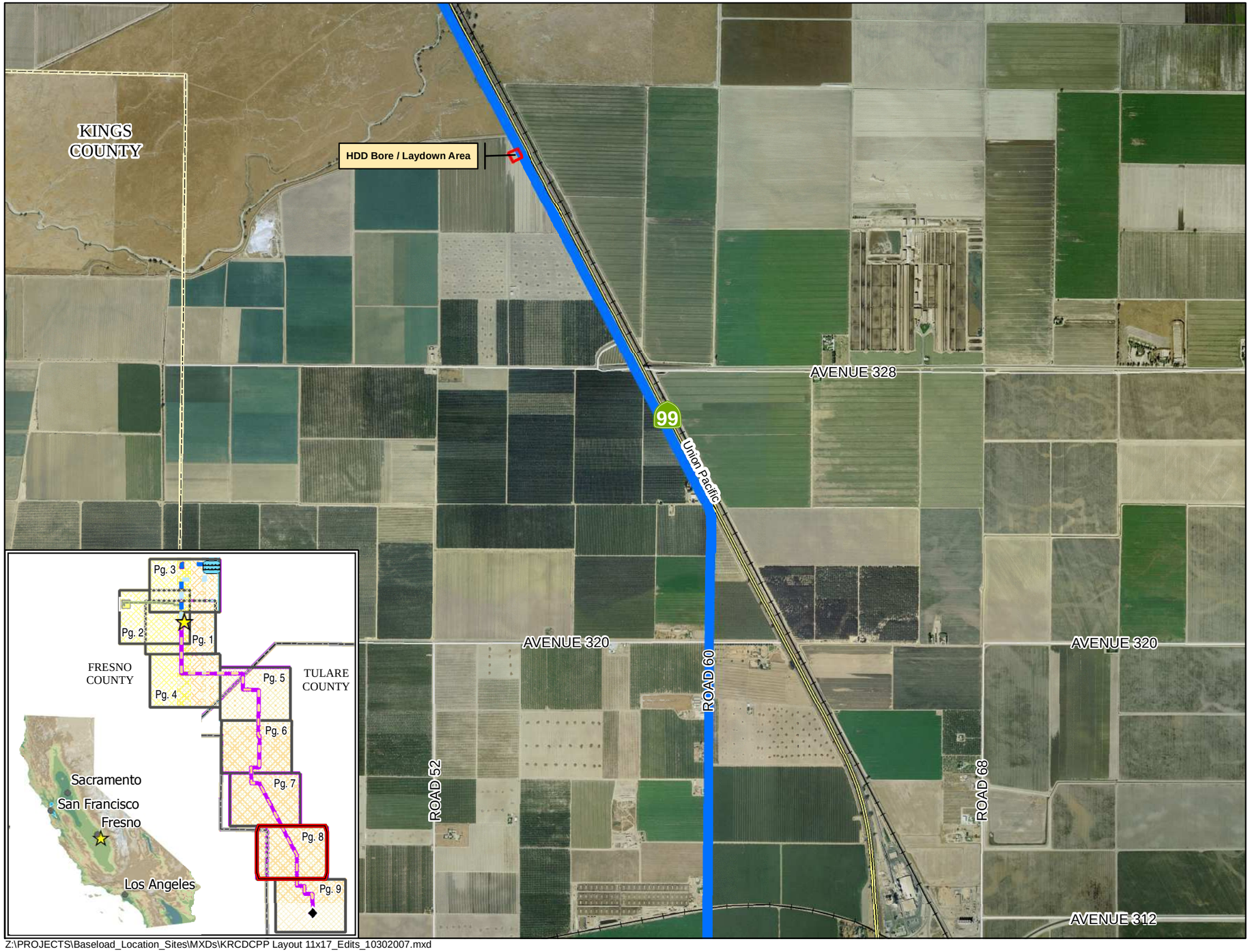
Page: 7 of 9

- KRCD Community Power Plant
- Substation
- Waste Water Percolation Ponds
- Surveyed Project Area
- Unsurveyed Project Area
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Kings River Conservation District Community Power Plant



Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_10302007.mxd

KRCD COMMUNITY POWER PLANT

Energy for our Future

KRCD CPP Project Survey Coverage

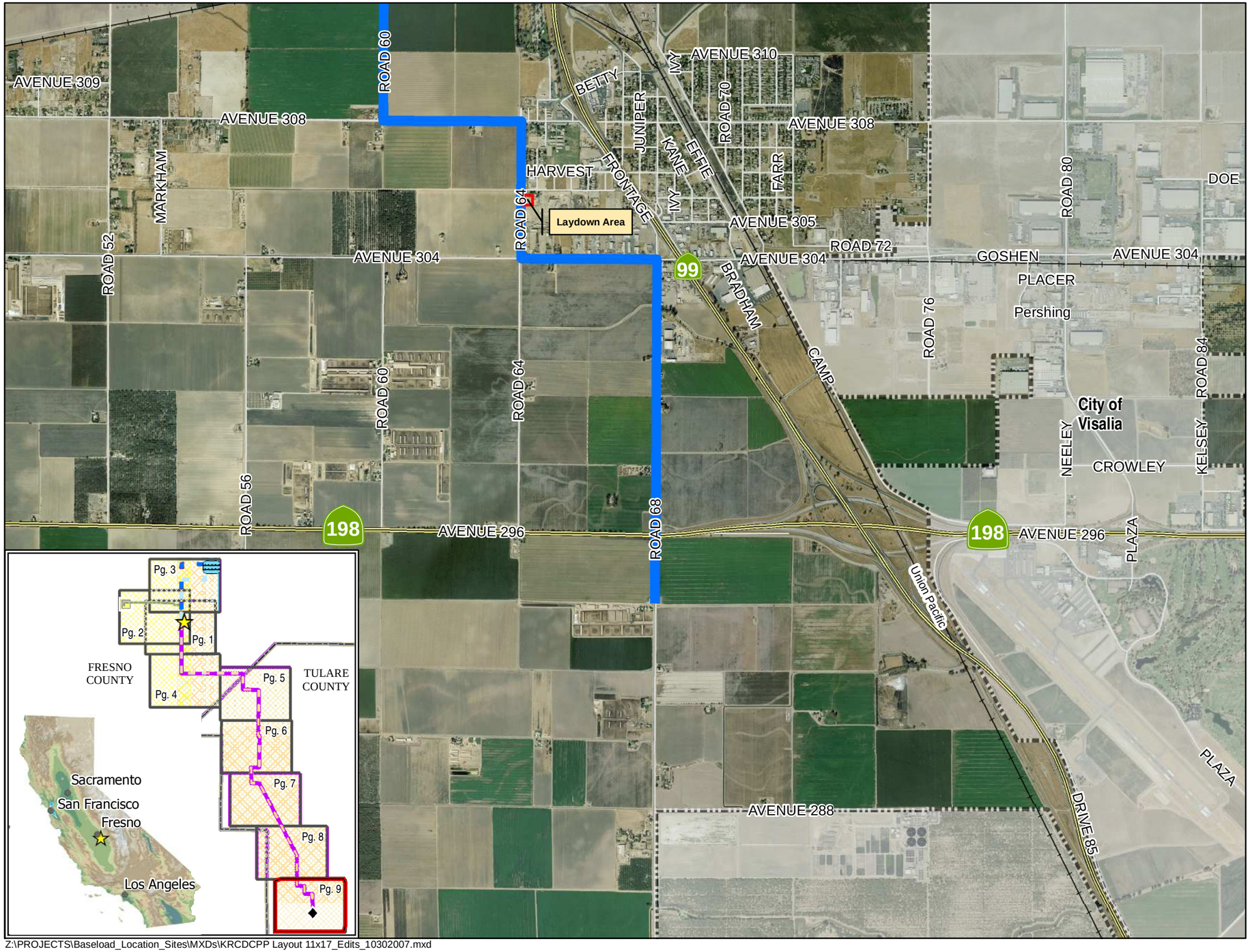
Page: 8 of 9

- KRCD Community Power Plant
- Substation
- Waste Water Percolation Ponds
- Surveyed Project Area
- Unsurveyed Project Area
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

KRCD CPP Project Survey Coverage

Page: 9 of 9

- KRCD Community Power Plant
- Substation
- Waste Water Percolation Ponds
- Surveyed Project Area
- Unsurveyed Project Area
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_10302007.mxd

Technical Area: Hazardous Materials Management

Data Request 24:
Please provide information on the location and the identities/quantities of hazardous materials stored at any facility located or proposed to be located within a 1-mile radius of the proposed power plant. If there are no facilities either in existence or proposed to be built, please so indicate.

Updated Response:
The initial response to this data request, which was filed on February 25, 2008, listed the following six facilities as being located within 1-mile of the KRCD CPP and identified by the Fresno County Department of Community Health as facilities, which store or use hazardous materials:

- Gullian Farming Equipment, 13000 E Manning Avenue, Parlier
- Nextel-Communication-Parlier #361, 12949 E Manning Avenue, Parlier
- Tiger Auto Sales, 13069 East Manning Avenue, Parlier
- Southeast Regional Disposal, 12716 East Dinuba, Selma
- Huntsman Avenue Inert Waste Landfill, 12253 East Huntsman, Selma
- Bethel Avenue Disposal Site, 10758 South Bethel Avenue, Selma.

As noted in the initial response to this data request, the Fresno County Department of Community Health indicated that each of the facilities listed above uses hazardous materials in quantities that are below the reporting thresholds and therefore, specific information regarding the types and quantities of the hazardous materials is not available from this agency.

Based on further investigation, it was determined that four of these facilities, Gullian Farming Equipment, Nextel-Communication-Parlier #361, Huntsman Avenue Inert Waste Landfill and Bethel Avenue Disposal Site, are no longer active businesses. A visit to the Southeast Regional Disposal site indicated no storage of hazardous materials on-site, and Tiger Auto Sales has been replaced by Memo's Tire Shop (see below).

Based on discussions with CEC staff during the March 6, 2008 Data Response & Issues Identification Workshop, the Applicant drove the area within 1-mile of the KRCD CPP project site to provide an additional level of coverage regarding the use and/or storage of hazardous materials by other facilities. Based on visual inspection, the following additional facilities were identified as possible candidates for the use or storage of hazardous materials:

- Custom Produce – 13475 East Progress Drive
- Custom Wood Products (pallet manufacturer) – 13458 East Industrial Drive
- W.E. Plemans Machinery Services (assembly operation) - 13479 East Industrial Drive
- D & L Produce (farming operation) – 10463 South Del Ray
- Mendocino Auto Sales – 8750 South Mendocino Avenue
- Manning Auto Sales – 12999 East Manning Avenue
- Memo's Tire Shop – 13069 East Manning Avenue

For Custom Produce, which was identified by CEC staff during the workshop as a possible site of interest, it was confirmed that there are no hazardous materials stored or used in quantities above the reporting thresholds. Per phone conversations with Custom Produce staff on March 20 and April 29, 2008, the only hazardous material used is sulfur dioxide of which no more than 65 pounds is on-site at any time.

Based on visual inspection, it also appears that none of the other six additional facilities listed immediately above use or store hazardous materials in quantities above the reporting thresholds.

Technical Area: Land Use

Data Request 25:
Please provide written confirmation from Fresno County as to whether the project would need a conditional use permit, variance, or any other land use entitlement from the County but for the exclusive authority of the Energy Commission.

Updated Response:
Written confirmation from Fresno County is included as Attachment Land-1.

Technical Area: Land Use

Data Request 31:
Please provide a figure(s) and descriptive labels or text identifying sensitive receptors within 200 feet of the centerline of linears and any associated appurtenances.

Updated Response:
Included as Attachment Land-2 are maps of the KRCD CPP project area which identify private sensitive receptors (residences) within 200 feet of the project linears.

Technical Area: Land Use

Data Request 32:
Please describe what temporary fill or paving would be used and at what locations.

Updated Response:
In addition to areas discussed in the original response to this data request, which was submitted to the CEC on February 25, 2008, the proposed temporary construction staging areas would all be restored to their natural ground surface, except as otherwise agreed to by property owner. Best Management Practices would be implemented at all temporary construction staging areas as will be further addressed in the Drainage Erosion and Sediment Control Plan, which is being prepared in response to Data Request 70.

ATTACHMENT LAND-1

Letter from Fresno County

County of Fresno

DEPARTMENT OF PUBLIC WORKS AND PLANNING
ALAN WEAVER, DIRECTOR

June 20, 2008

Jim Richards
Kings River Conservation District
4886 E. Jensen Avenue
Fresno, CA 93725

VIA FAX (559) 237-5560

Subject: Kings River Conservation District Community Power Plant

Dear Mr. Richards:

The County has determined that the proposed Kings River Conservation District (KRCD) 565 megawatt Community Power Plant proposed to be located at 9664 S. Bethel Avenue, Parlier California, is exempt from the provisions of the Fresno County Zoning Ordinance.

The County's determination is limited, however, to construction activities proposed on the project site. Off-site improvements associated with the project, including but not limited to, water, gas and transmission lines will required County review (construction documents and Franchise Agreements, etc.) and clearance (Encroachment Permits, etc.) prior to improvement initiation. In addition, KRCD is encouraged to file a Site Plan Review Application in order to facilitate project coordination and completion.

If you have any questions regarding the County's Site Plan Review submittal requirements, please contact Robin Tani, Senior Planner at (559) 262-4215.

Sincerely,

Bernard Jimenez, Manager

G:\4360Devs&Pln\ADMIN\Bernard letters\KRCD CPP.doc

c: Lynn Gorman, Deputy Director
Robin Tani, Senior Planner

DEVELOPMENT SERVICES DIVISION
2220 Tulare Street, Sixth Floor / Fresno, California 93721 / Phone (559) 262-4055 / 262-4029 / 462-4320 / 262-4022 / FAX 262-4893
Equal Employment Opportunity • Affirmative Action • Disabled Employer

ATTACHMENT LAND-2

Private Receptor Maps

Private Sensitive Receptors (Residences) within 200ft of Proposed Gas Pipeline, Water Pipeline, or Transmission Line

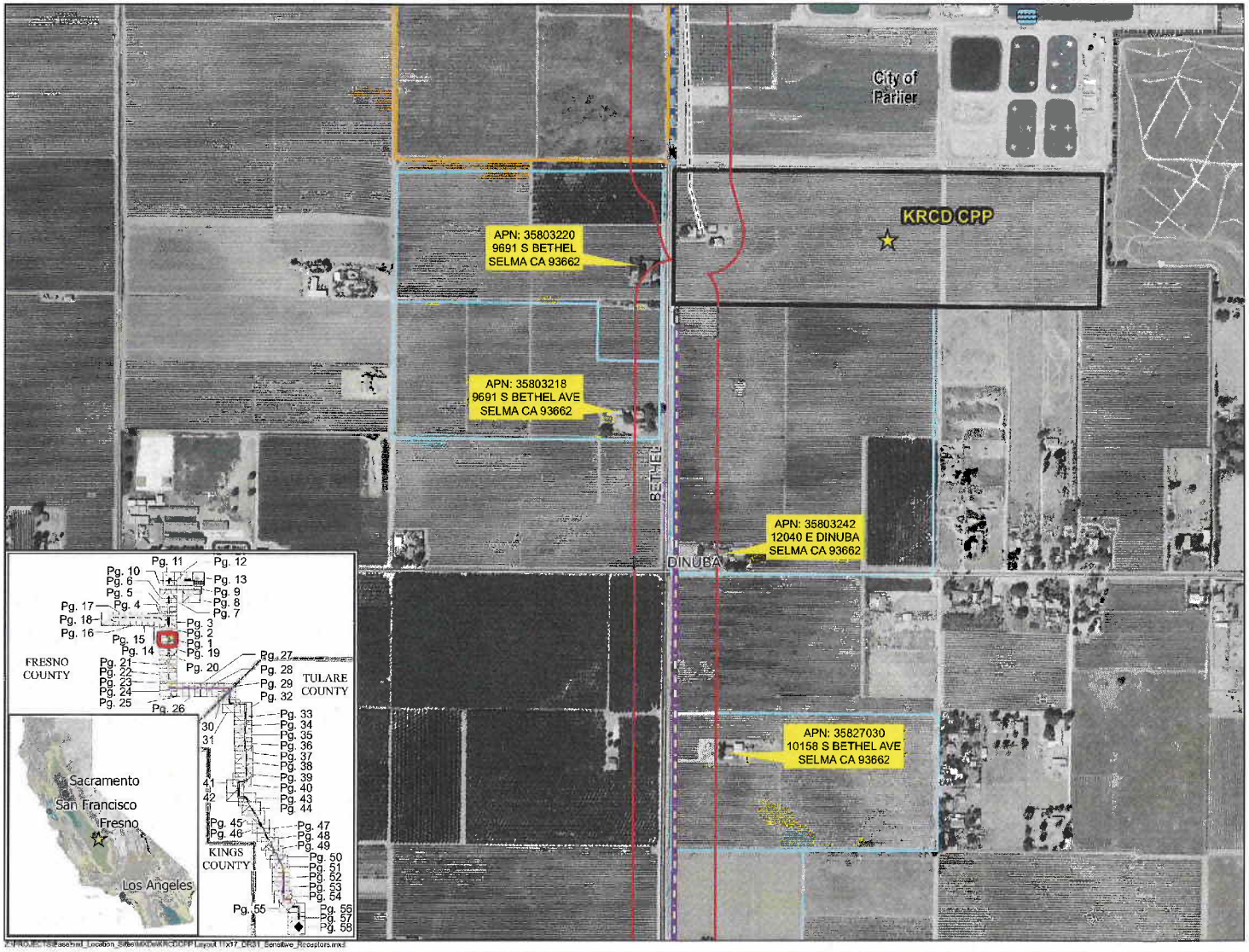
2008 APN	2006 APN	County	OWNER1	OWNER2	ADDRESS1	ADDRESS2	ADDRESS 3	ADDRESS 4
34503106		Fresno	PISOR RUSSELL O TRUSTEE		8464 S LEONARD	FOWLER CA 93625		
34503122		Fresno	LETIZIA BENJAMIN F & SHARON M TRUSTEES		8447 S LEONARD	FOWLER CA 93625		
34519004		Fresno	RAMIREZ RICHARD & RITA		8656 S DEWOLF	FOWLER CA 93625		
34519017		Fresno	FOX THERESA L		8506 S LEONARD	FOWLER CA 93625		
35006110	35006067	Fresno	JAURIGUE JAVIER R & PATRICIA C		6161 S BETHEL AVE	DEL REY CA 93616		
35006112	35006092	Fresno	SHAHBAZIAN TIMOTHY S		4320 SUNDEW CT	HAYWARD CA 94542		
35006117	35006015	Fresno	WEST COAST HISPANIC CONFERENCE	OF THE INTERNATIONAL PENTECOSTAL	% F VALDEZ	P O BOX 575	SAN JACINTO CA 92583	
35006119	35006089	Fresno	NUNES ELIAS & LUZMILA		6080 S GREENWOOD	DEL REY CA 93616		
35006120	35006082	Fresno	OGAWA EDWARD & CAROLE KASHIKI		12907 E LINCOLN	DEL REY CA 93616		
35006131	35006029	Fresno	KOMOTO KIYOSHI		P O BOX 126	PARLIER CA 93648		
35006137	35006097	Fresno	GARZA FRED JR & LAUREN A TRUSTEES		1101 E ANNADALE	SANGER CA 93657		
35006138	35006098	Fresno	MORISHITA DORI LIFE ESTATE		% F GARZA	1101 E ANNADALE	SANGER CA 93657	
35007035		Fresno	MC WILLIAMS WAYNE D		2459 N OAKS #51	TULARE CA 93274		
35007055		Fresno	FLORES JOSE & MARGARITA		13493 E LINCOLN	PARLIER CA 93648		
35016010		Fresno	ESQUIVEL AGUSTIN G & RITA C		13552 E LINCOLN	PARLIER CA 93648		
35016011		Fresno	HEIN JOLEEN M		13704 E LINCOLN	PARLIER CA 93648		
35016013		Fresno	VALDERO JAMES & EVELYN FAMILY TRUST		5716 N 8TH	FRESNO CA 93710		
35016028		Fresno	FRAUENHEIM DANIEL A & JOYCE E TRS		5914 S ACADEMY	DEL REY CA 93616		
35019023		Fresno	GORELLA MATTEO & MARIA		2533 S THOMPSON	SANGER CA 93657		
35303060		Fresno	FLORES ROBERT & MAGDALENA		12787 E ADAMS	PARLIER CA 93648		
35304046		Fresno	MC CLARTY FARMS LLC		8067 S BETHEL	SELMA CA 93662		
35305011		Fresno	MAHAL SURINDER SINGH & PARAMJIT KAUR		6055 CONTRA COSTA RD	OAKLAND CA 94618		
35305014		Fresno	VARELA EDWARD G		10534 PARLIER	SELMA CA 93662		
35305015		Fresno	CANTU ANTONIO R & JUANA V		13649 E PARLIER	PARLIER CA 93648		
35305028		Fresno	CHANDLER FARMS L P		9337 E SOUTH	SELMA CA 93662		
35305039		Fresno	CANTU ANTONIO & ESTHER H		10508 E PARLIER	SELMA CA 93662		
35305055		Fresno	VARELA EDWARD G		10534 E PARLIER	SELMA CA 93662		
35305061		Fresno	ZAVALA RAMIRO	ZAVALA MARIA	10806 E PARLIER	SELMA CA 93662		
35306107		Fresno	MC CLARTY FARMS LLC		8067 S BETHEL	SELMA CA 93662		
35306128		Fresno	SHEPARD MARK AND NANCY		8514 S INDIANOLA	SELMA CA 93662		
35306139		Fresno	GAROFALO PAUL J & LISA B		8752 S BETHEL AVE	SELMA CA 93662		
35306140		Fresno	MORALES ROGASIANO		8816 S BETHEL	SELMA CA 93662		
35306153		Fresno	FLAGLER DAVID M & KAREN D		9071 S BETHEL	SELMA CA 93662		
35306160		Fresno	TEAGUE FRANK & KARIN TRUSTEES		P O BOX 518	SELMA CA 93662		
35306163		Fresno	GUERRA ENRIQUE & CAROL		8484 S INDIANOLA	SELMA CA 93662		
35306165		Fresno	KOBASHI KIYOMI K TRUSTEE		10911 S ZEDIKER	PARLIER CA 93648		
35306172		Fresno	MIRAMONTES FRANK R & LORENZA P		8865 S BETHEL	SELMA CA 93662		
35803218		Fresno	ABAJIAN NISHAN		C/O MESIK ABAJIAN	9691 S BETHEL AVE	SELMA CA 93662	
35803220		Fresno	ABAJIAN SHELLY H	ABAJIAN WENDY E	9691 S BETHEL	SELMA CA 93662		
35803229		Fresno	FLAGLER DAVID M & KAREN D		9071 S BETHEL	SELMA CA 93662		
35803230		Fresno	FLAGLER DAVID M		9071 S BETHEL AVE	SELMA CA 93662		
35803231		Fresno	LETIZIA BENJAMIN F & SHARON M TRUSTEES	LETIZIA BENEDICT F	P O BOX 70	SELMA CA 93662		
35803232		Fresno	TRUJILLO NICOLAS G & ANGIE T		9145 S BETHEL	SELMA CA 93662		
35803242		Fresno	WHITE DEWEY DEE & BETTY L TRUSTEES		12040 E DINUBA	SELMA CA 93662		
35805020		Fresno	AWAD NANCY E		10875 BETHEL	SANGER CA 93657		
35805022		Fresno	PRIETO ANTHONY J & PAMELA J TRUSTEES		801 S GOLDEN STATE BLVD	SELMA CA 93662		
35805024		Fresno	KRUM FRANK P & LINDA I		P O BOX 1200	SELMA CA 93662		
35805027		Fresno	BANK OF NEW YORK TRUSTEE		1757 TAPO CANYON RD	SVW-88	SIMI VALLEY CA 93063	
35805072		Fresno	SHEEHAN TOBIN SEAN & KRISTIN VALERICE		10702 S BETHEL	SELMA CA 93662		
35805076		Fresno	RIEDEL RICHARD B		10614 S BETHEL	SELMA CA 93662		
35805077		Fresno	BROCK HENRY C III & M PATRICIA		10646 S BETHEL	SELMA CA 93662		
35805078		Fresno	FEDERICO LOU S & RUTH E		10678 S BETHEL	SELMA CA 93662		
35805081		Fresno	PRIETO ANTHONY J & PAMELA J TRUSTEES		801 S GOLDEN STATE BLVD	SELMA CA 93662		
35805082		Fresno	MENDOZA JOE C & R BERTHA		10641 S BETHEL	SELMA CA 93662		
35805094		Fresno	ALCOSER RUDOLPH		2172 E FRONT #112	SELMA CA 93662		
35827026		Fresno	MOORE ROGER L & JOEY C		10426 S BETHEL AVE	SELMA CA 93662		
35827030		Fresno	SAMRA SATNAM & KIRANDEEP		10158 S BETHEL AVE	SELMA CA 93662		
35827048		Fresno	PRINE RONNY & REGINA		10356 S BETHEL AVE	SELMA CA 93662		
39307118		Fresno	GARCIA MICHELLE MERIGIAN		11437 E NEBRASKA	SELMA CA 93662		
39307201		Fresno	CHEVALIER ROBERT E TRUSTEE	CHEVALIER PATSY TRUSTEE	12039 E NEBRASKA	SELMA CA 93662		
39307204		Fresno	LEWIS ANTHONY A & HATTIE L	LEWIS MARK A	12452 S BETHEL	SELMA CA 93662		
39307214		Fresno	ROSENDAHL LEONA A TRUSTEE	LOFGREN JOHN R & MARILYN J TRUSTEE	13570 S ACADEMY	KINGSBURG CA 93631		
39307215		Fresno	GAYTAN CARLOS G TRUSTEE		12760 E MOUNTAIN VIEW	KINGSBURG CA 93631		
39307221		Fresno	FORREST MARION L	FORREST MARION L TRUSTEE	12408 E MOUNTAIN VIEW	KINGSBURG CA 93631		
39307222		Fresno	CARTER BRIM J & JUNE A TRUSTEES		6427 E FLORAL	SELMA CA 93662		
39307223		Fresno	PETERSON KENDRICK B & ANNA J TRUSTEES		% ERICKSON & ASSOC	ATT B PEARSON	P O BOX 573	KINGSBURG CA 93631
39307224		Fresno	ANDERSON JAMES RICHARD	RICHARDSON CARLENE LOIS	28463 AVION CIR	CASTAIC CA 91384		
39307231		Fresno	MORITA LEO T TRUSTEE		12196 S BETHEL	SELMA CA 93662		
39307310		Fresno	GREY STEPHEN M	ULRICH SANDRA L	12601 S BETHEL	SELMA CA 93662		

39307311		Fresno	GREY DONALD M & ELAINE H TRUSTEES		12739 S BETHEL	SELMA CA 93662		
39307312		Fresno	SUN-MAID GROWERS OF CALIFORNIA		ATTN: K CONLAN	13525 S BETHEL	KINGSBURG CA 93631	
39308108		Fresno	BRANDON PERRY & SHERI	BRANDON TIM	2220 HAROLD	KINGSBURG CA 93631		
39308109		Fresno	MEDRANO HECTOR P		13246 E MT VIEW	SELMA CA 93662		
39308206		Fresno	BEDROSIAN RAYMOND A & LOTUS B TRUSTEES		1498 KLEPPER	KINGSBURG CA 93631		
39308207		Fresno	LOVEN LONNIE D & CAROLYN TRUSTEES		2515 22ND	KINGSBURG CA 93631		
39308216		Fresno	MAIER ROBERT N & HAZEL KATHERINE		12906 S MENDOCINO	SELMA CA 93662		
39308307		Fresno	AVILA EMILIO & ROSIE		14950 E MOUNTAIN VIEW	KINGSBURG CA 93631		
39308308		Fresno	LINDGREN DOUGLAS & BONNIE M TRUSTEES		11646 S ZEDIKER	KINGSBURG CA 93631		
39308332		Fresno	JENSEN PAUL MICHAEL & JOAN MARIE		13138 S BETHEL	KINGSBURG CA 93631		
39308338		Fresno	JONES WALTER L & BEULAH IRENE TRUSTEES		P O BOX 351	REEDLEY CA 93654		
39309064		Fresno	HAMADA PRESTON DALE		12538 ZEDIKER AVE	KINGSBURG CA 93631		
39309065		Fresno	SCHNITZLER MANFRED & LYDIA	SCHNITZLER GARY H	PO BOX 610	KINGSBURG CA 93631		
39309066		Fresno	WILLEMS GREGORY P		40500 RD 32	KINGSBURG CA 93631		
39309070		Fresno	TEVENDALE ROBERT & LETICIA ESCOTO TRS		P O BOX 340	KINGSBURG CA 93631		
39309090		Fresno	KINNERSLEY RONALD L & CAROL R		556 E CYPRESS	REEDLEY CA 93654		
39312229		Fresno	ANDERSEN VERA LOUISE		P O BOX 547	KINGSBURG CA 93631		
39312403		Fresno	HENRIKSEN KENT A & JANET E		14143 E MT VIEW AVE	KINGSBURG CA 93631		
39312405		Fresno	TRANK ELEANOR A TRUSTEE	JENSEN PAUL MICHAEL TRUSTEE	40407 RD 28	KINGSBURG CA 93631		
39312407		Fresno	SAULS RAYMOND MICHAEL		14601 E MOUNTAIN VIEW	KINGSBURG CA 93631		
39312408		Fresno	MARTINEZ RICHARD M	OROSCO ESMERALDA	14643 E MOUNTAIN VIEW	KINGSBURG CA 93631		
39312427		Fresno	CARLSON BLAKE L & LISA	BORTOLUSSI JEFFREY P & JULIE	14262 E CARUTHERS	KINGSBURG CA 93631		
39313002		Fresno	OLSON RICHARD D	OLSON R WAYNE & EILEEN M TRUSTEES	% W OLSON	4651 BOSTON AVE	KINGSBURG CA 93631	
39313004		Fresno	VELA NICK		15609 MT VIEW	KINGSBURG CA 93631		
39313007		Fresno	DOMINGUEZ ELENA TRUSTEE		40332 RD 36	KINGSBURG CA 93631		
39323023		Fresno	HAGGMARK EDWARD C & JAMI M		12731 E MT VIEW	KINGSBURG CA 93631		
39329035		Fresno	BENNETT BRIAN B & KAREN R TRUSTEES		11313 S BETHEL	SELMA CA 93662		
39330030		Fresno	JOHNSON NORMAN A & MARILYN J		P O BOX 1418	SELMA CA 93662		
39330048		Fresno	SHIPMAN TERRY & LOUISE		11685 S BETHEL	SELMA CA 93662		
39330049		Fresno	ESPINO REUBEN M & BETTY A TRUSTEES		11836 E NEBRASKA	SELMA CA 93662		
39330052		Fresno	HERRICK BRUCE J & JACQUELINE V		11773 S BETHEL	SELMA CA 93662		
39331004		Fresno	MONTIJO ANDY F & YVETTE G TRUSTEES		1092 RORDEN	SELMA CA 93662		
39331031		Fresno	WOODARD DEBBIE		150 TERRY LOOP	WATSONVILLE CA 95076		
39331043		Fresno	TEIXEIRA FRANK A		11654 S BETHEL AVE	SELMA CA 93662		
34503122S		Fresno	LETIZIA BENJAMIN F & SHARON M TRUSTEES	LETIZIA BENEDICT F ETAL	P O BOX 70	SELMA CA 93662		
35006111S	35006070S	Fresno	JIMENEZ LUCY G		11625 E LINCOLN	DEL REY CA 93616		
35007046S		Fresno	FRAUENHEIM STEPHEN A & KERRY L		13364 E ADAMS	PARLIER CA 93648		
35303047S		Fresno	ALBRECHT EDDIE WAYNE & JUDY E		7200 S BETHEL	DEL REY CA 93616		
35303048S		Fresno	ALBRECHT LOUISE M TRUSTEE		12373 E ADAMS	DEL REY CA 93616		
35303051S		Fresno	HELWIG DAVID M		12649 E ADAMS AVE	DEL REY CA 93616		
35305046S		Fresno	LAW DUKE GENE & JOETTA SUE		10574 E PARLIER	SELMA CA 93662		
35306127S		Fresno	KELLY JAMES W & YVONNE MARIE		8603 S INDIANOLA	SELMA CA 93662		
39303127S		Fresno	NAGAO SHIGENORI & KIMIYO TRUSTEES		12030 E ROSE ST	SELMA CA 93662		
39307216S		Fresno	VILLINES WAYNE E & CHRISTINE B TRS		P O BOX 862	KINGSBURG CA 93631		
39312428S		Fresno	HERRERA JESSE E & ROSEMARY		P O BOX 982	KINGSBURG CA 93631		
39329014S		Fresno	D & L INC		10463 S DEL REY AVE	SELMA CA 93662		
39331037S		Fresno	SHORT LAURA LEE TRUSTEE		P O BOX 1077	SELMA CA 93662		
39331038S		Fresno	HUERTA NICHOLAS LOEFFLER		11778 S BETHEL	SELMA CA 93662		
12070008		Tulare	TOKUMOTO YUTAKA		41179 RD 32	KINGSBURG CA 93631		
12090006		Tulare	GIANNINI LEROY		P O BOX 155	DINUBA CA 93618		
12100055		Tulare	THE KNODE PARTNERSHIP		41133 RD 32	KINGSBURG CA 93631		
12100059		Tulare	MATSUOKA KEITH		1003 BLANDFORD BLVD	REDWOOD CITY CA 94062		
12100061		Tulare	JACKSON MICHAEL G & LORI R		40952 RD 32	KINGSBURG CA 93631		
12100062		Tulare	JACKSON RYAN M		40952 RD 32	KINGSBURG CA 93631		
12310001		Tulare	DEAN ROLAND & KATHLEEN		40825 RD 40	DINUBA CA 93618		
12310002		Tulare	WEIDMAN LORIN A (TR)		3854 AVE 408	KINGSBURG CA 93631		
12310004		Tulare	COX STEPHEN E & DIANNE E		1353 RHONDA LN	REDLANDS CA 92373		
12310011		Tulare	BREMEL DAVID H & PAULA H (CO-TRS)		3796 AVE 408	KINGSBURG CA 93631-9620		
12310013		Tulare	SMITTCAMP BRENT E & LISA A		3672 AVE 408	KINGSBURG CA 93631		
12310014		Tulare	EASTWEST LANDSCAPE LLC		3236 W ASHLAND AVE	FRESNO CA 93722		
12310015		Tulare	SANDOVAL CHARLES & KIM		3872 AVE 408	KINGSBURG CA 93631		
28050009		Tulare	ROBINSON GEORGE E (TR)		40649 RD 40	DINUBA CA 93618		
28050020		Tulare	WIMER NEWTIN R IV		40563 RD 40	DINUBA CA 93618		
28050021		Tulare	SOLIAN JOSE E & MARIA E		PO BOX 663	KINGSBURG CA 93631		
28050032		Tulare	MC RAE JOHN W		40461 RD 40	DINUBA CA 93618		
28050034		Tulare	FESTEJO LESTER B & SHIRLEY		3709 AVE 408	KINGSBURG CA 93631		
28050035		Tulare	FESTEJO SHIRLEY M		3709 AVE 408	KINGSBURG CA 93631		
28050042		Tulare	MARIN MIKE & DEBI		40785 ROAD 40	DINUBA CA 93618		
28050043		Tulare	MARIN RUBEN & MARGIE		40765 ROAD 40	DINUBA CA 93618		
28050044		Tulare	REMMER THURMAN D & CAROL SUE		40519 RD 40	DINUBA CA 93618		
28050045		Tulare	HERNANDEZ CELIA P		40537 RD 40	DINUBA CA 93618		

28050047		Tulare	HESSER DARREL A & SHARON A		40425 RD 40	DINUBA CA 93618		
28250023		Tulare	CARLSON RANDAL E & GAIL M (TRS)		38977 RD 40	KINGSBURG CA 93631		
28350025		Tulare	FORTIER LAURA ANN		P O BOX 768	KINGSBURG CA 93631		
28350034		Tulare	WATKINS FRANCILE		40045 RD 40	KINGSBURG CA 93631		
28350035		Tulare	VELA NICOLAS M		15509 E MOUNTAIN VIEW	KINGSBURG CA 93631		
28350038		Tulare	BIALZA ALEJANDRO & ELENA		2674 EDGAR ST	SANGER CA 93657		
28350039		Tulare	PAGE NATHAN R & JENNIFER R		40051A ROAD 40	KINGSBURG CA 93631		
28390003		Tulare	ZIMENDEZ JOEL P & YOLANDA		4597 RD 404	DINUBA CA 93618		
28390004		Tulare	CORREA MIGUEL & MARIA N		1000 LAS BRISAS	MISSION TX 78572		
28390005		Tulare	MATTOS LUCIANO & MANUELA		40261 RD 40	DINUBA CA 93618		
28390006		Tulare	GLOVER WILLIAM W		40283 RD 40	DINUBA CA 93618		
28390008		Tulare	ANTONETTI ROY J & JUNE (TRS)		40231 RD 40	DINUBA CA 93618		
28390009		Tulare	MATTOS LUCIANO & MANUELA		40261 RD 40	DINUBA CA 93618		
28400003		Tulare	BURNIAS NOE		39581 RD 40	KINGSBURG CA 93631		
28400006		Tulare	OLSON DARREL W & BEVERLY		39668 RD 36	KINGSBURG CA 93631		
28410004		Tulare	OLSON BRADLEY D & ELAINE J (CO-TRS)		3043 BONANDER DR	KINGSBURG CA 93631		
29010001		Tulare	SCHMIDT RAYMOND V & KRISTINE D		PO BOX 254	REEDLEY CA 93654		
29010024		Tulare	BOSS KENNETH FRANKLIN		4068 AVE 404	DINUBA CA 93618		
29010027		Tulare	BOSS EDDIE F & FLORENCE M		40440 ROAD 40	DINUBA CA 93618		
29010028		Tulare	BOSS MICHAEL W & DONNA S		C/O MICHAELS TOWING	718 I ST		
29050006		Tulare	MOORE W P & GUNBORG S		39652 RD 40	KINGSBURG CA 93631		
29050007		Tulare	OLSON RAYMOND L & BETTY L (TRS)		39762 RD 40	KINGSBURG CA 93631		
29050036		Tulare	GUZMAN JOSE M & MARIA E (TRS LIV TR		39894 RD 40	KINGSBURG CA 93631		
29080006		Tulare	HUCKABAY TROY G		P O BOX 889	KINGSBURG CA 93631		
29080014		Tulare	MEGRENNE JOSEPH & MARY F		39412 RD 40	KINGSBURG CA 93631		
29090014		Tulare	THIESEN DONALD G & LILLIAN (TRS)		266 KINGSWOOD PARKWAY	REEDLEY CA 93654		
29120007		Tulare	EPCO FARMS		4572 AVE 400	DINUBA CA 93618		
29120008		Tulare	ENS PATRICIA		2460 17TH ST	KINGSBURG CA 93631		
29120009		Tulare	HUCKABAY RYAN C & JULIE P		38790 RD 40	KINGSBURG CA 93631-8001		
29270001		Tulare	DRENNEN CRAIG & JILL		40368 RD 40	DINUBA CA 93618		
29270005		Tulare	PASILLAS JOHNNY R & SANDRA L		40342 ROAD 40	DINUBA CA 93618		
29270007		Tulare	MATHEWS RONALD P & PATRICIA L		40322 ROAD 40	DINUBA CA 93618		
29270009		Tulare	GARCIA GUILLERMINA & GUMARO Z		40256 ROAD 40	DINUBA CA 93618		
29270010		Tulare	MENDEZ FEBRONIO JR & ANNA M		40284 RD 40	DINUBA CA 93618		
29280001		Tulare	PEREZ PETE R		38211 RD 40	KINGSBURG CA 93631		
29280002		Tulare	GUZMAN JOSE M & MARIA E		39894 RD 40	KINGSBURG CA 93631		
40010004		Tulare	CASAS PASCUAL & JUVENTINA		P O BOX 33	TRAVER CA 93673		
43010003		Tulare	RADCLIFF ROCKSY J & CHERRON CAY (L		38355 RD 40	KINGSBURG CA 93631		
43010005		Tulare	ALVES RALPH H (TR)		38112 RD 40	KINGSBURG CA 93631		
43010006		Tulare	ALVES RALPH H (TR)		38112 RD 40	KINGSBURG CA 93631		
43010033		Tulare	PEREZ PETE R & MARIA D		C/O PEREZ FARMS	38211 RD 40		
43010038		Tulare	DLM PARTNERS		3265 W FIG GARDEN	FRESNO CA 93711		
43131005		Tulare	GRIFFIN JIMMIE P & JOAN W L		37403 RD 40	KINGSBURG CA 93631		
43131006		Tulare	SOUTHARD RAYMOND & MARY		37425 RD 40	KINGSBURG CA 93631		
43131007		Tulare	CHRISTENSEN-LINDELL CORP		1910 WINTER ST	KINGSBURG CA 93631		
43131008		Tulare	CHRISTENSEN-LINDELL INC		1910 WINTER ST	KINGSBURG CA 93631		
43132003		Tulare	MC DONALD JAMES C & JACKIE D		37412 RD 40	KINGSBURG CA 93631		
43132014		Tulare	GARCIA OSCAR		37382 RD 40	KINGSBURG CA 93631		
43132024		Tulare	HICKS LINDLEY & MICHELE		37428 RD 40	KINGSBURG CA 93631		
45040004		Tulare	CHANCE JAMES W & JANET J		35909 HWY 99	KINGSBURG CA 93631		
45050002		Tulare	THIESEN DONALD G & LILLIAN L (TRS)		266 KINGSWOOD PARKWAY	REEDLEY CA 93654		
72070003		Tulare	JOHNSTON ROY DEL & BEATRICE		31695 RD 60	VISALIA CA 93291		
72070005		Tulare	GARCIA TIBURCIO I & CRUZ C		31655 RD 60	VISALIA CA 93291		
72070007		Tulare	JOHNSTON ROY DEL & BEATRICE		31695 RD 60	VISALIA CA 93291		
72070008		Tulare	JOHNSTON ROY & BETTY		31695 RD 60	VISALIA CA 93291		
72080006		Tulare	BEATTIE ERIC & SHELLEY		31559 RD 60	VISALIA CA 93291		
72080013		Tulare	FULLMER QUE J & DEBORA J (TRS)		16600 HELLMAN AVE	CORONA CA 92880		
72100017		Tulare	FLAVOR TREE LLC		41646 RD 62	REEDLEY CA 93654		
73060008		Tulare	EKIZIAN ARAM & JEANETTE D (TRS) REV		2841 CRESCENT CT	VISALIA CA 93291		
73060011		Tulare	CORREIA ALVIN F & BETTY J (TRS)		6401 AVE 296	VISALIA CA 93277		
73060015		Tulare	HALSTEAD DOROTHY (TR)		5999 AVE 308	VISALIA CA 93291		
73080009		Tulare	NUNES PHYLLIS M		1421 HARVARD CT	HANFORD CA 93230-2555		
73090014		Tulare	JORDAN DWIGHT F & EVELYN A (TRS)		18060 FISHER DR	VISALIA CA 93292		
73090072		Tulare	CALIFORNIA WATER SERVICE CO		1720 N FIRST ST	SAN JOSE CA 95121		
73100008		Tulare	KASBERGEN NEIL & MARTHA		12400 LIMONITE	MIRA LOMA CA 91752		
73110056		Tulare	CORREIA ALVIN F & BETTY J (TRS)		6401 AVE 296	VISALIA CA 93277		
75300019		Tulare	DELGADO ABEL V & MARIA S		5249 AVE 308	VISALIA CA 93292		
75300020		Tulare	BETTENCOURT MANUEL T & N LORAINE (T		6446 AVE 304	VISALIA CA 93291		
75300021		Tulare	BUSBY EUGENE & WANDA		213 N CRENSHAW	VISALIA CA 93291		
75300052		Tulare	FORD DONALD B & CHARLOTTE C		6506 AVE 304	VISALIA CA 93291		
75300060		Tulare	LOPEZ FRED & ELSA		30590 ROAD 64	VISALIA CA 93291		

75320008		Tulare	JIMENEZ LOUIE R & FANCHON D		1901 LARCHMONT CIRCLE	FAIRFIELD CA 94534		
75320009		Tulare	VASQUEZ MANUEL S & RHONDA J		P O BOX 26	GOSHEN CA 93227		
75320010		Tulare	SPARLIN C GARY & B JOYCE (TRS)		356 E WILSON	TULARE CA 93274		
75320012		Tulare	ALTAMIRANO MANUEL & JOSEFA		30672 RD 64	VISALIA CA 93291		
75320018		Tulare	ABILA RAUL R & MARIA G		30602 RD 64	VISALIA CA 93291		
75320019		Tulare	GRANT BRIAN W & PEGGY D		30614 RD 64	GOSHEN CA 93291		
75320021		Tulare	PACHECO PABLO A & VICTORIA A		30670 RD 64	VISALIA CA 93291		
75320022		Tulare	SEALS ROY G & MILDRED M		30664 ROAD 64	VISALIA CA 93291		
75320066		Tulare	SEALS ROY M & MILDRED M		30642 RD 64	VISALIA CA 93291		
75320067		Tulare	GRANT BRIAN W & PEGGY D		30614 RD 64	VISALIA CA 93291		
75330010		Tulare	CORREA MANUEL NORMAN SR & PATSY		30738 RD 64	GOSHEN CA 93227		
75330012		Tulare	JONES HAZEL J (TRS)		547 S LANSING ST	TULARE CA 93274		
75330024		Tulare	GOODMAN MARY R		1202 N SHIRK	VISALIA CA 93277		
75330033		Tulare	SERRATO HECTOR P & TRINA LANEEN		30774 ROAD 64	GOSHEN CA 93227		

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

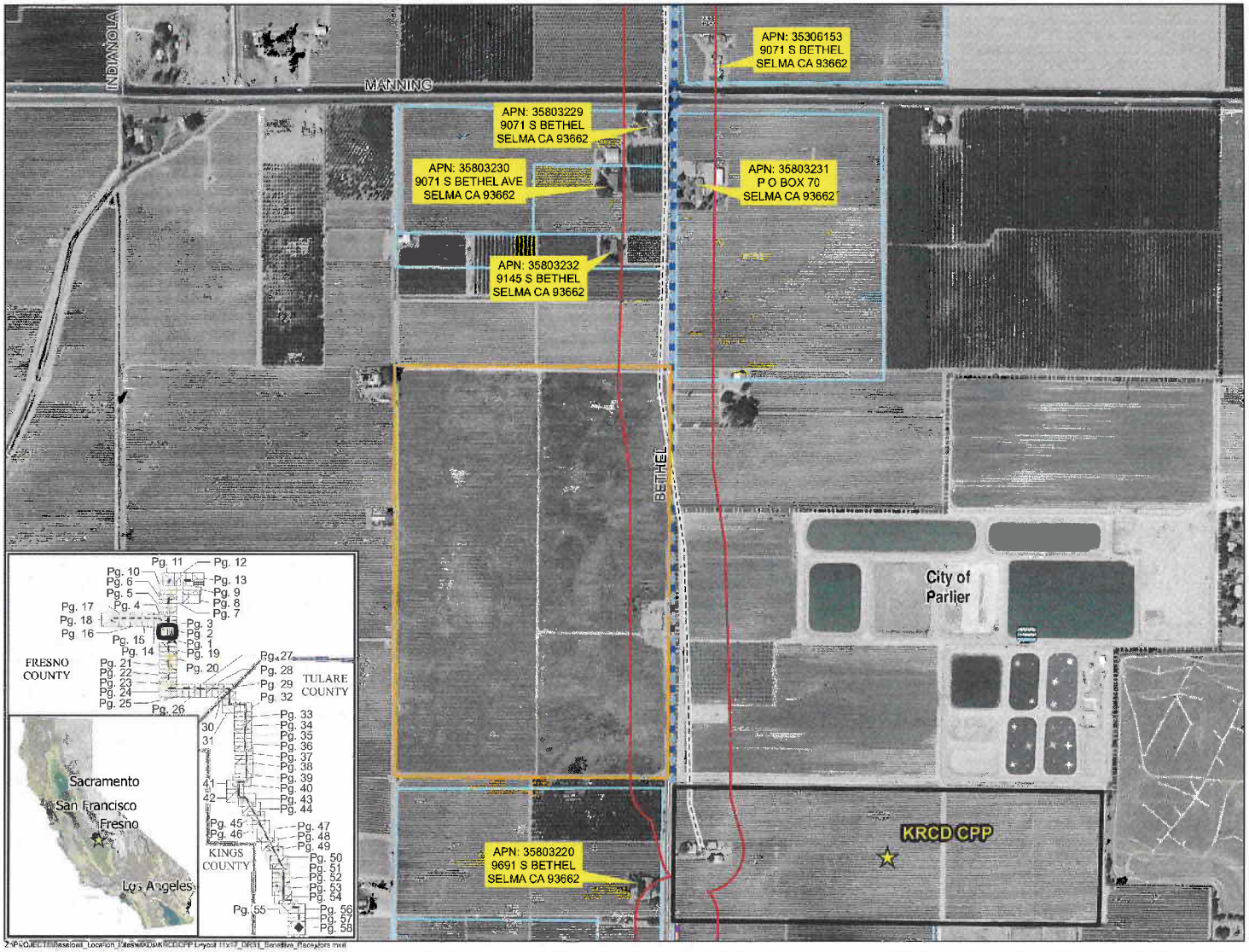
Page: 1 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

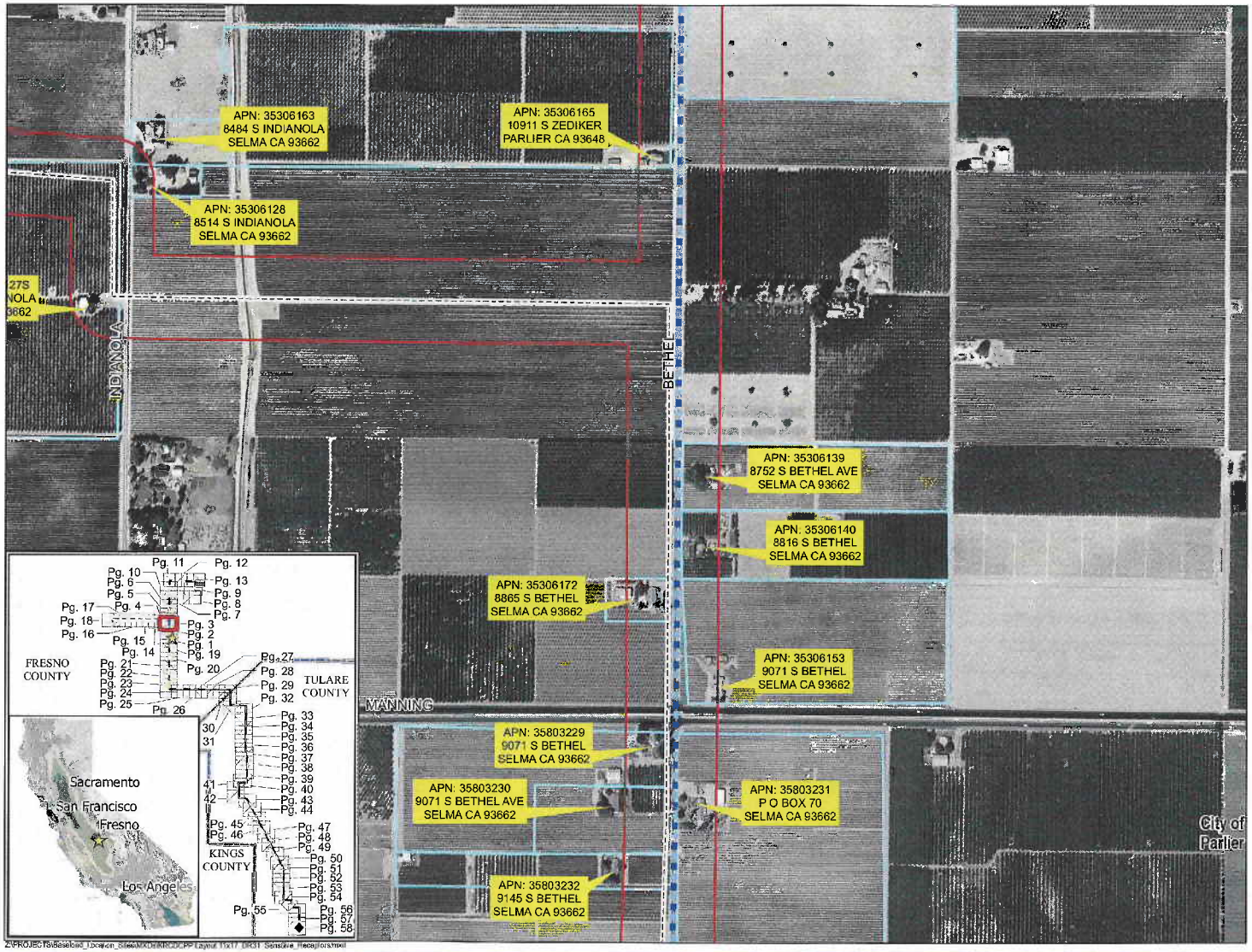
Page: 2 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

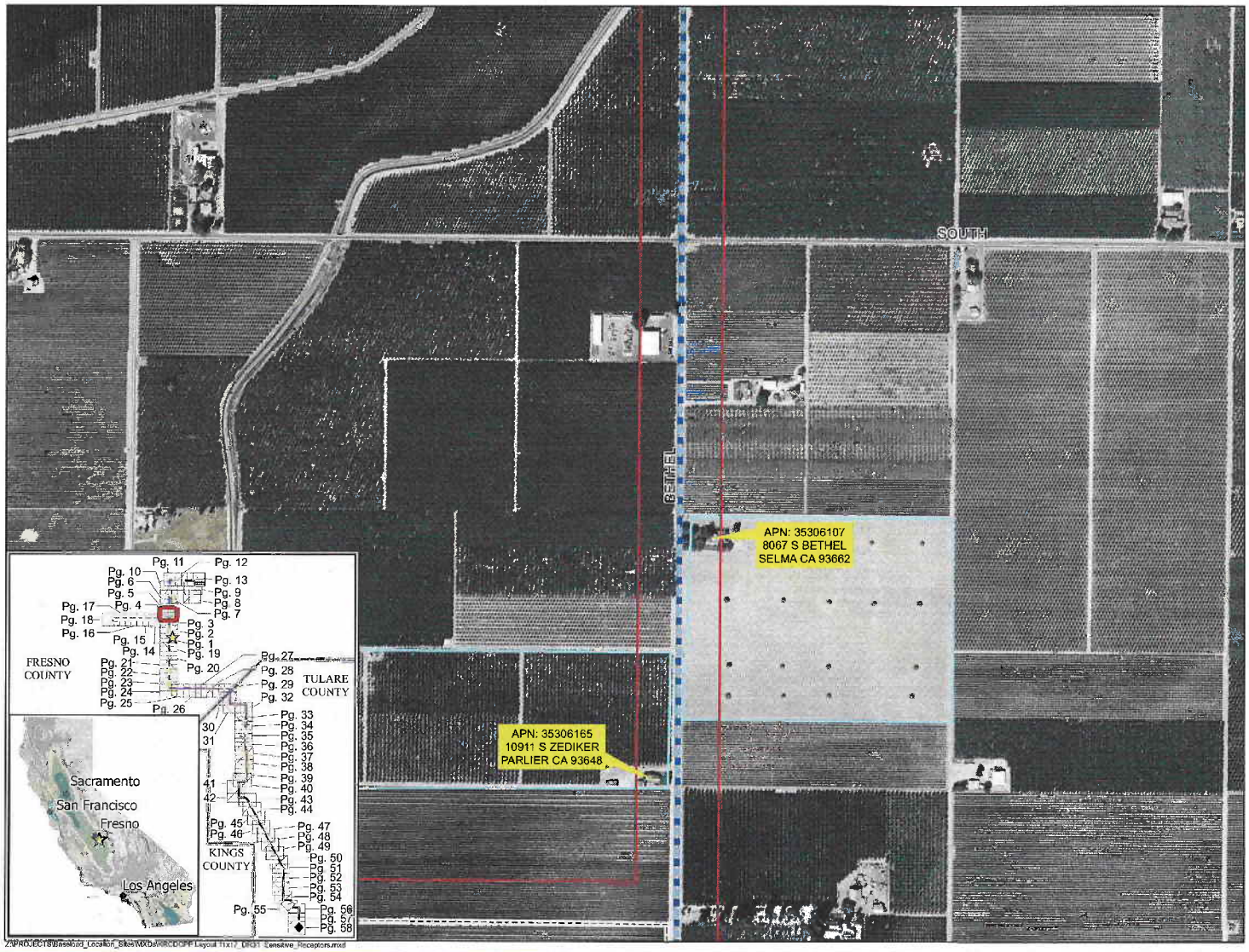
Page: 3 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

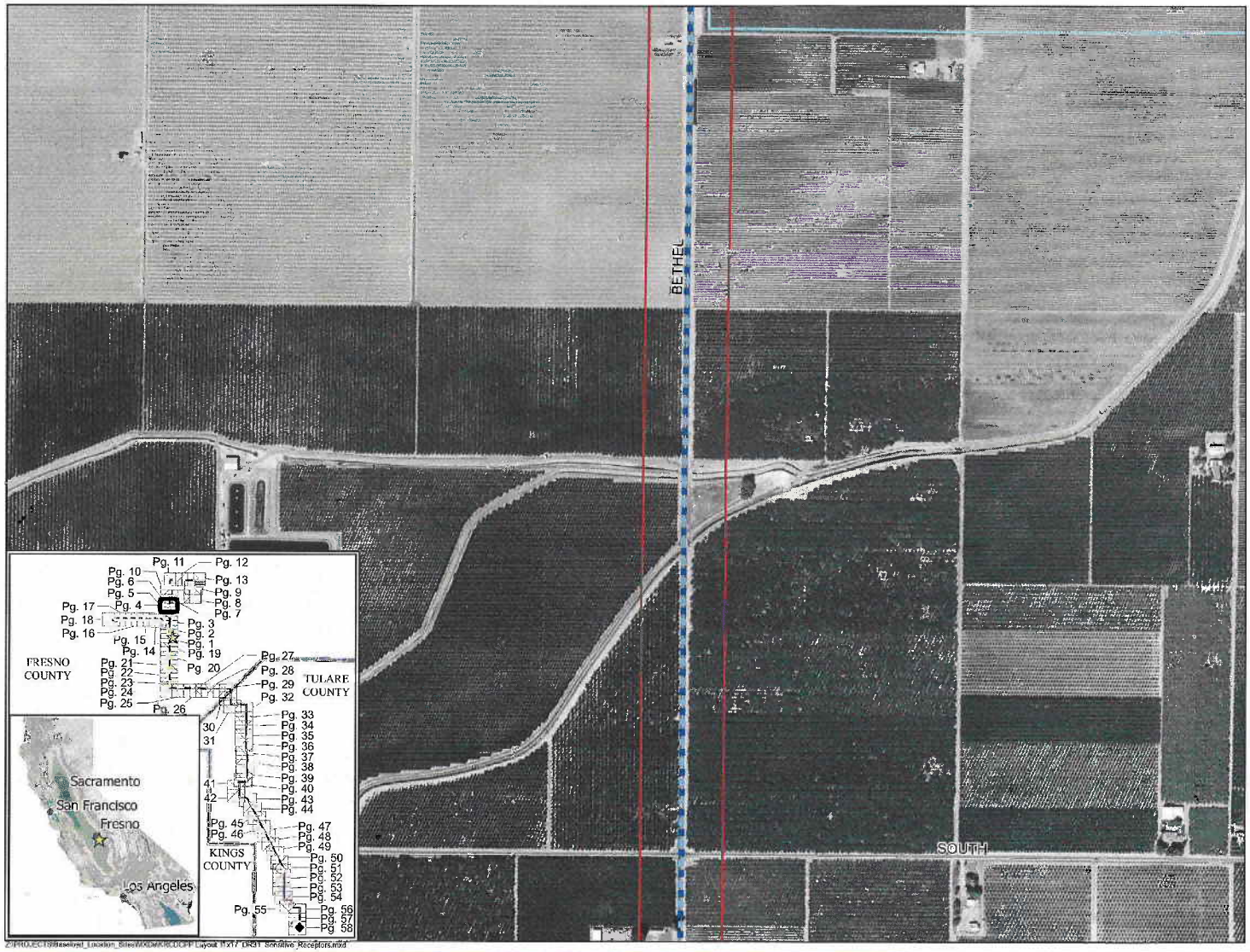
Page: 4 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 5 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

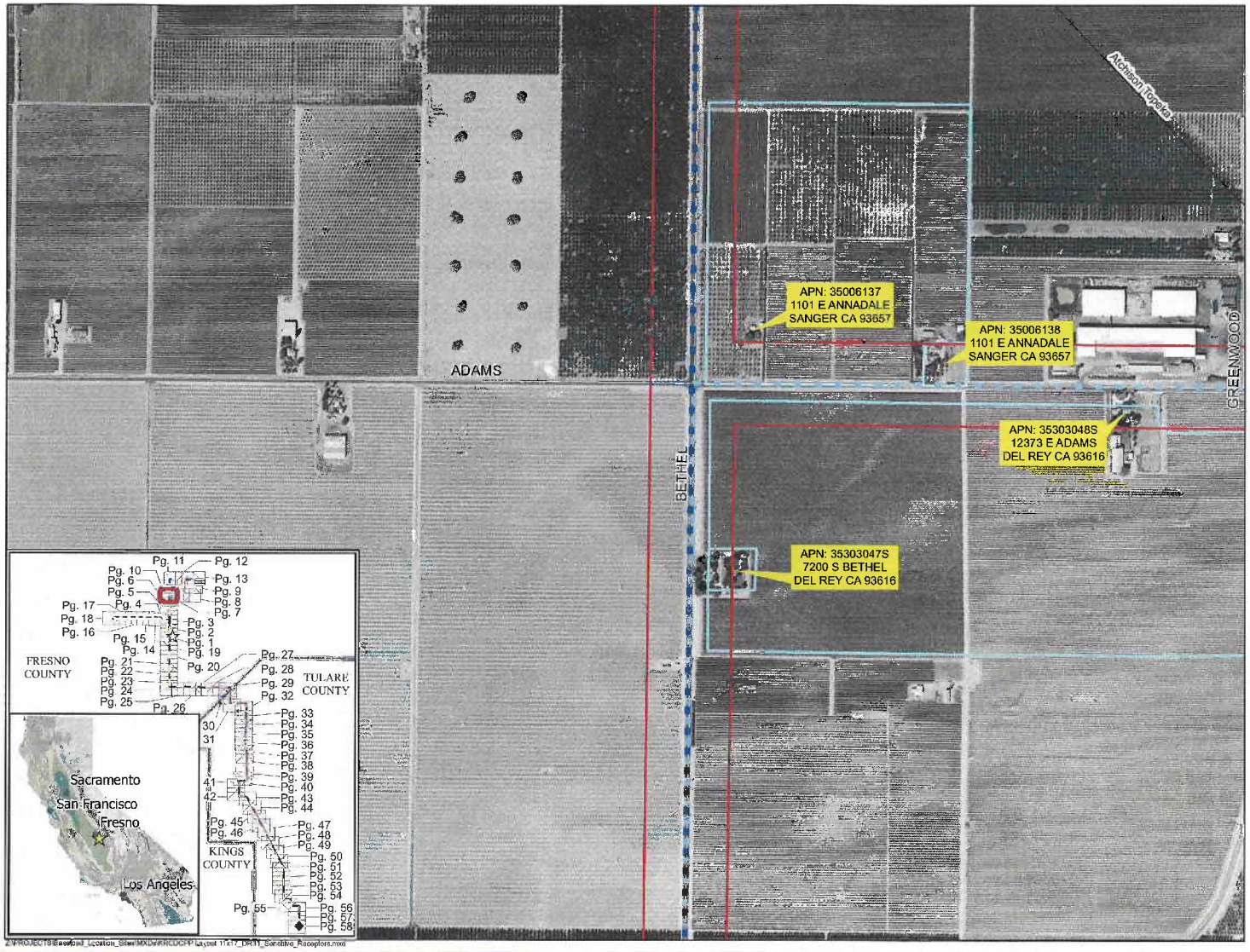
N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Z:\PROJECTS\Baseline_Location_Sites\KCD\KRCD\CPP Layout 11X17 DR31 Sensitive_Receptors.mxd

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 6 of 58

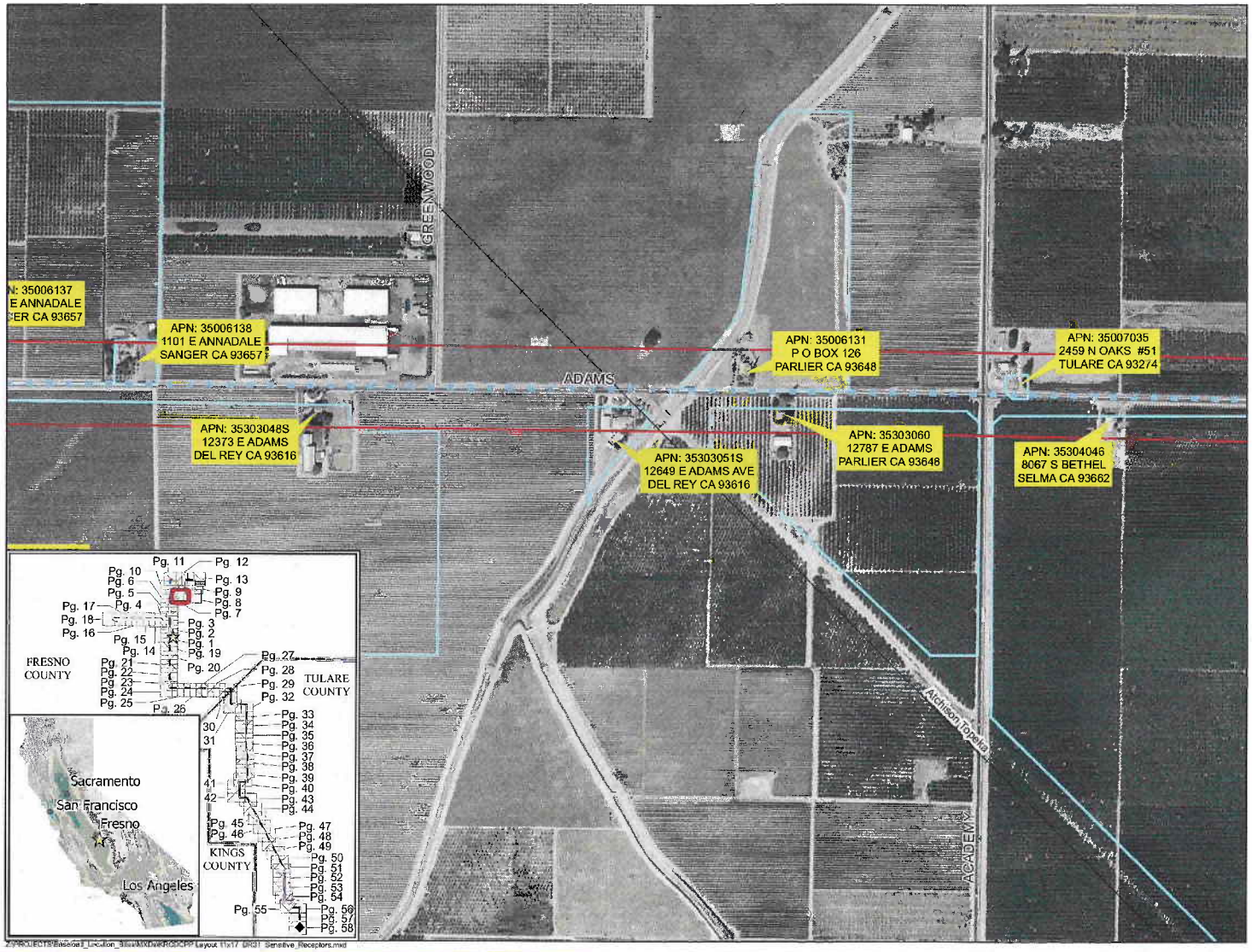
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

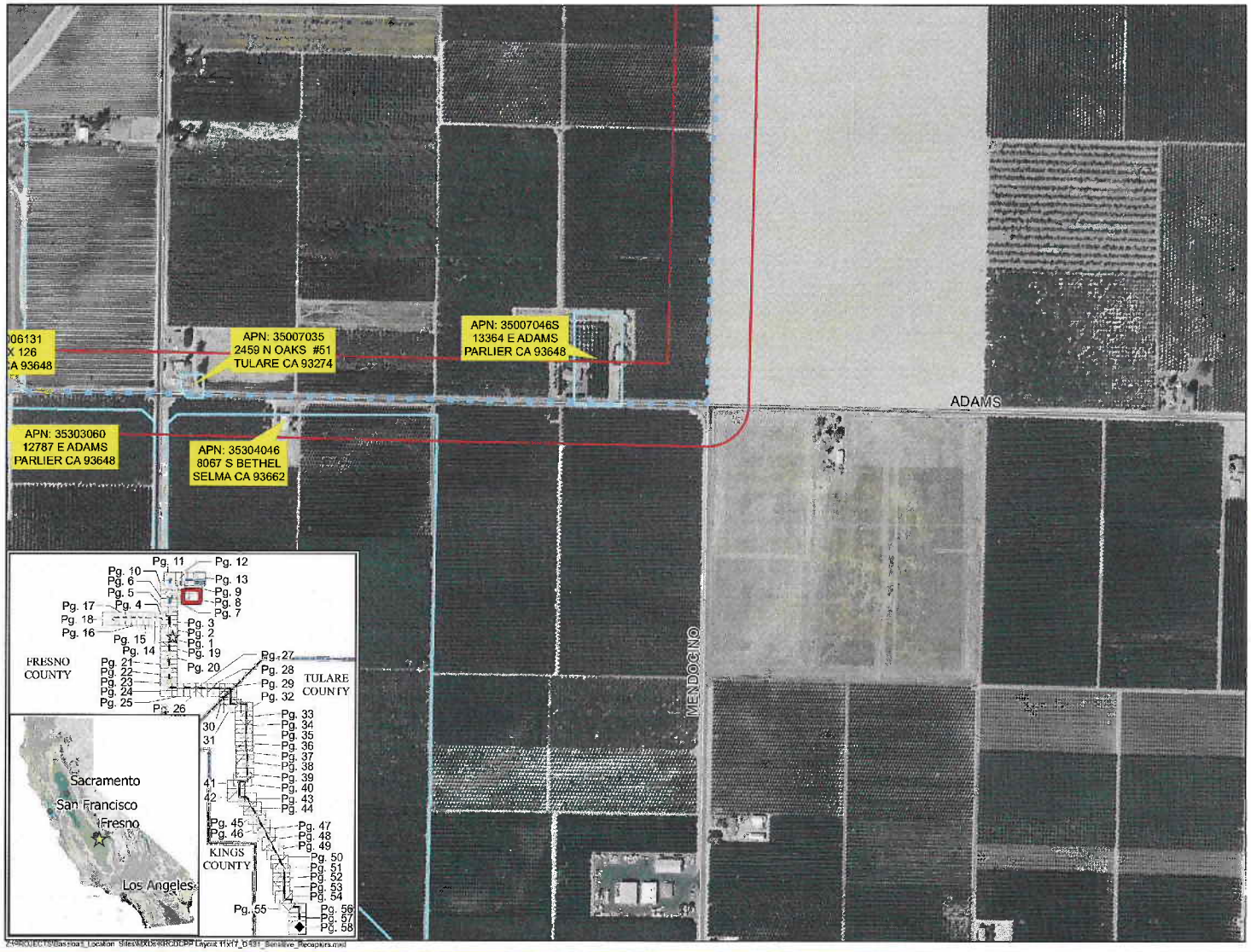
Page: 7 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Lincars

Page: 8 of 58

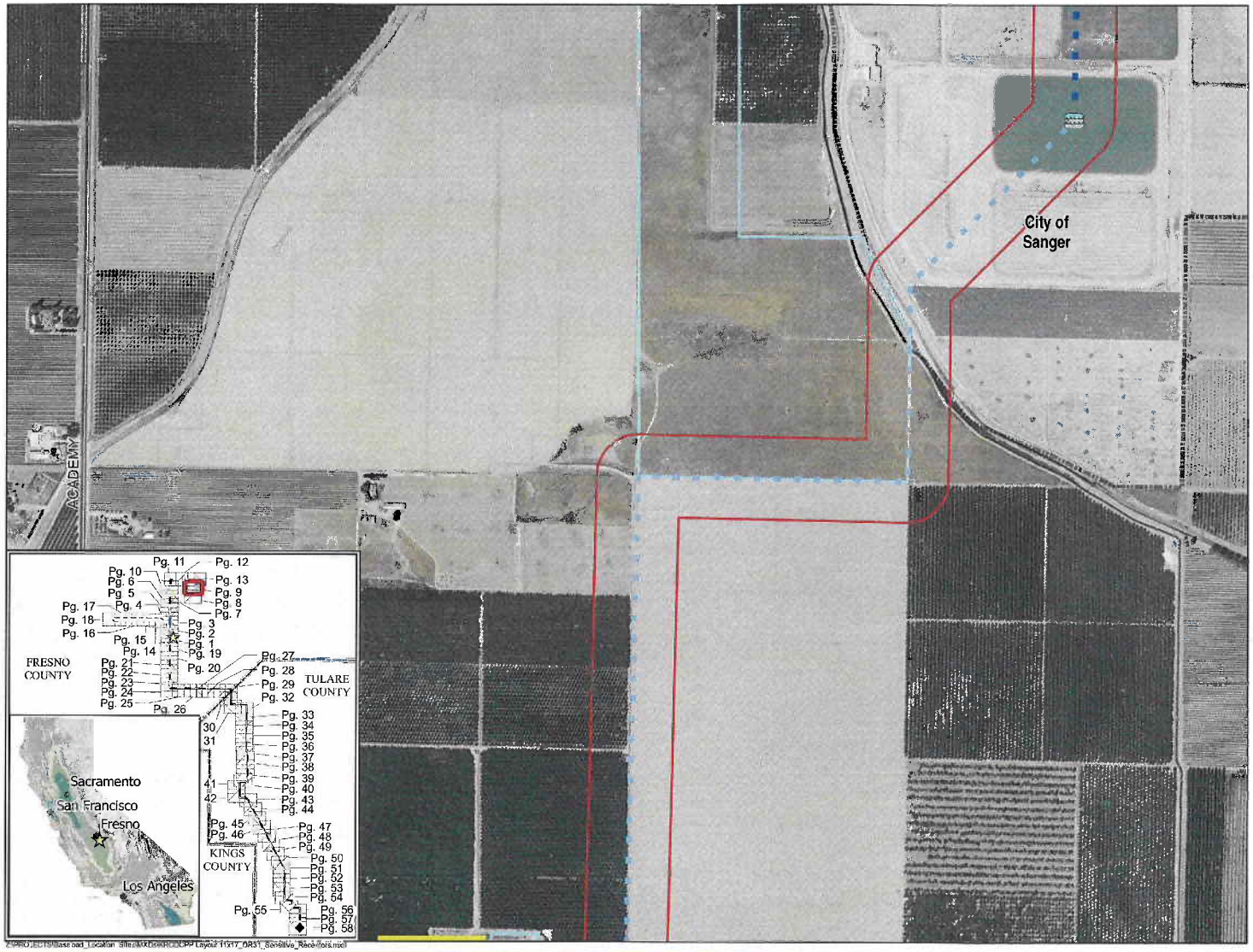
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 9 of 58

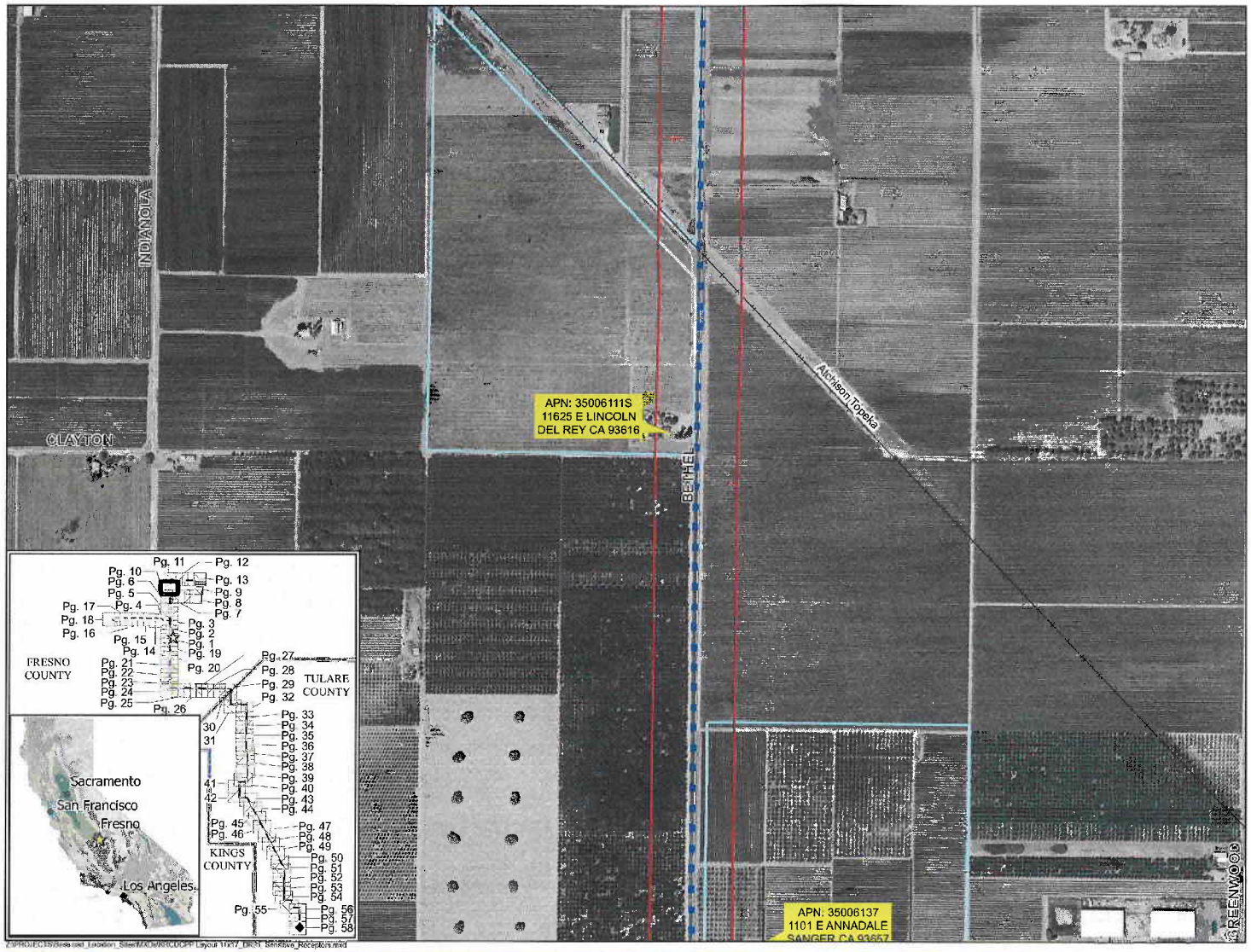
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 10 of 58

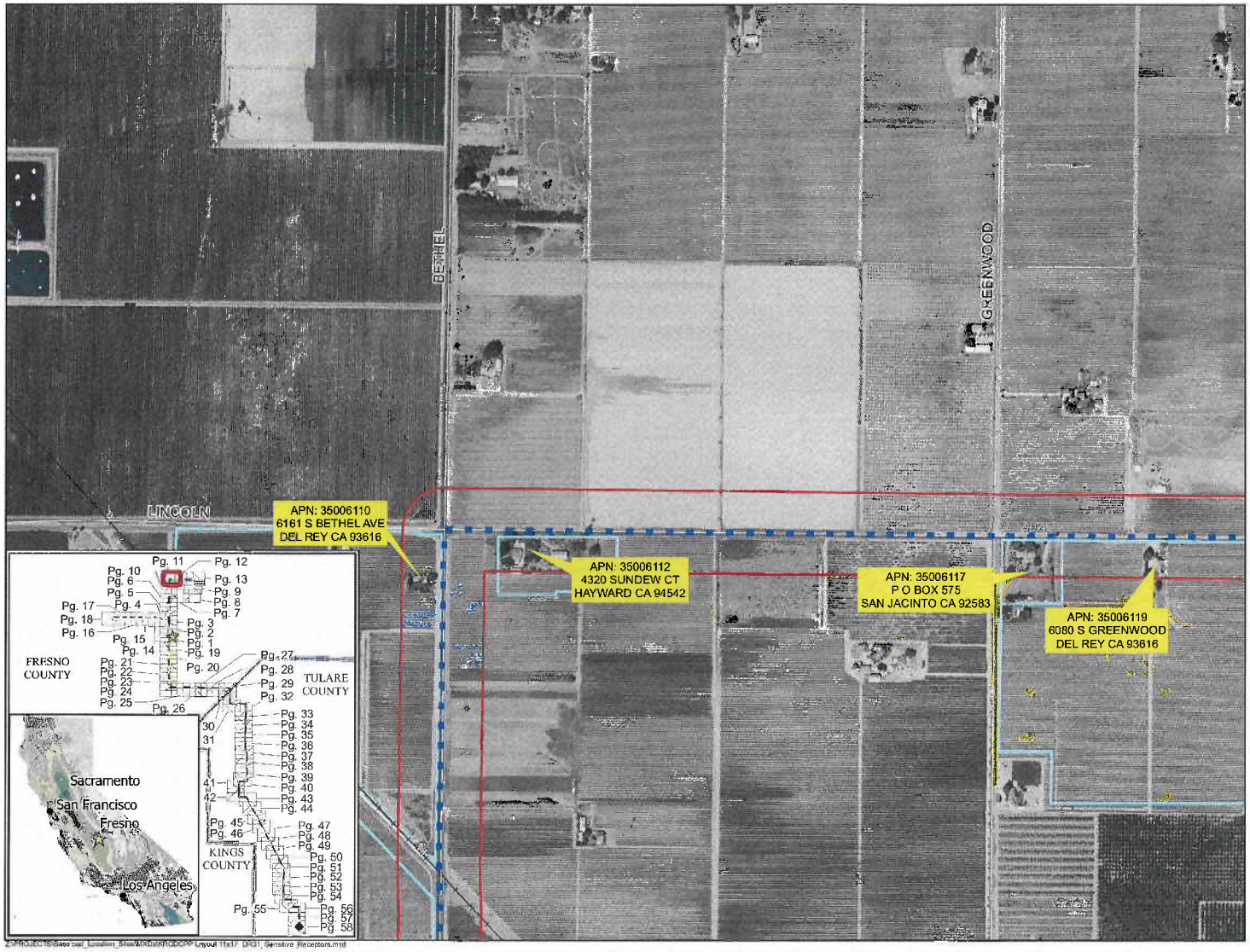
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

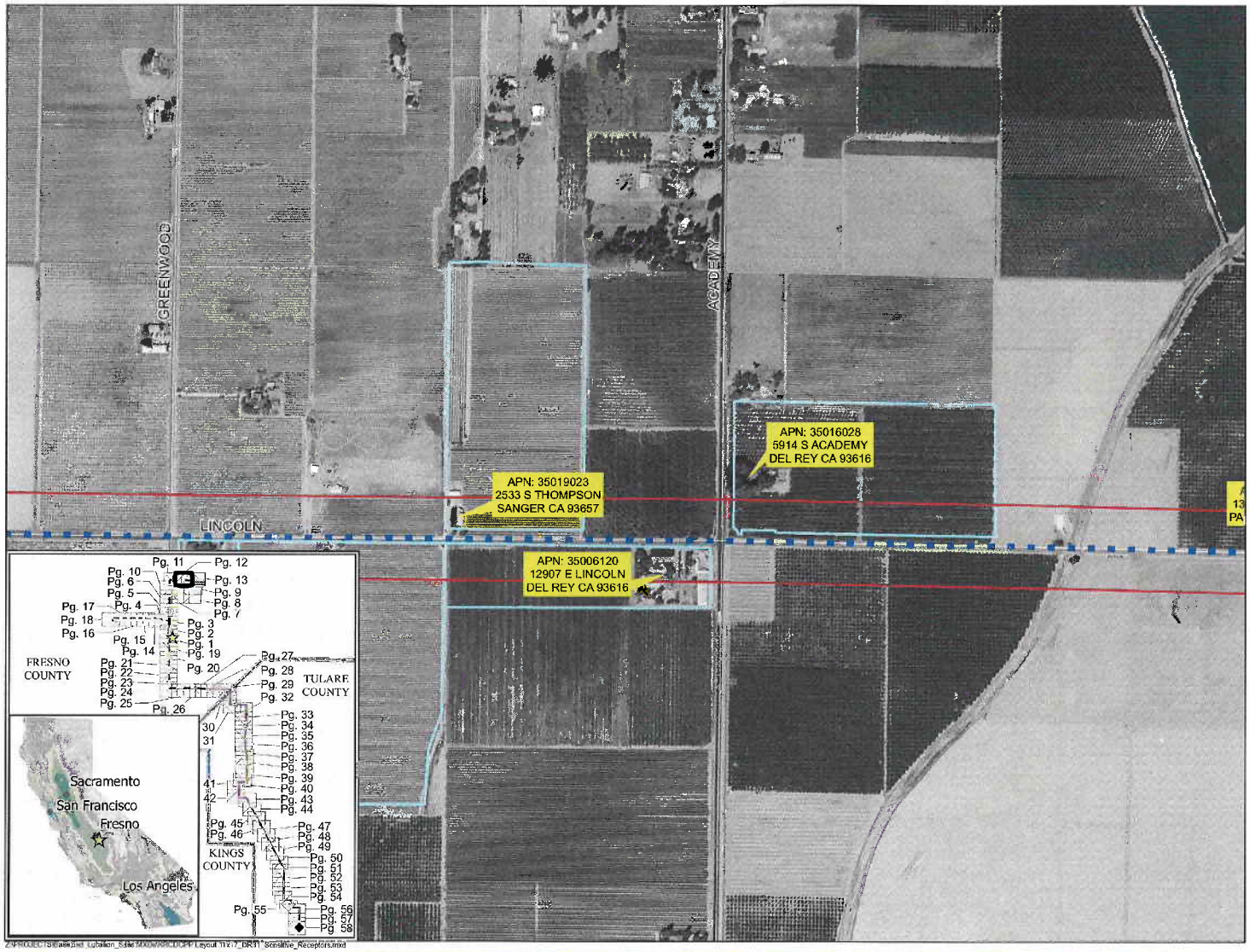
Page: 11 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

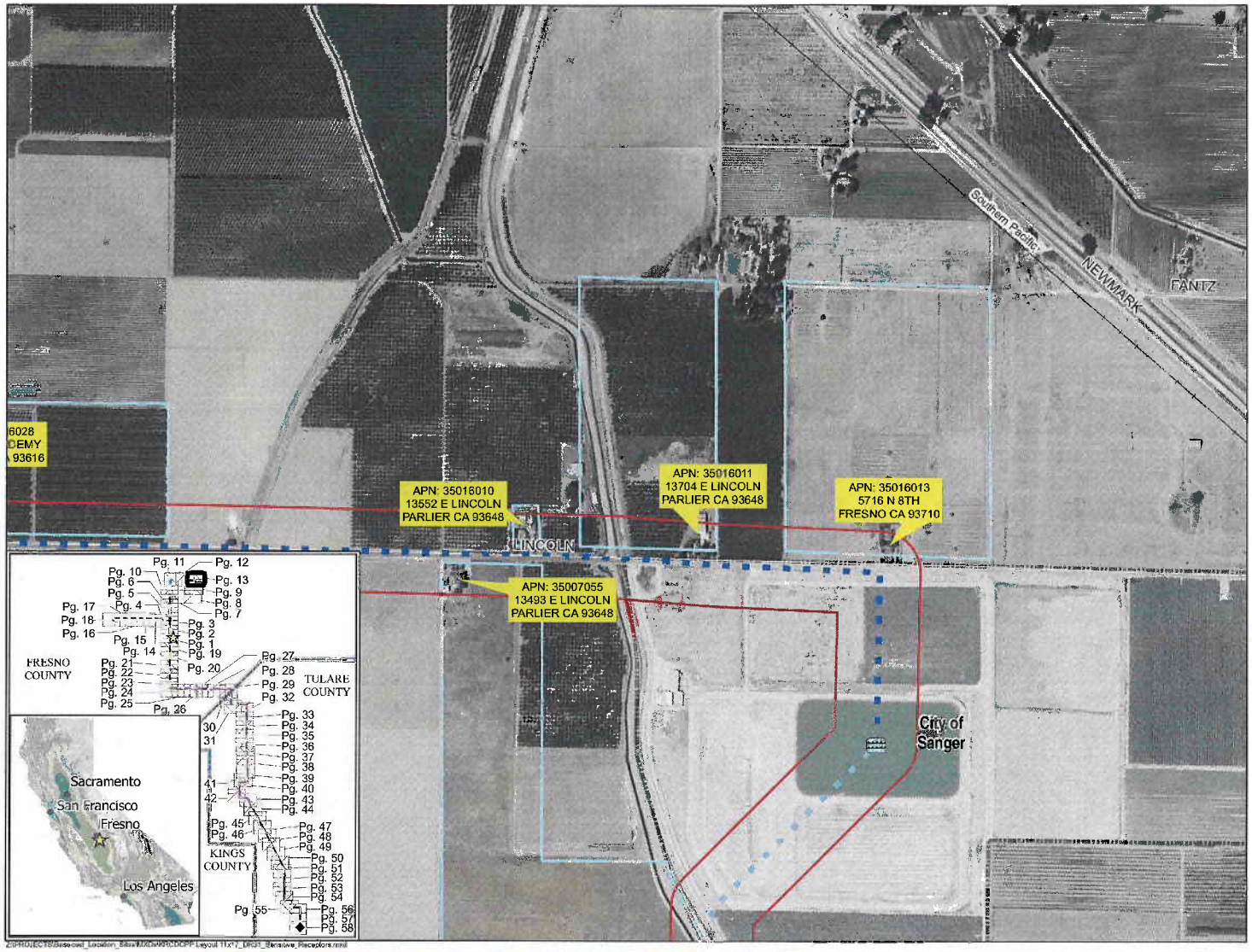
Page: 12 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

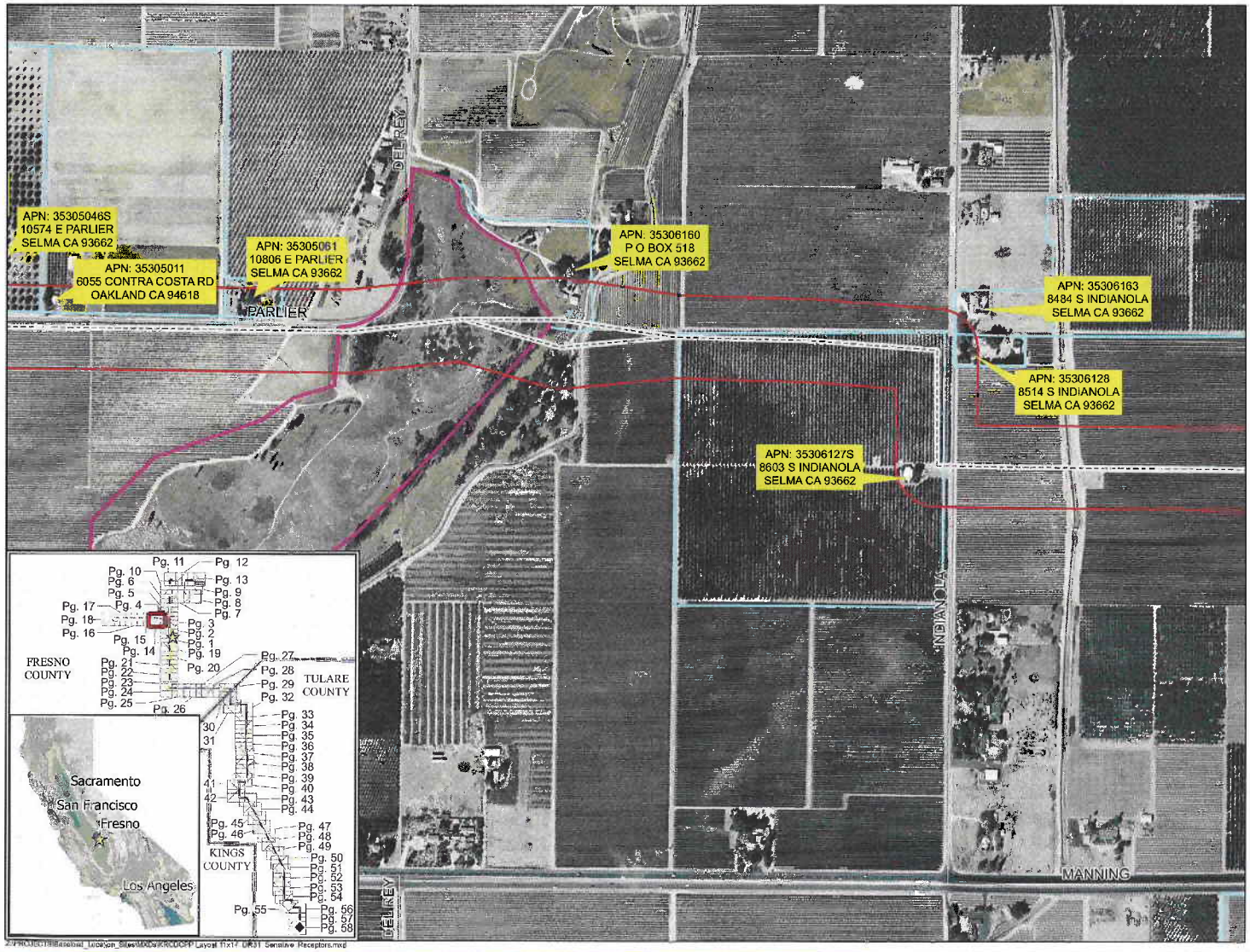
Page: 13 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 14 of 58

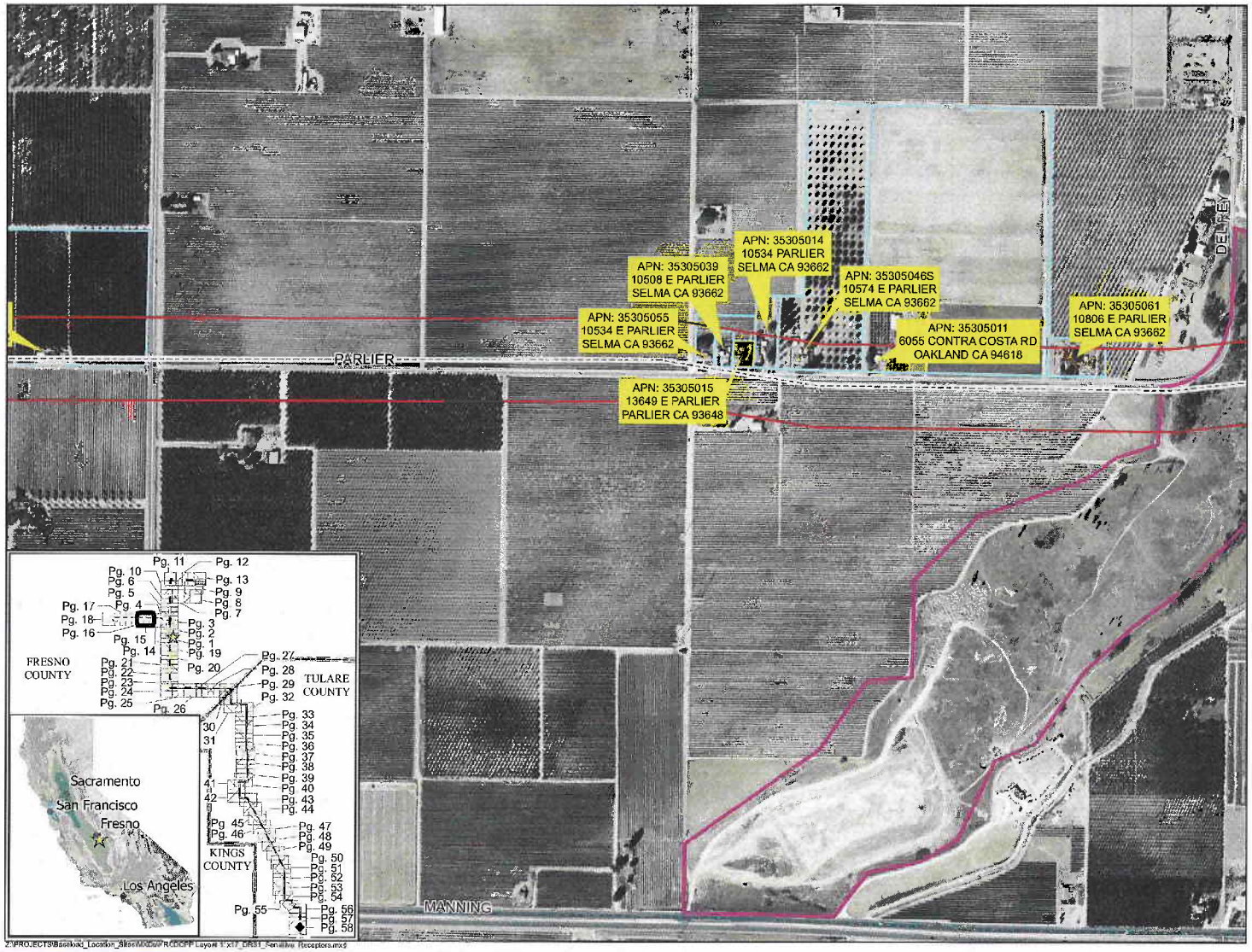
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

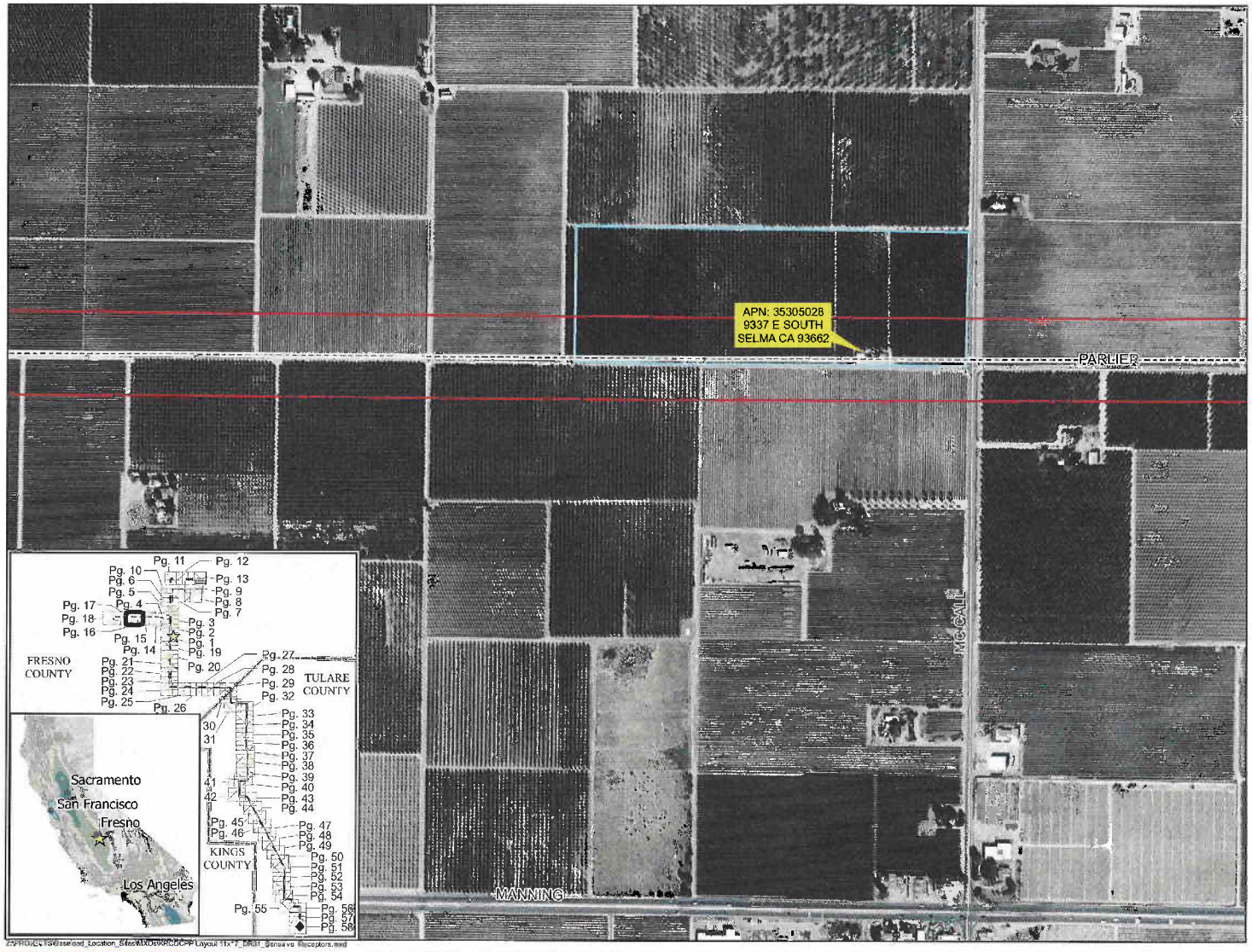
Page: 15 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

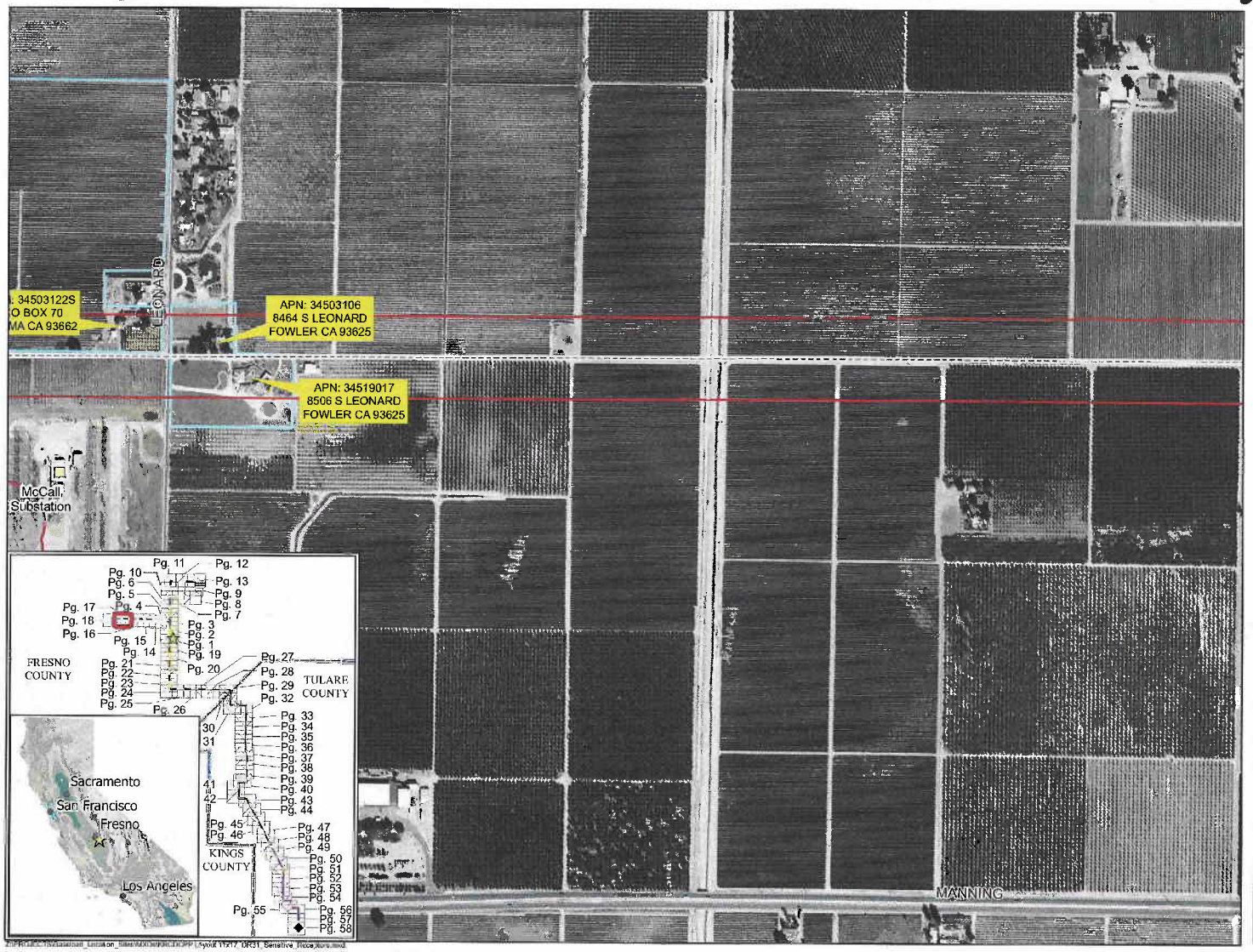
Page: 16 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

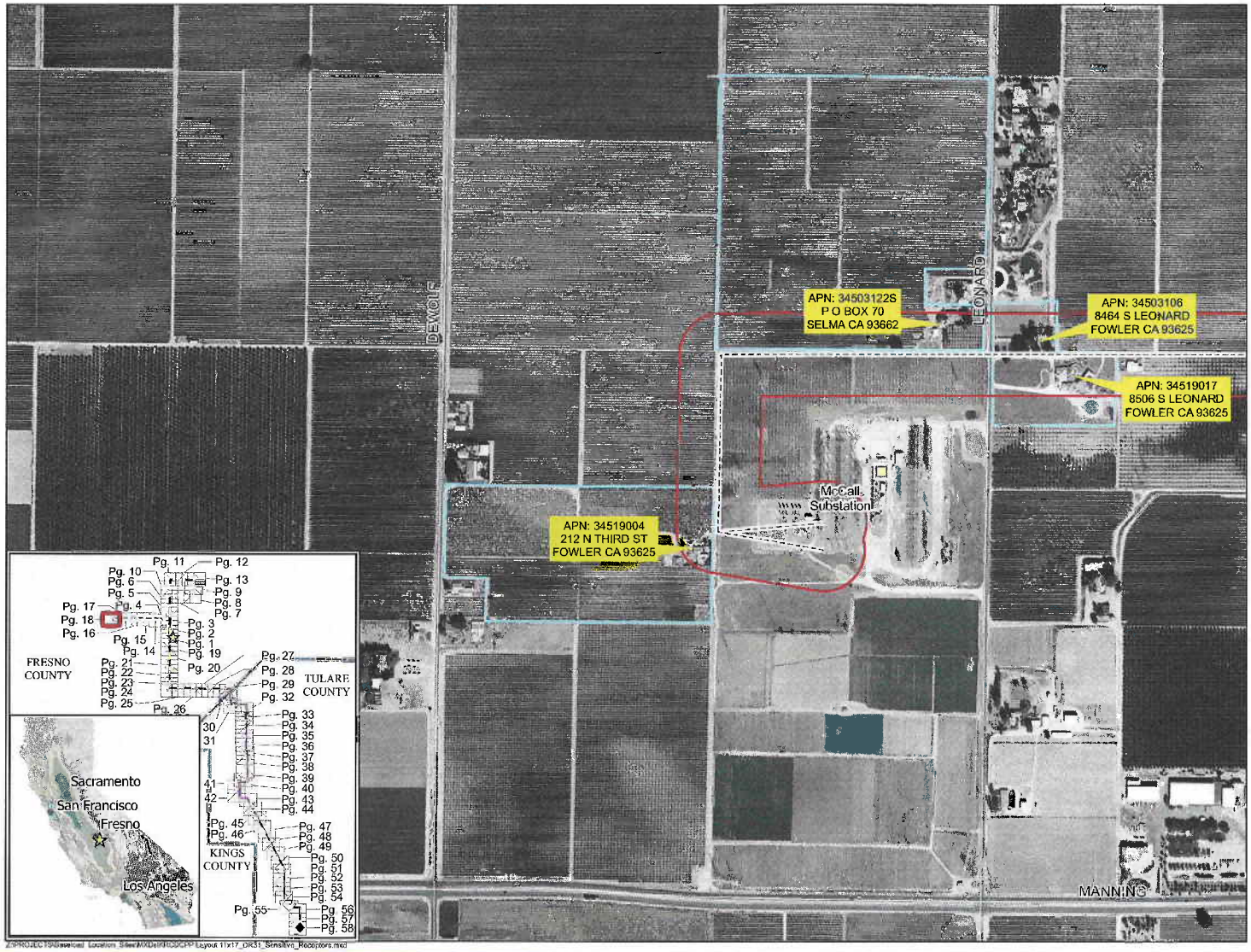
Page: 17 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 18 of 58

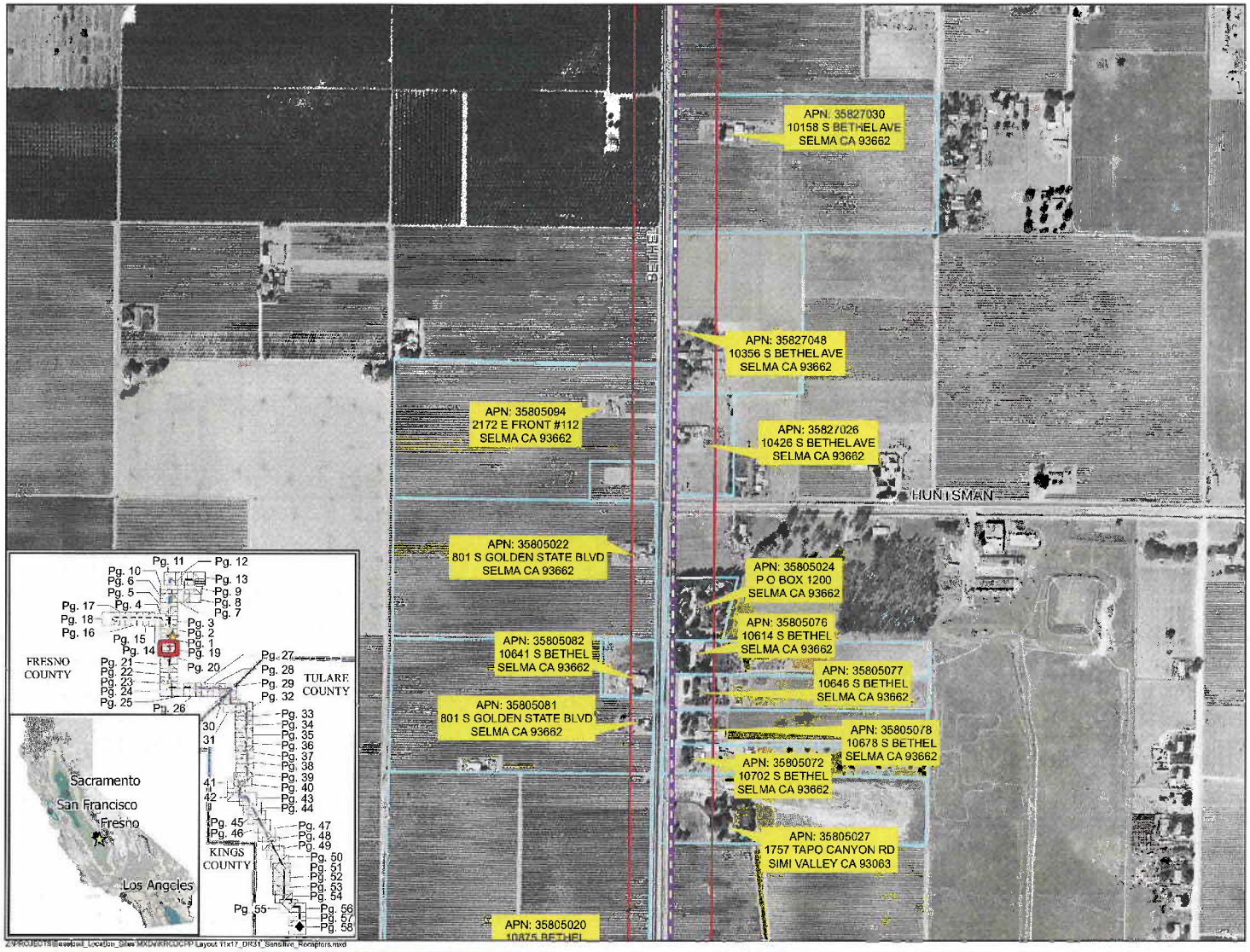
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

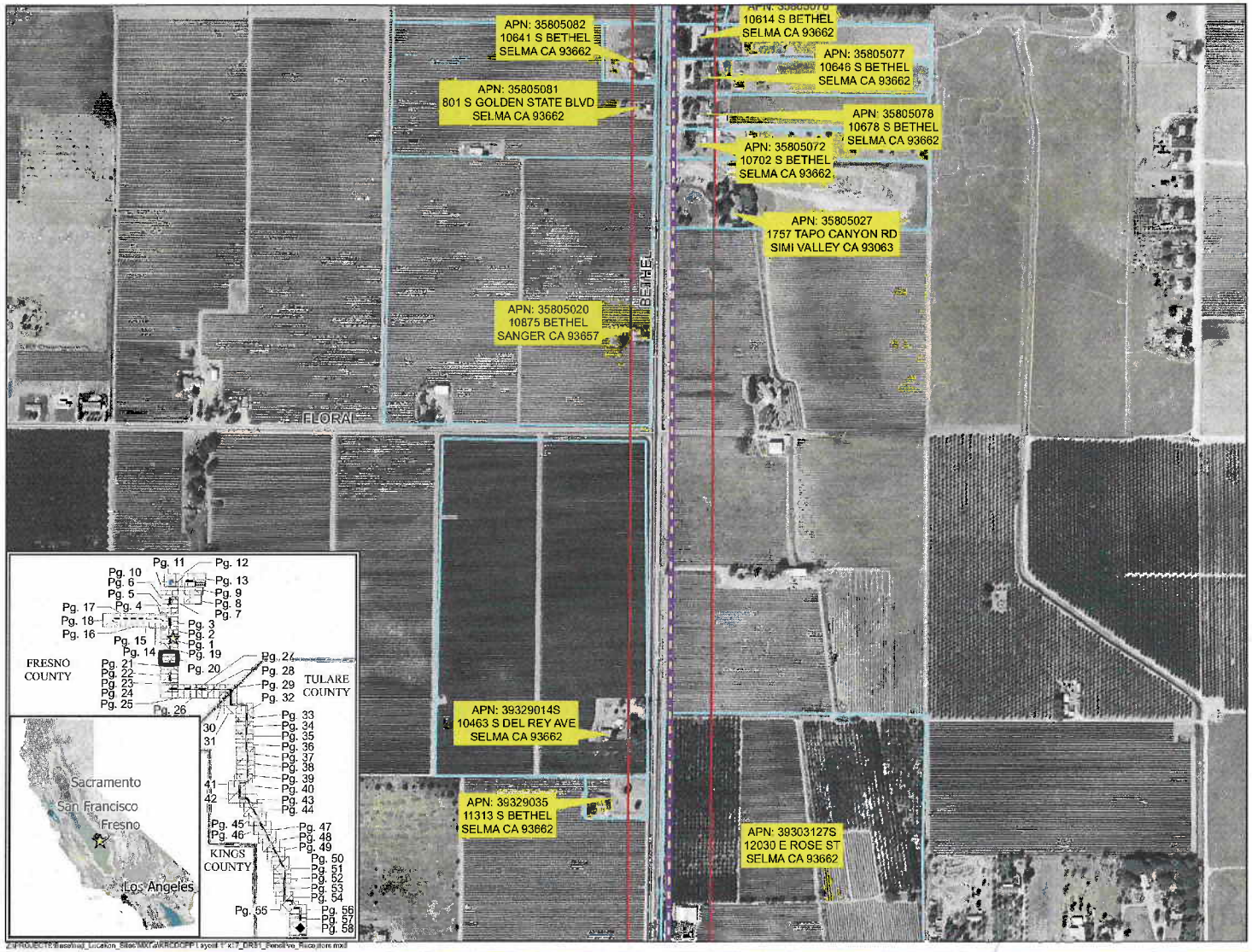
Page: 19 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

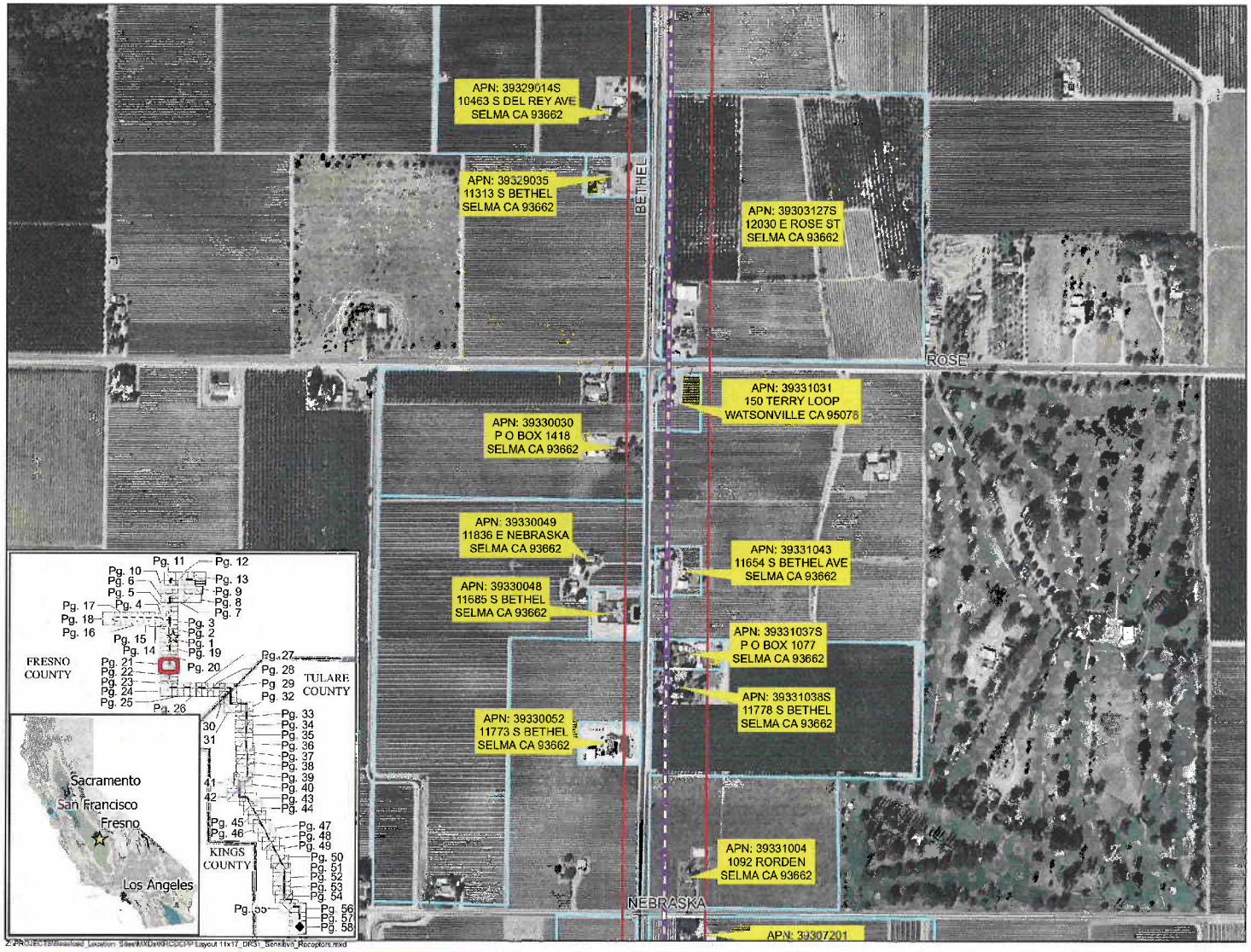
Page: 20 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

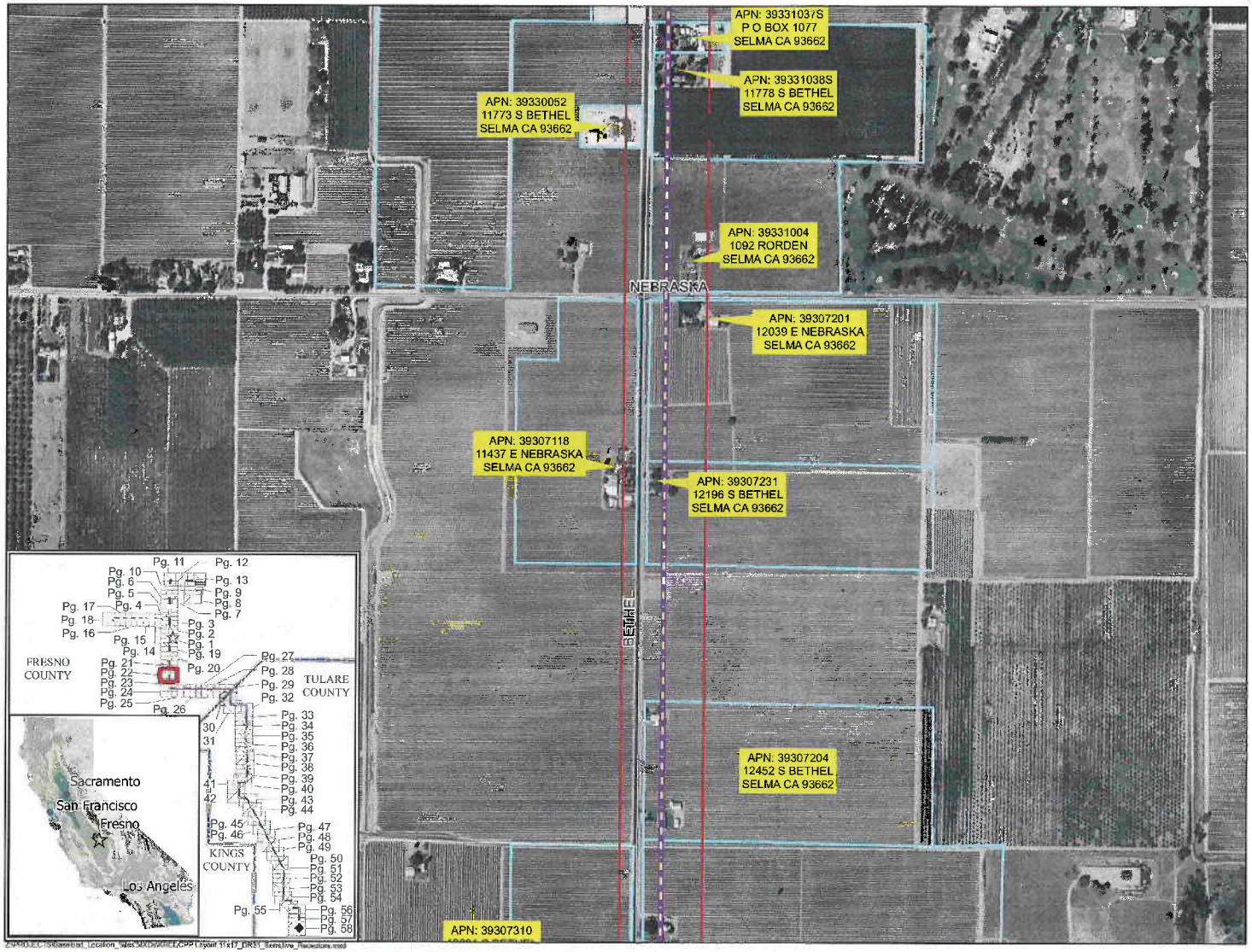
Page: 21 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 22 of 58

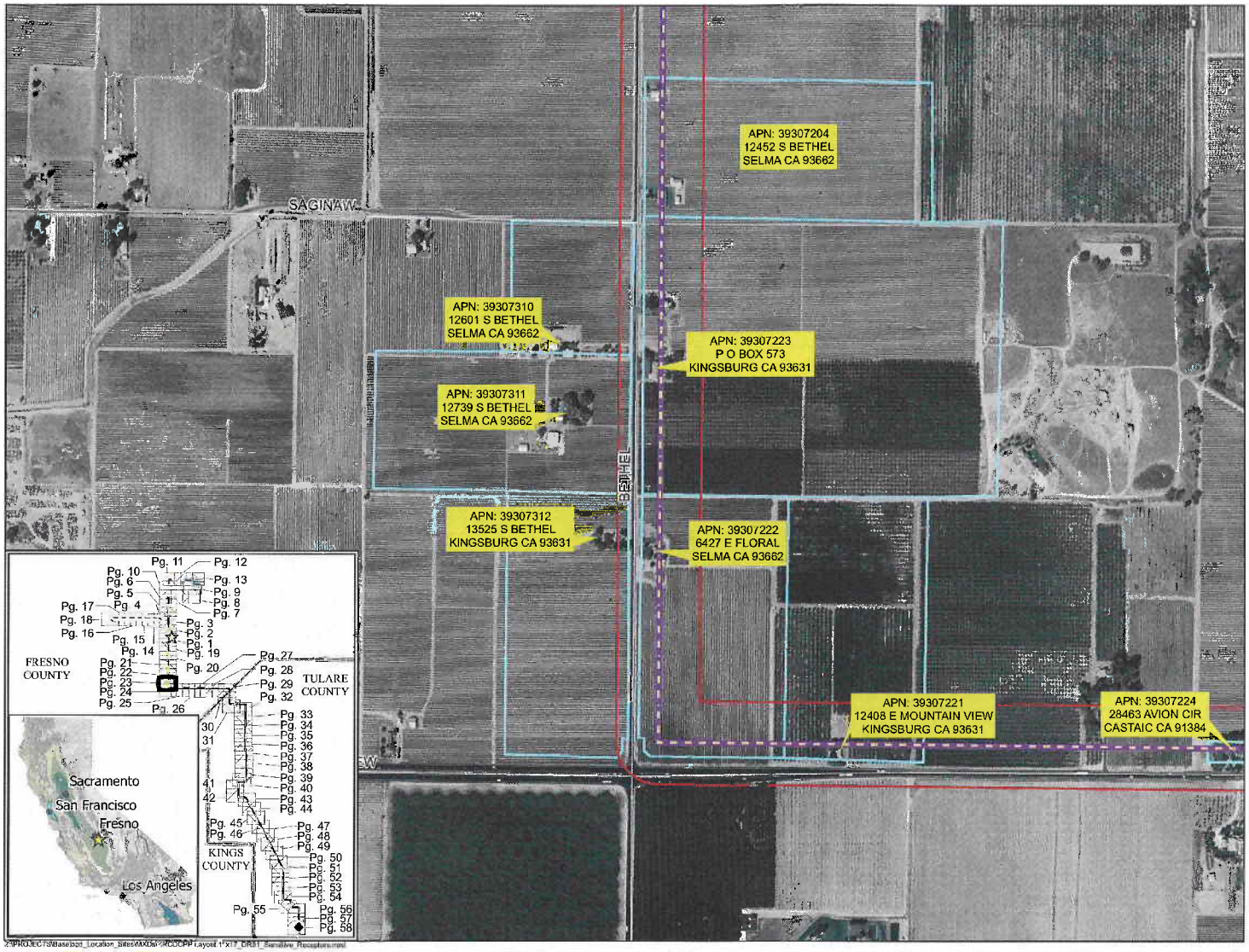
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 23 of 58

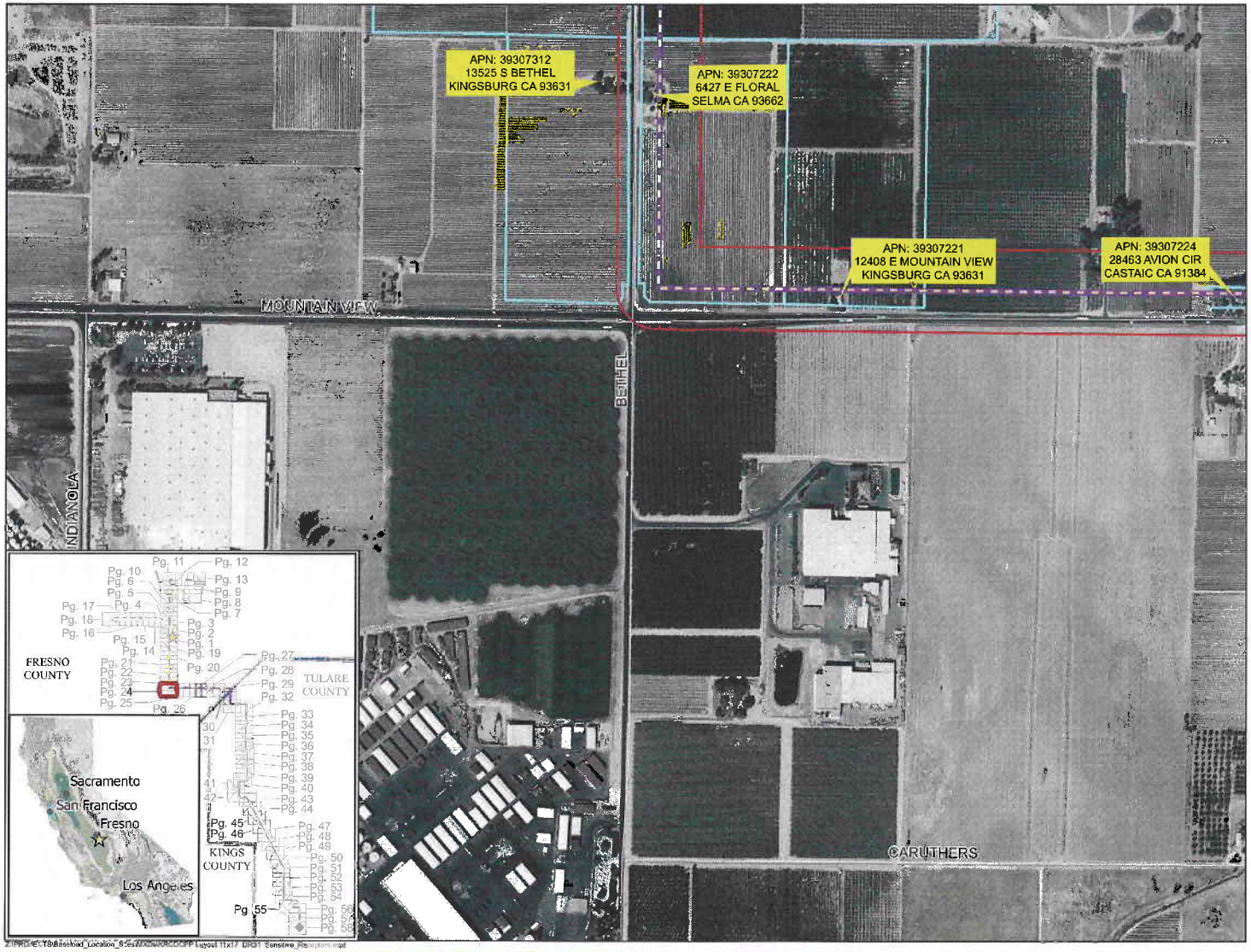
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

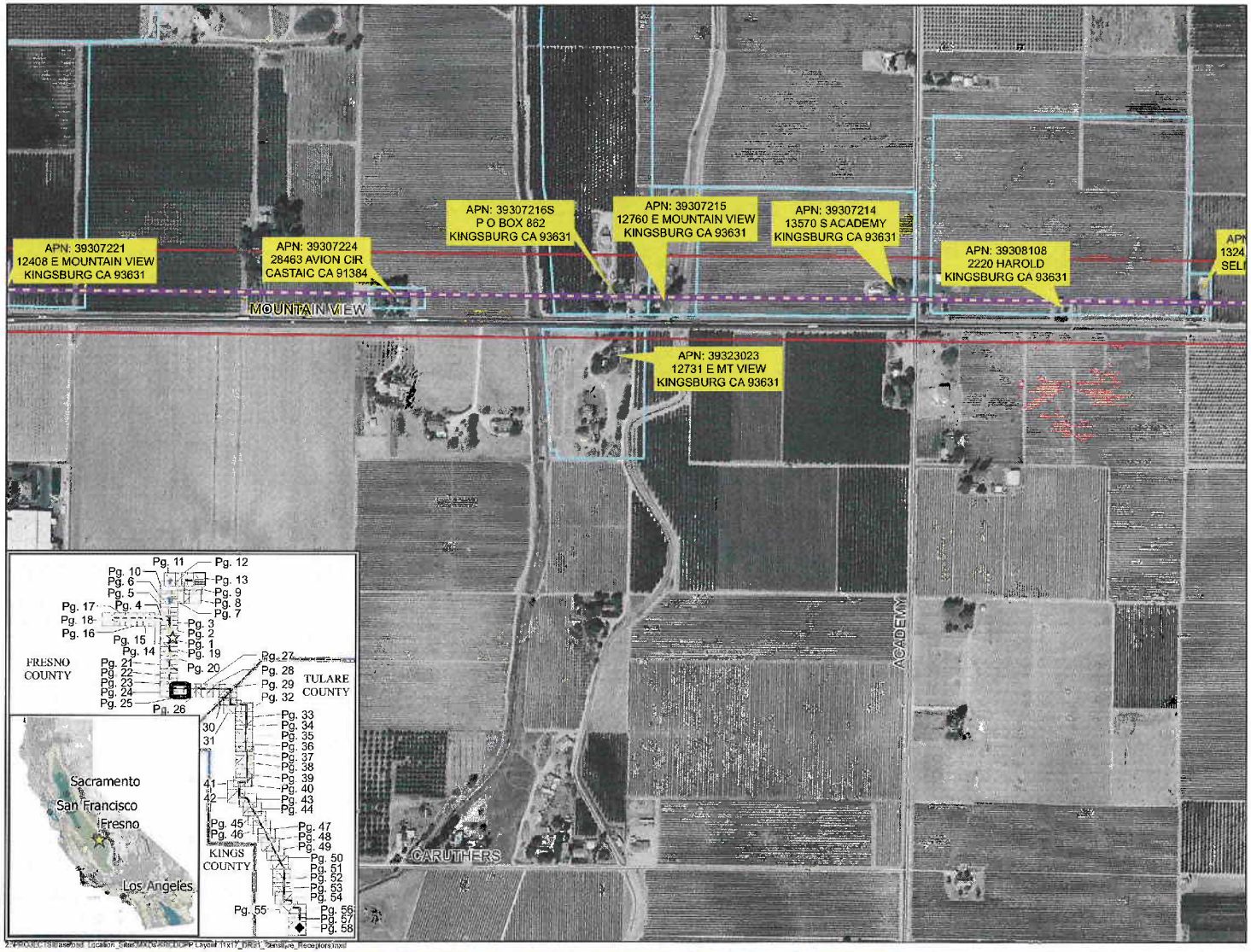
Page: 24 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

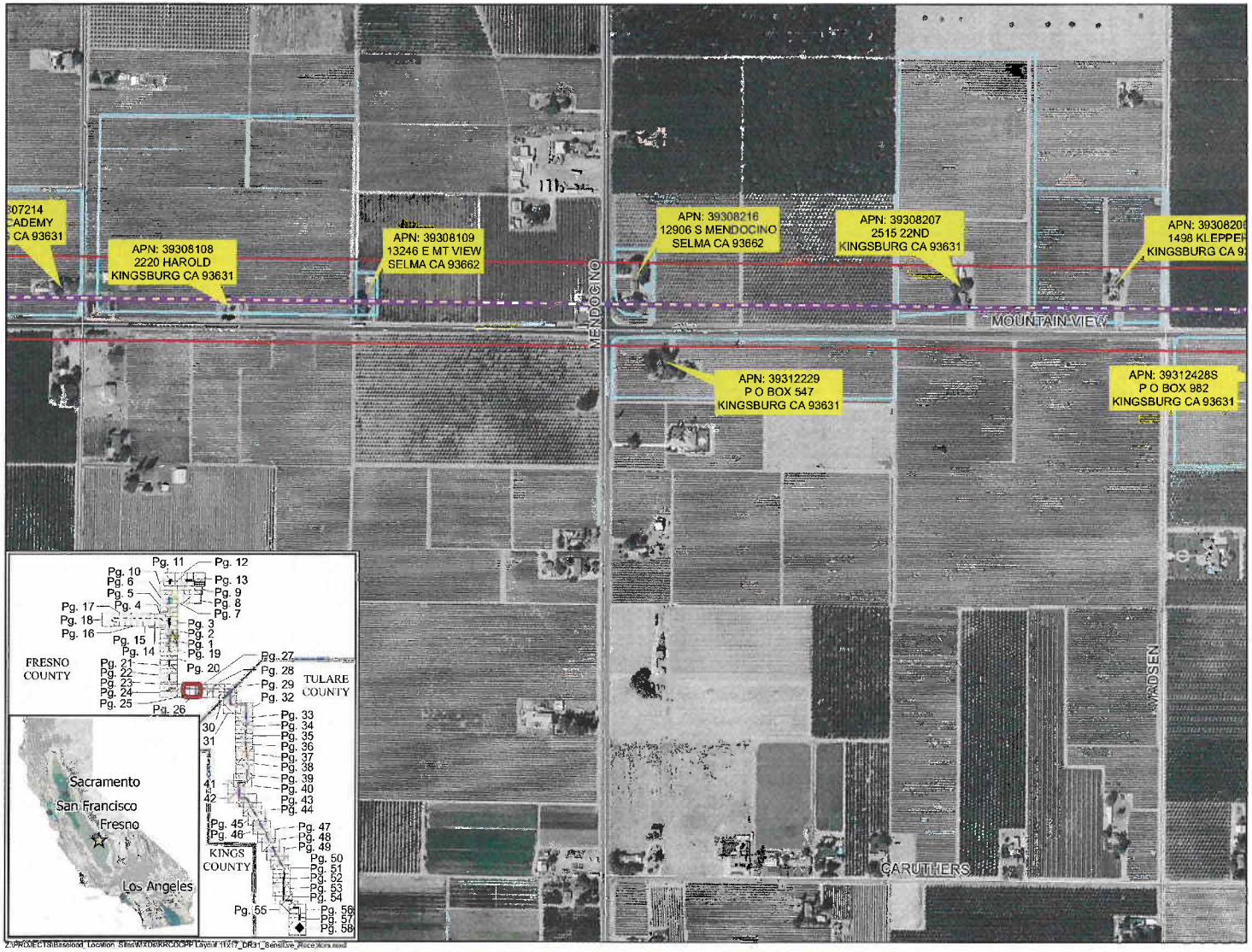
Page: 25 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

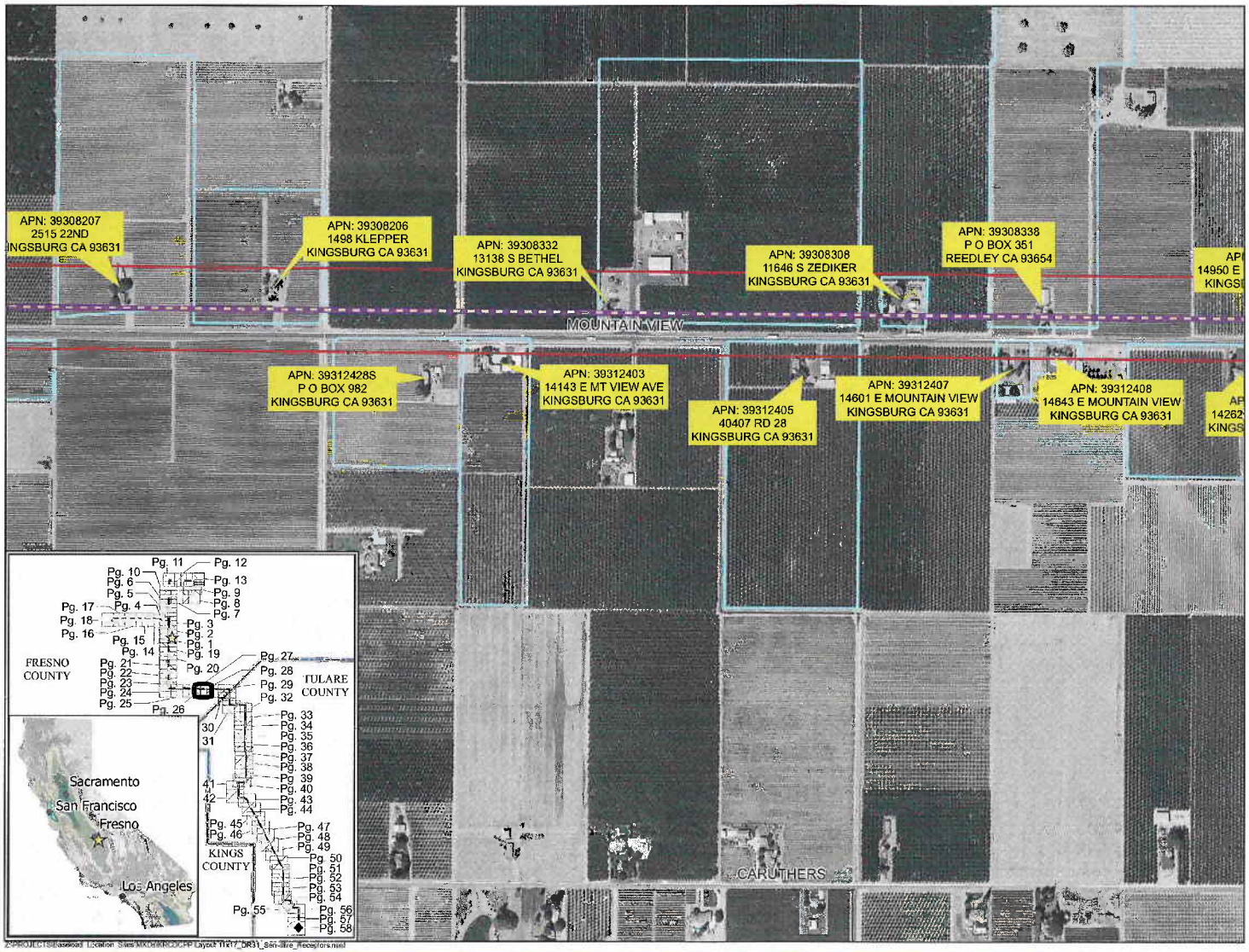
Page: 26 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 27 of 58

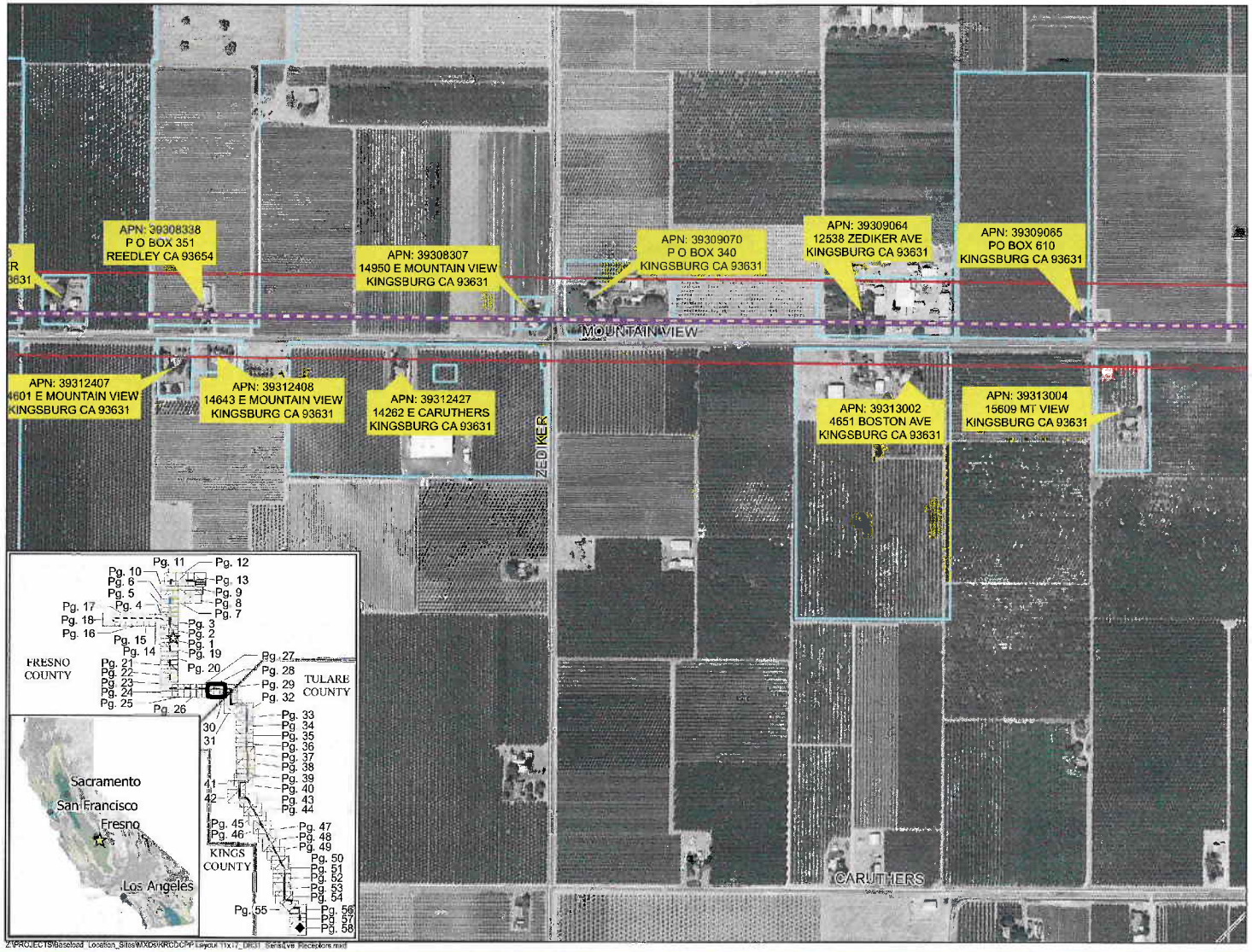
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 28 of 58

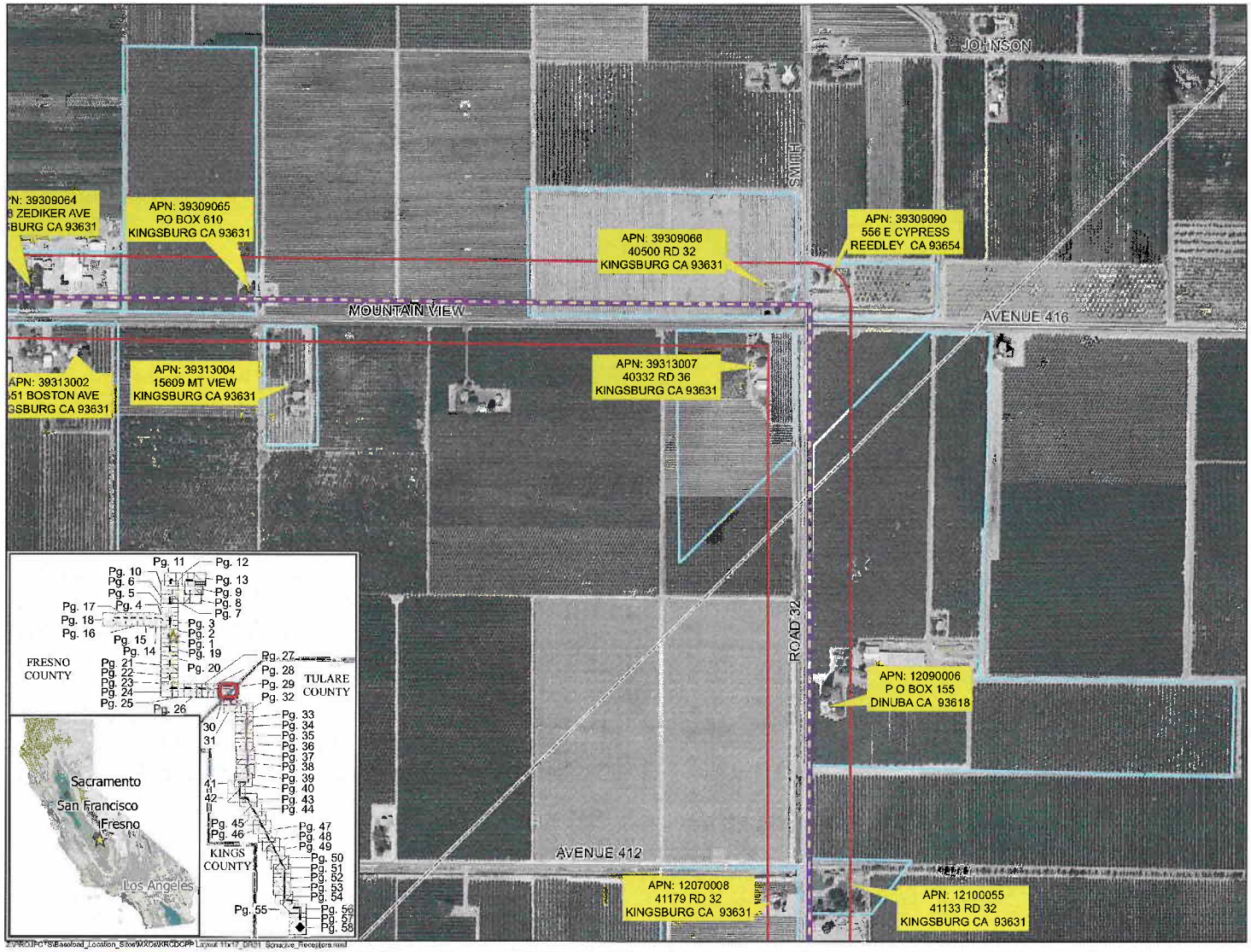
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

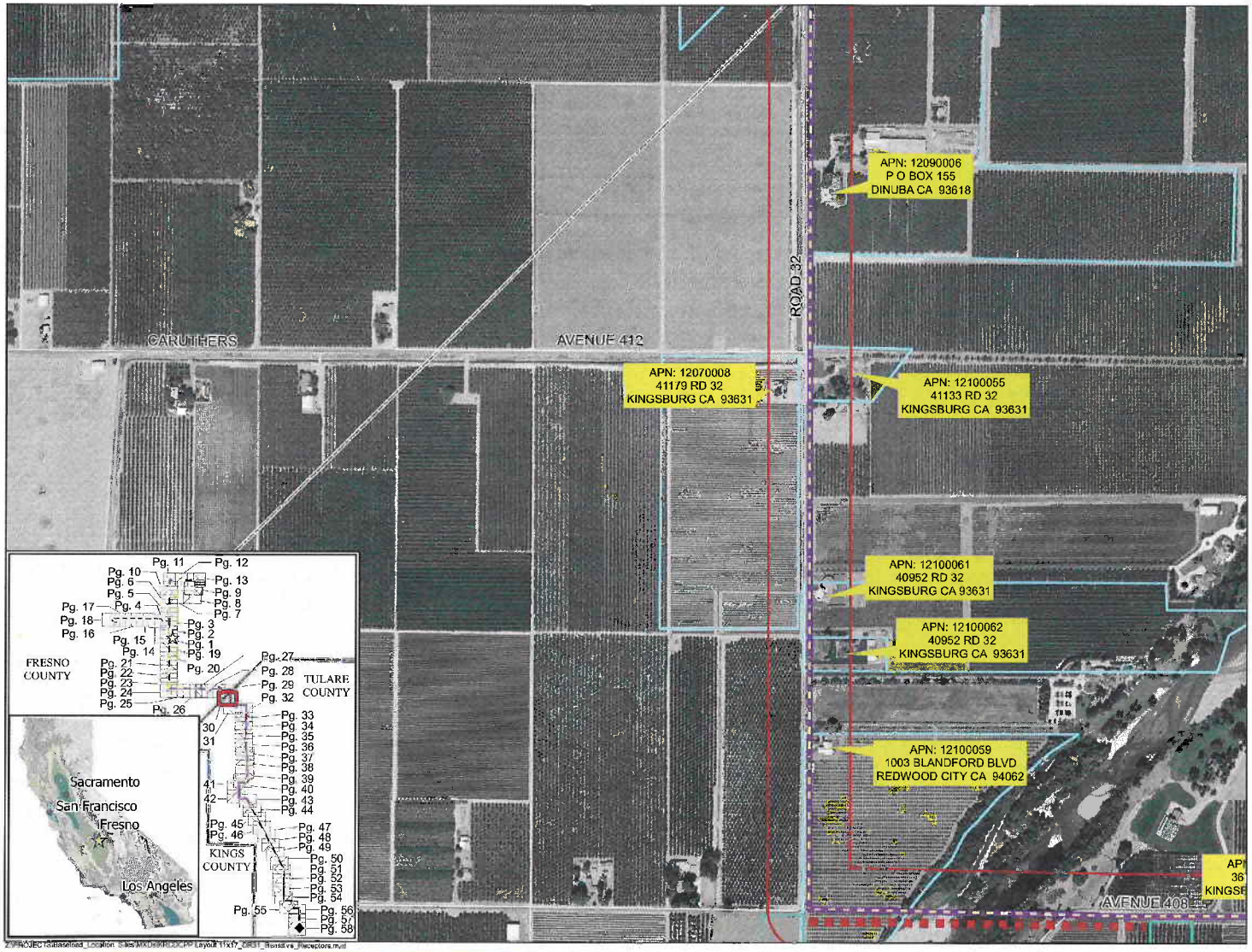
Page: 29 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 30 of 58

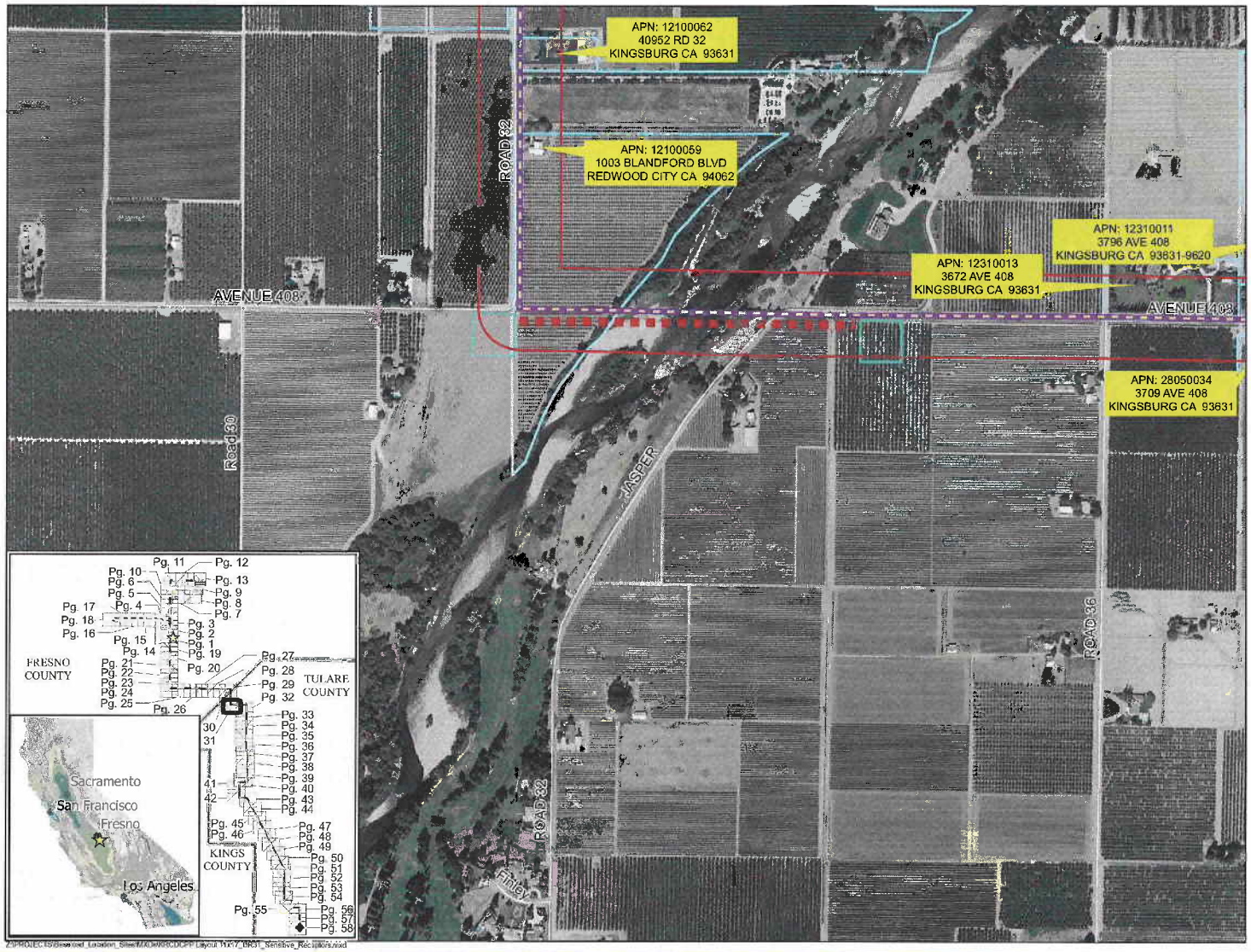
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

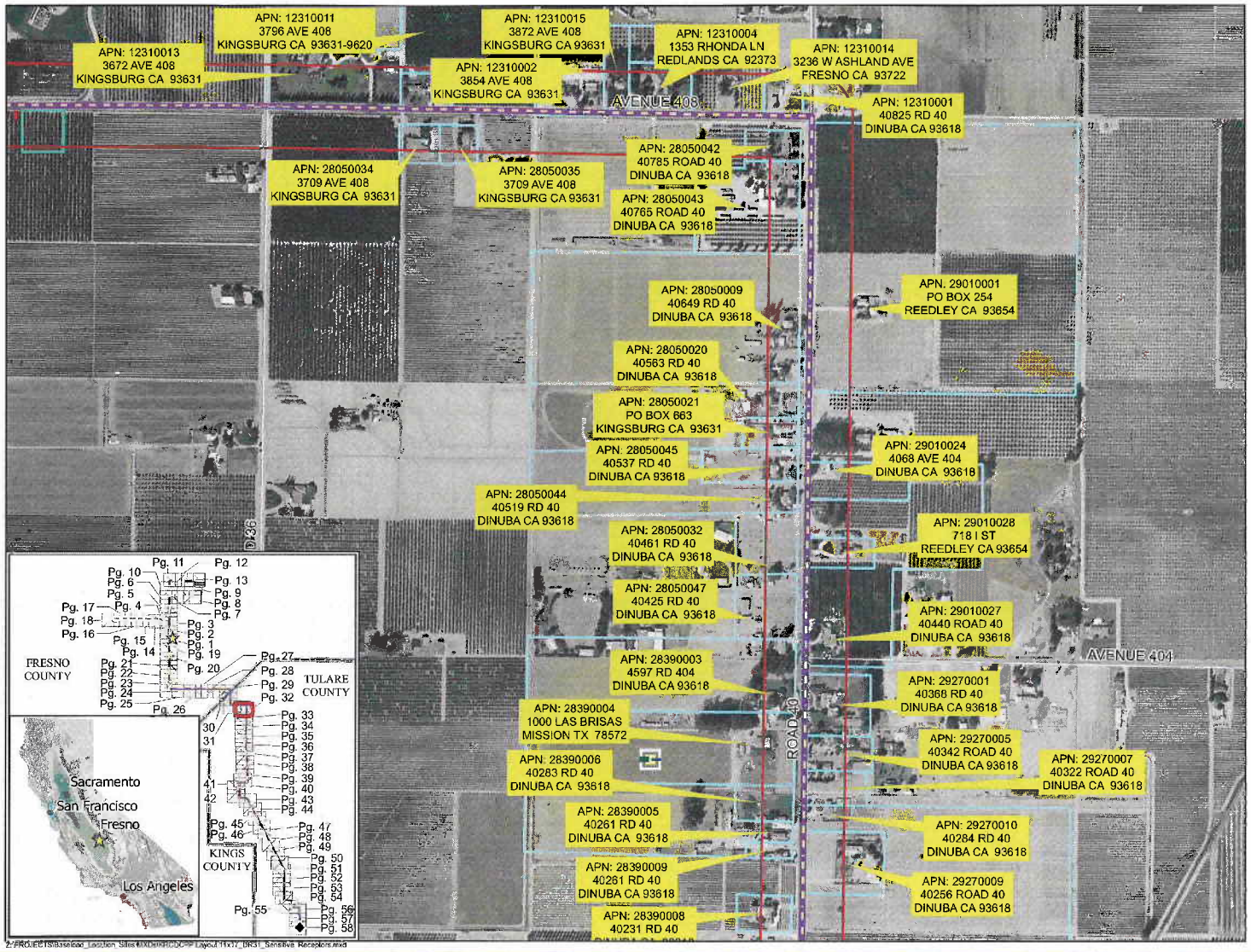
Page: 31 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 32 of 58

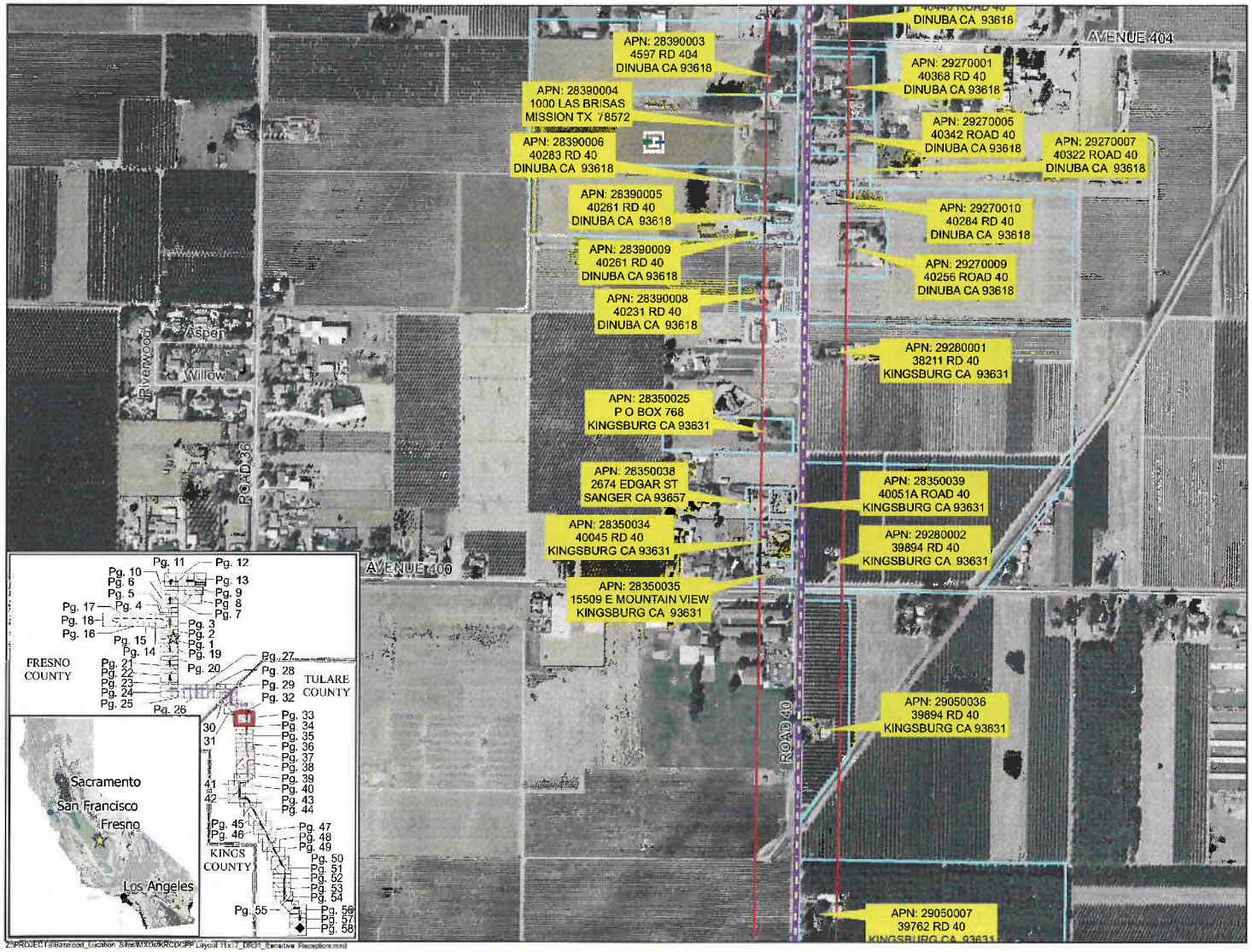
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Z:\PROJECTS\Baseload_Location_Sites\MXD\KRCDC\Layout\11x17_BR31_Sensitive_Receptors.mxd

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

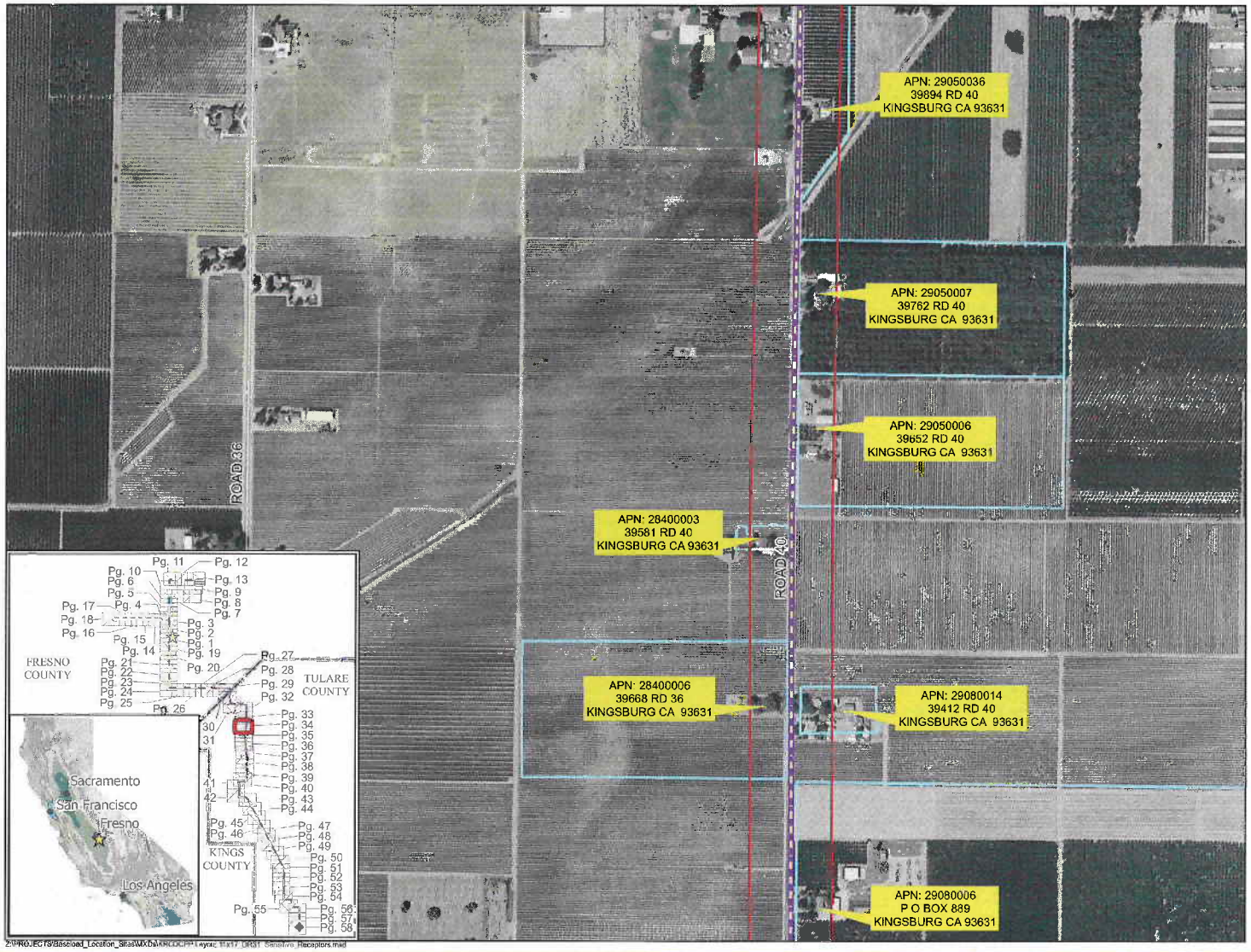
Page: 33 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

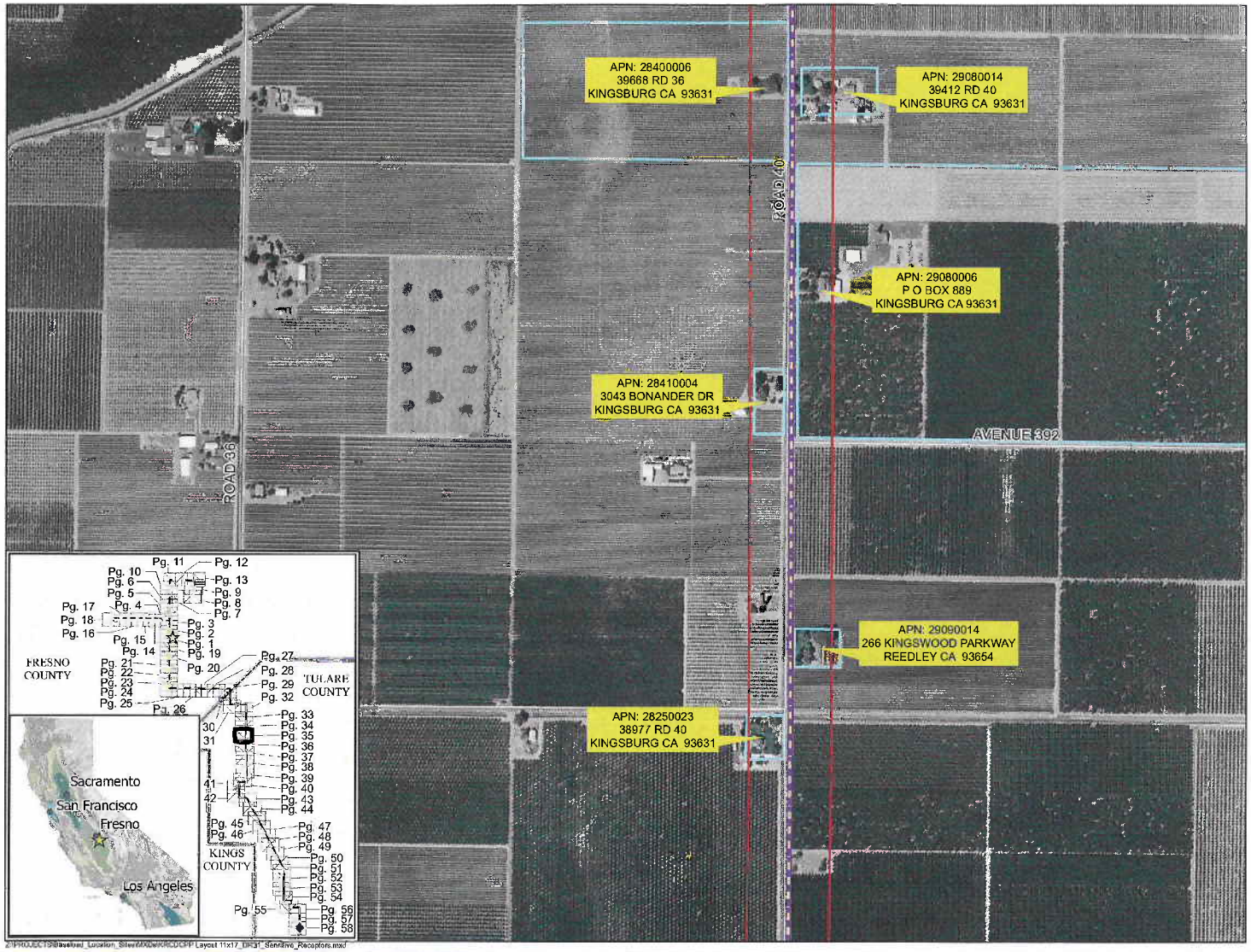
Page: 34 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 35 of 58

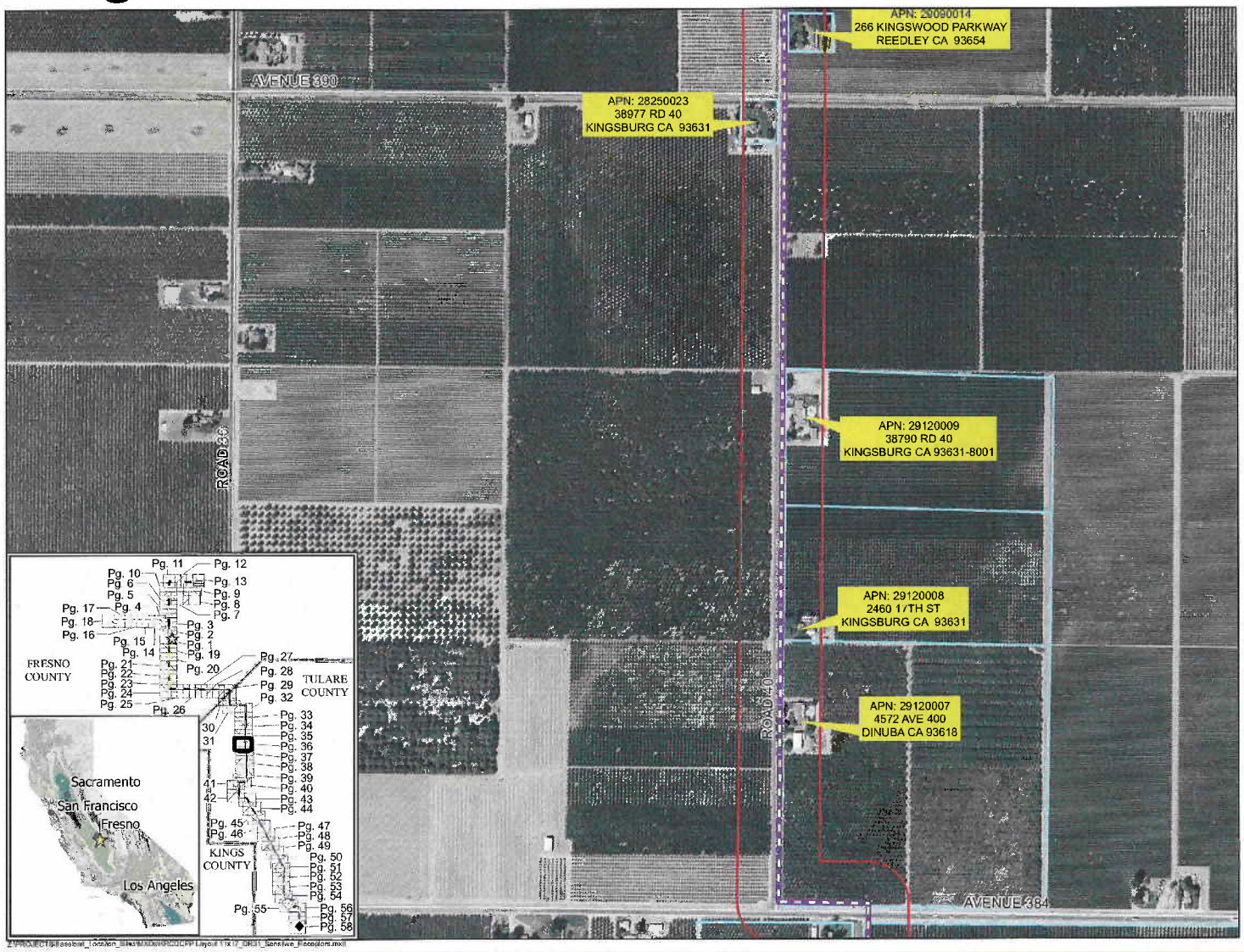
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

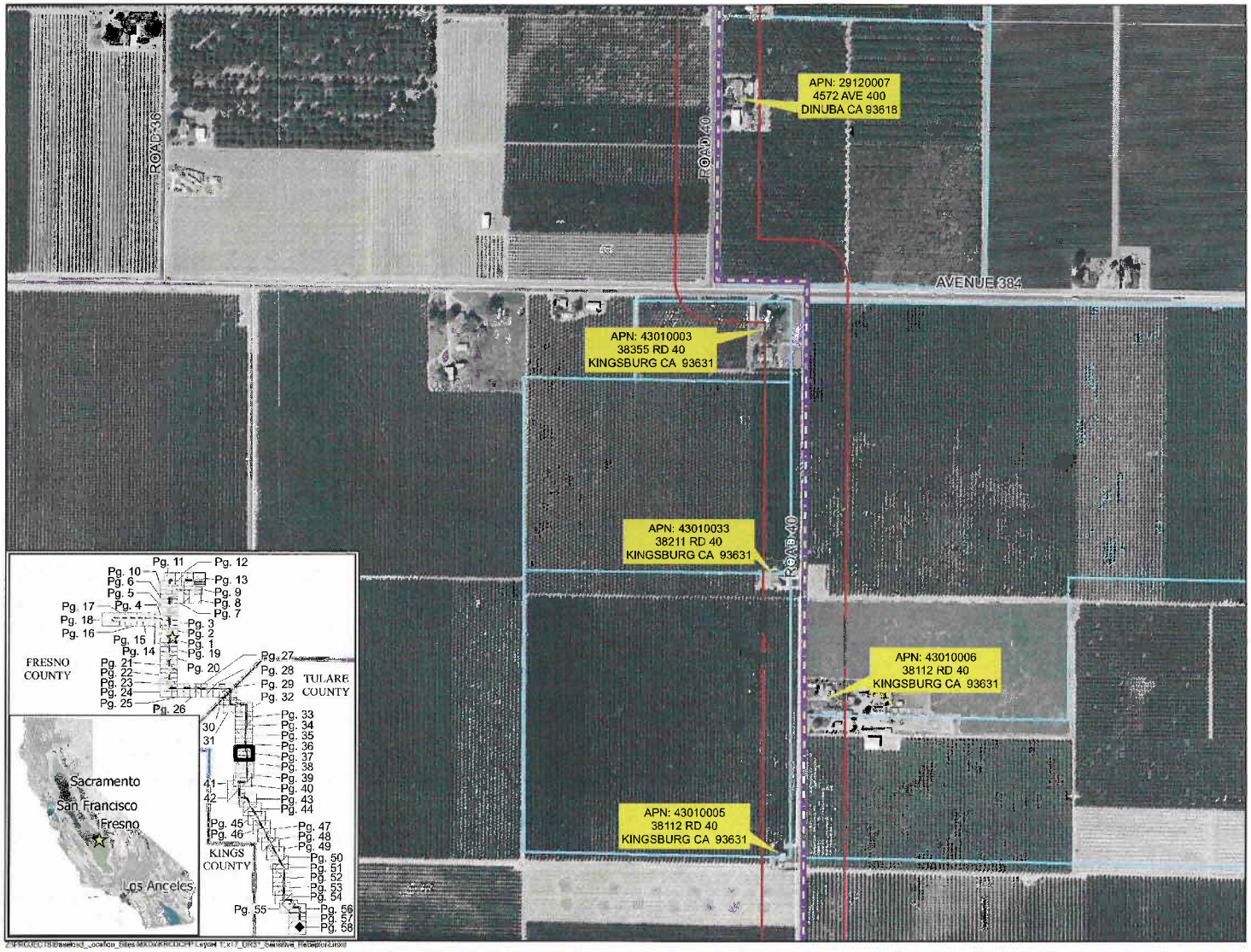
Page: 36 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 37 of 58

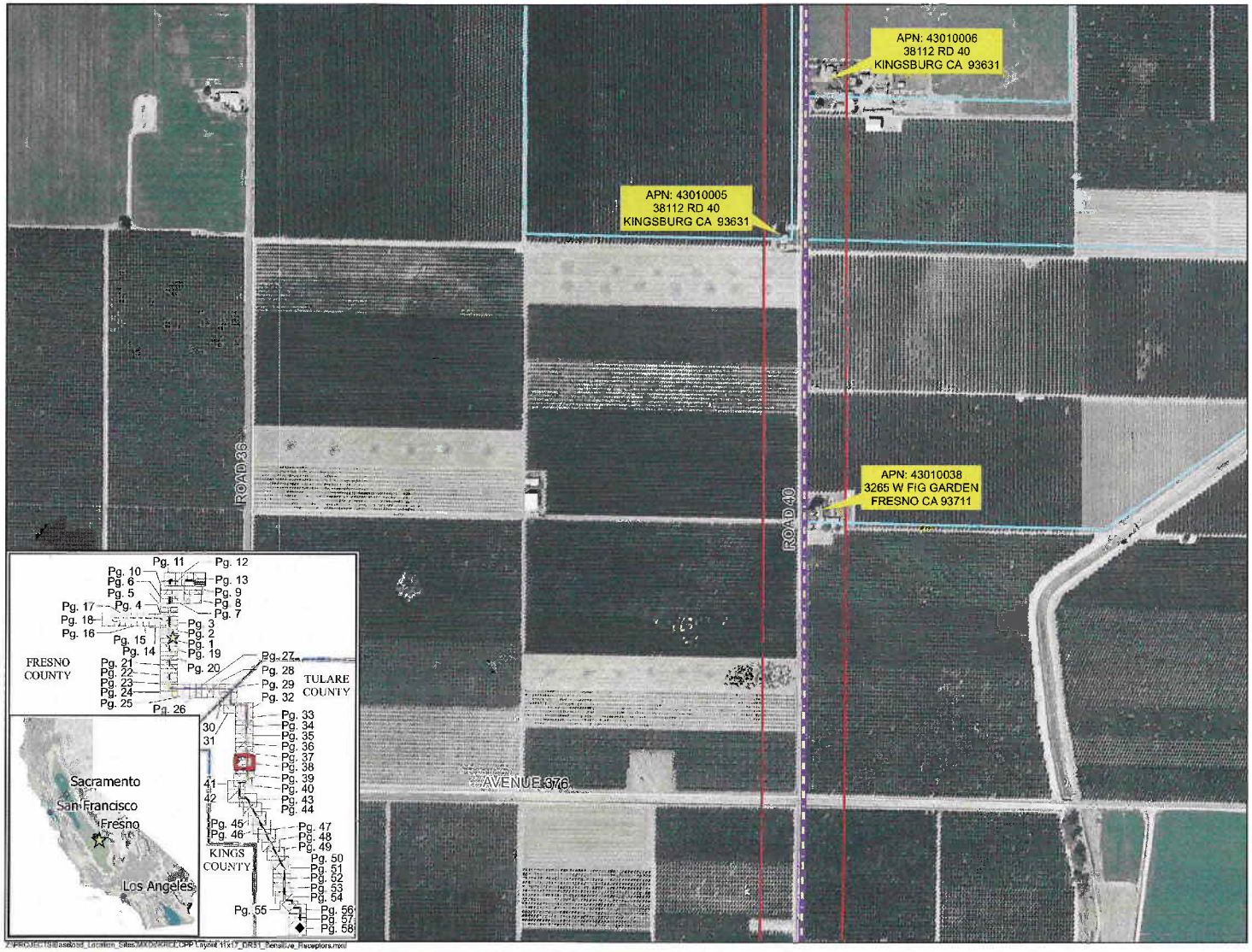
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 38 of 58

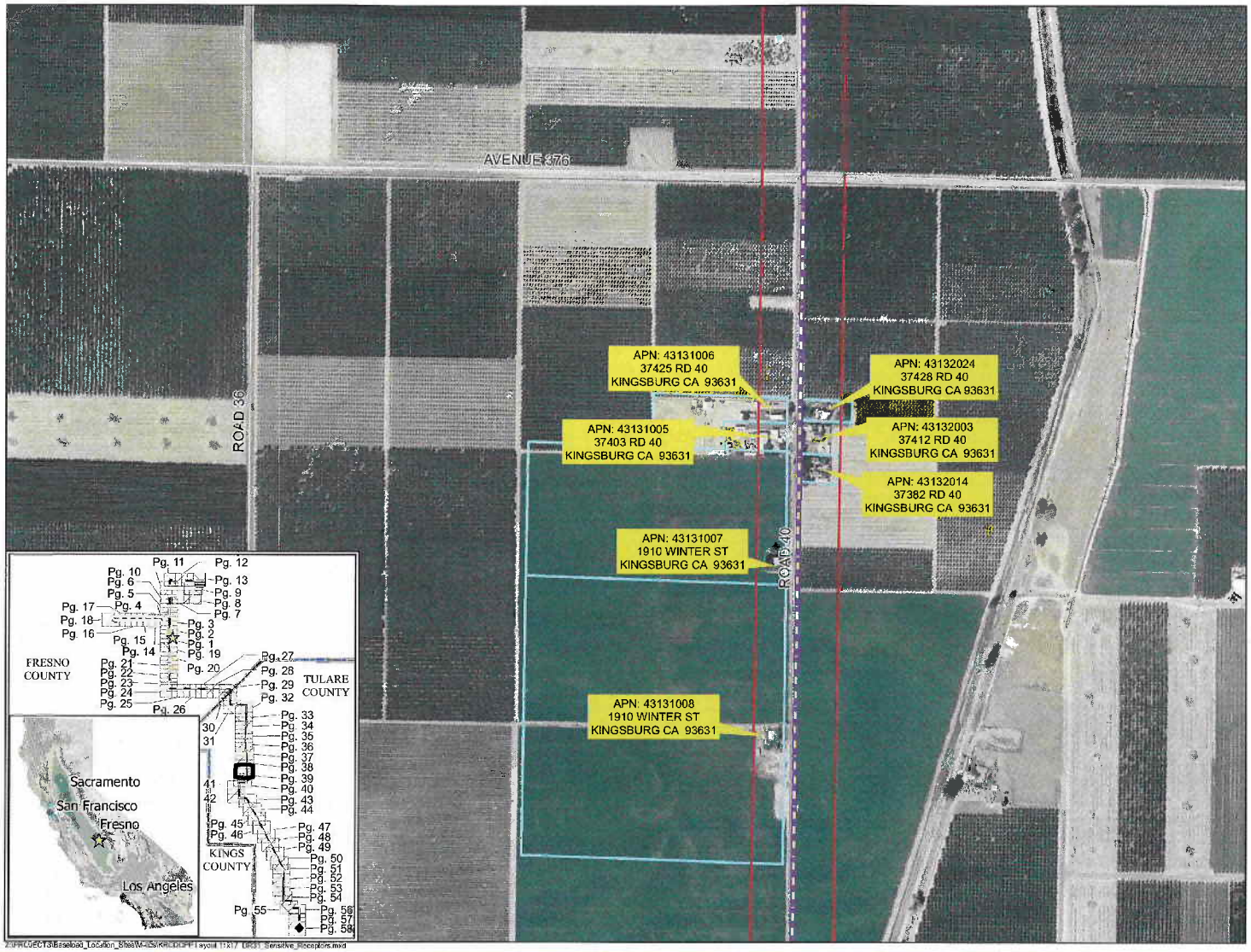
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 39 of 58

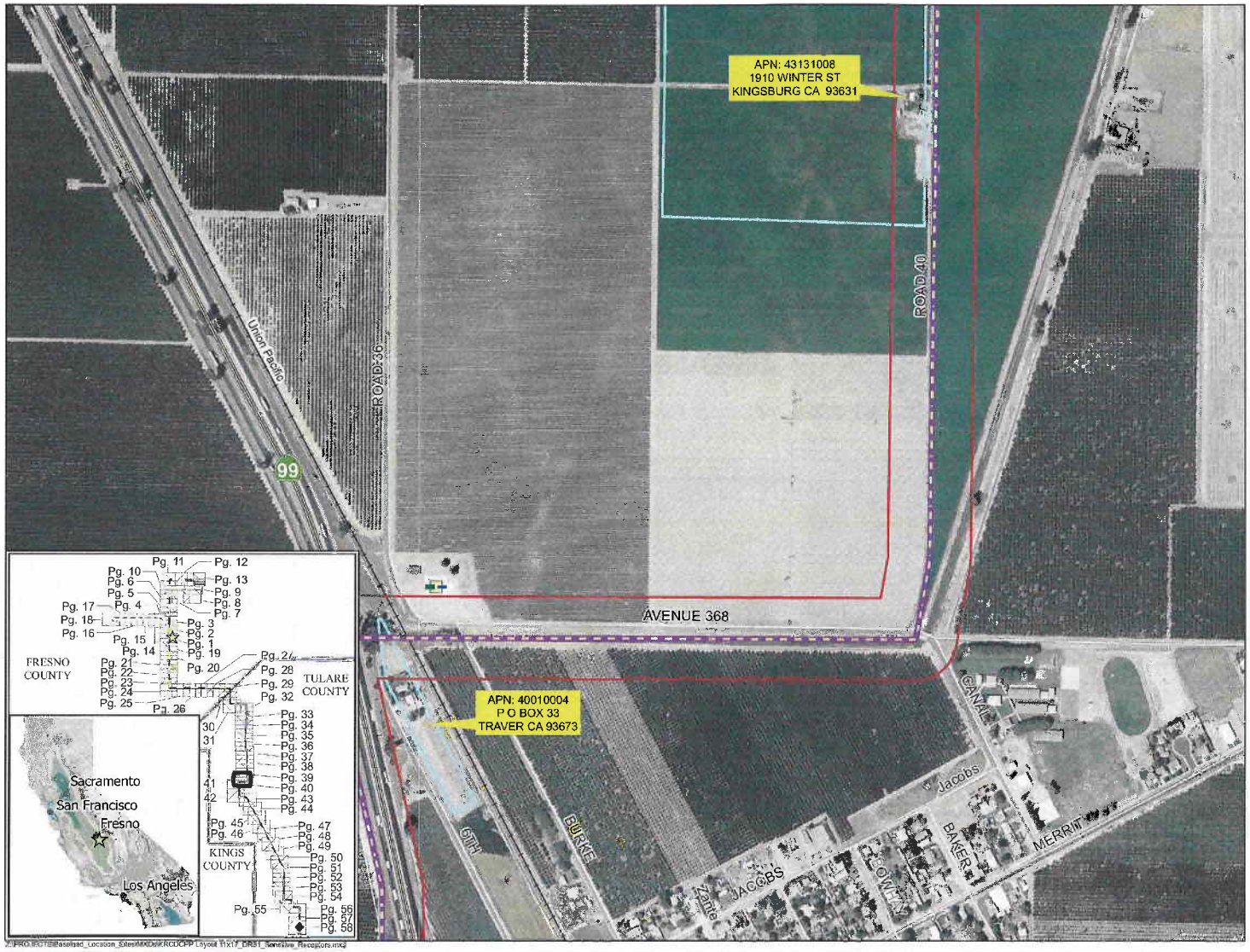
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 40 of 58

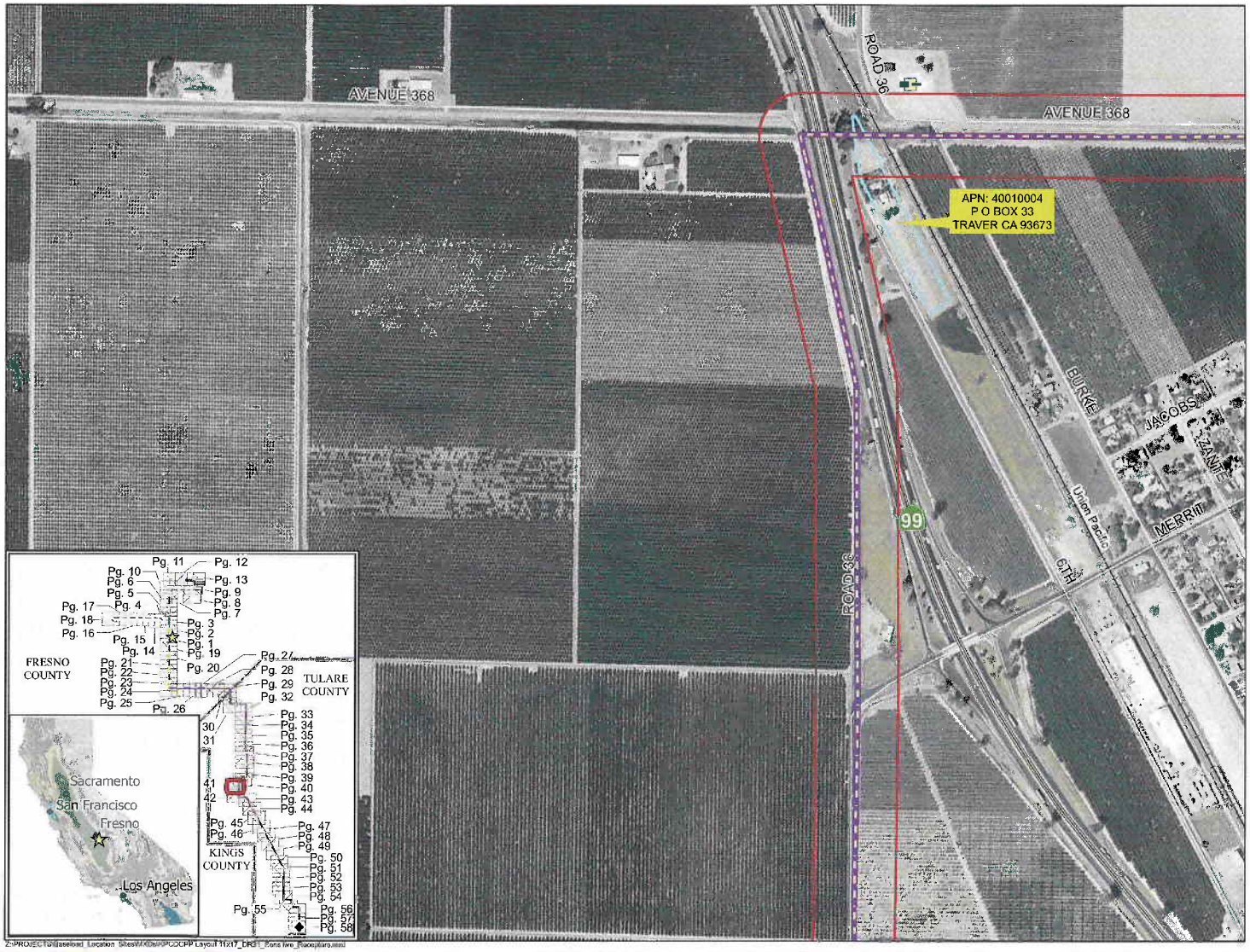
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

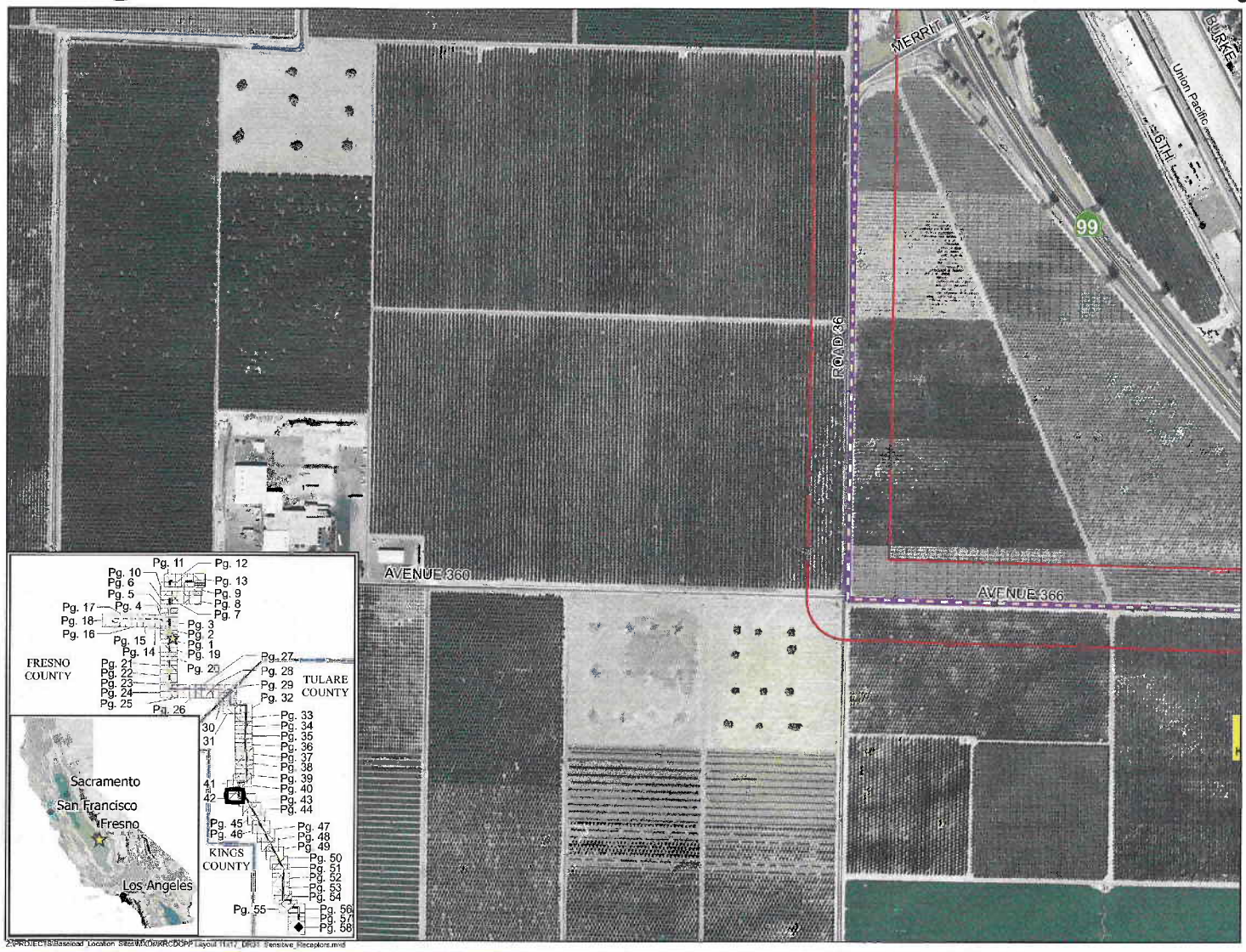
Page: 41 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

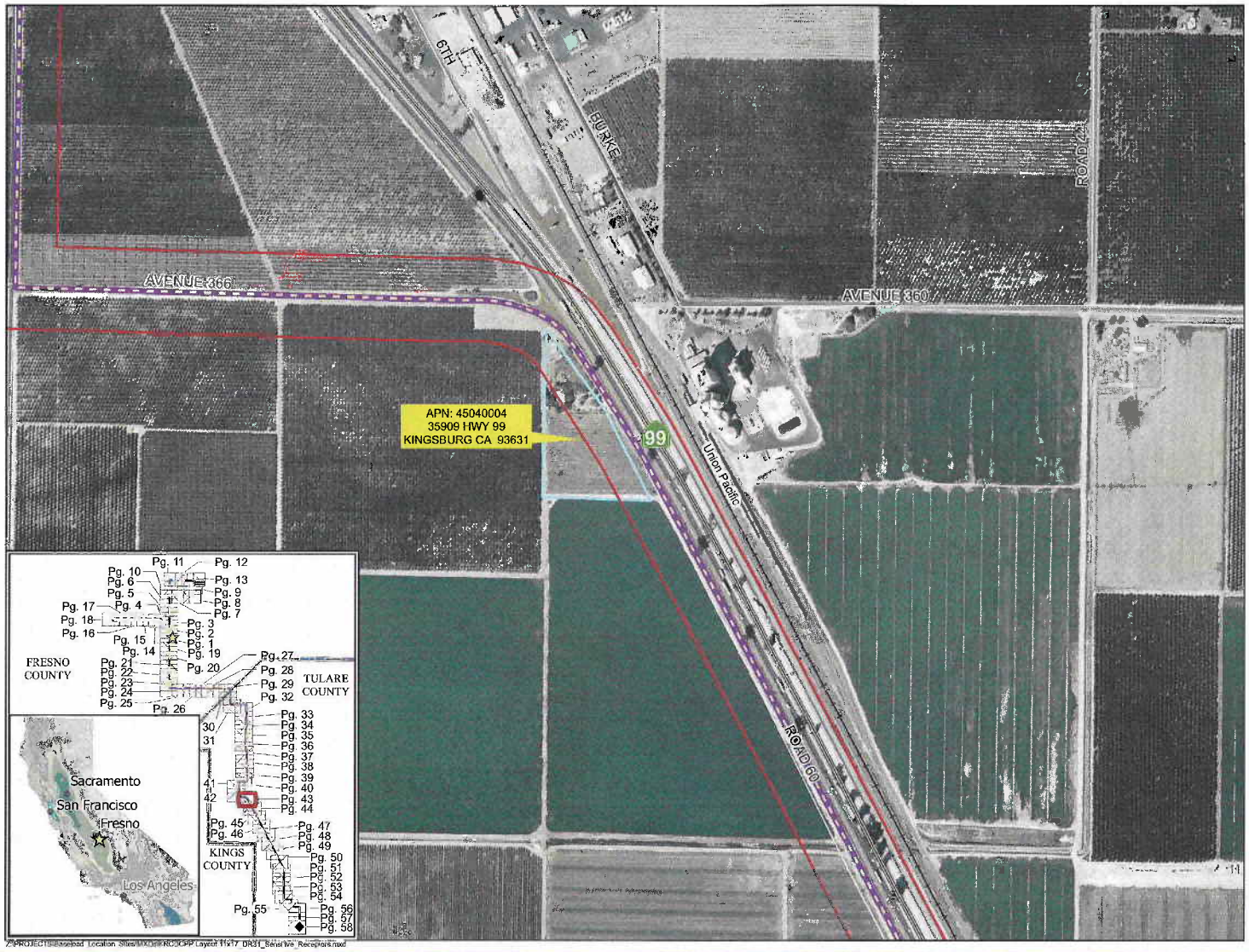
Page: 42 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

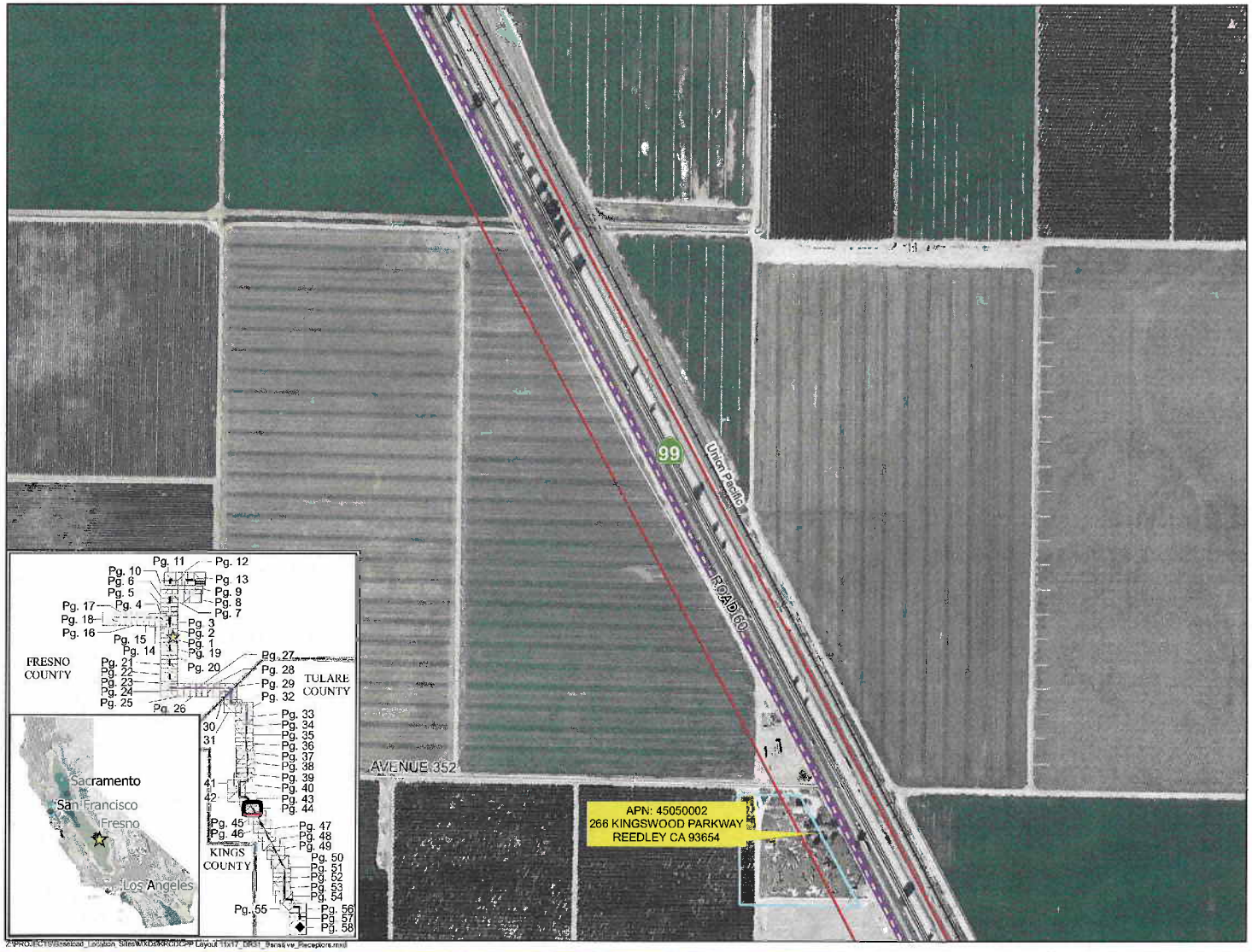
Page: 43 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 44 of 58

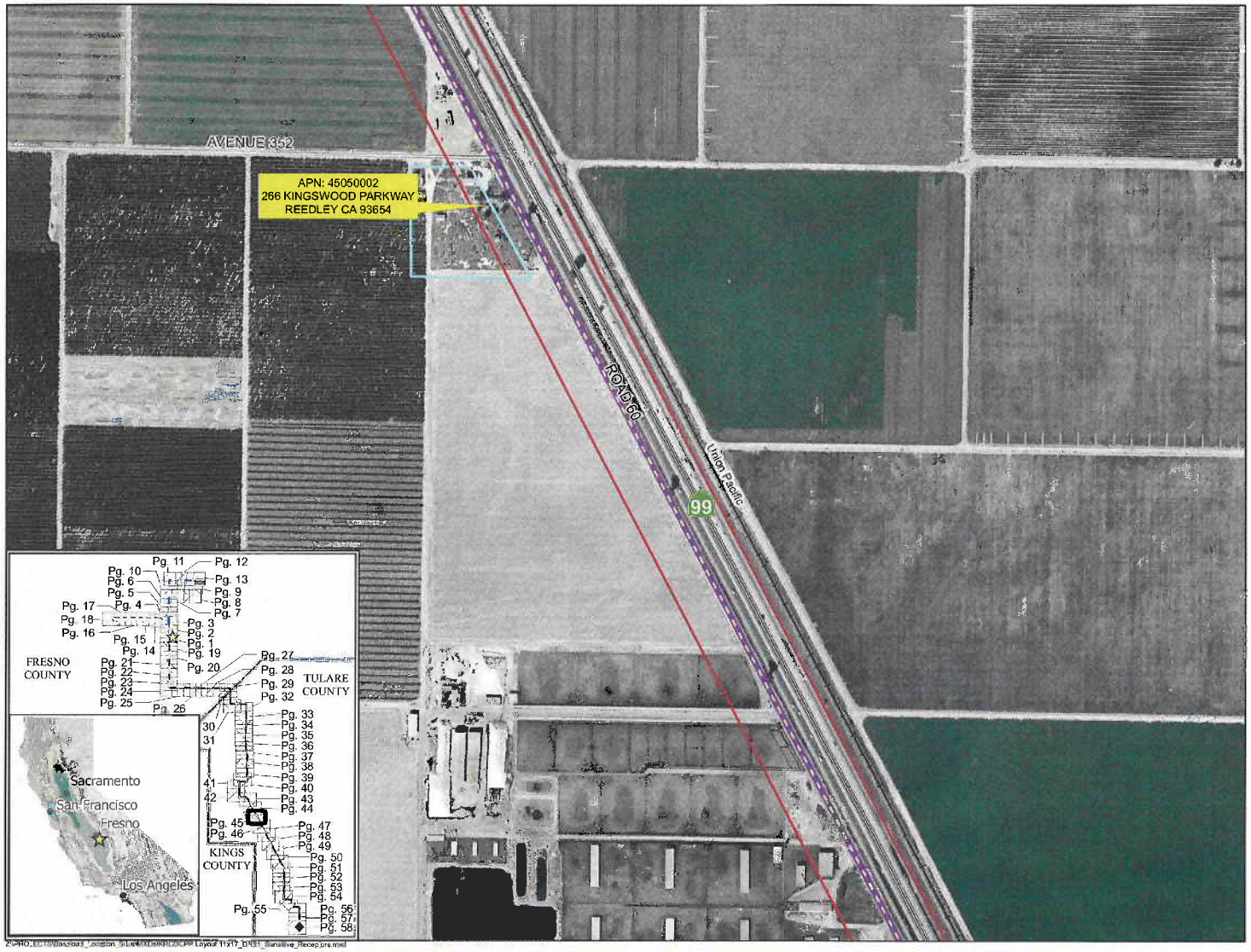
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 45 of 58

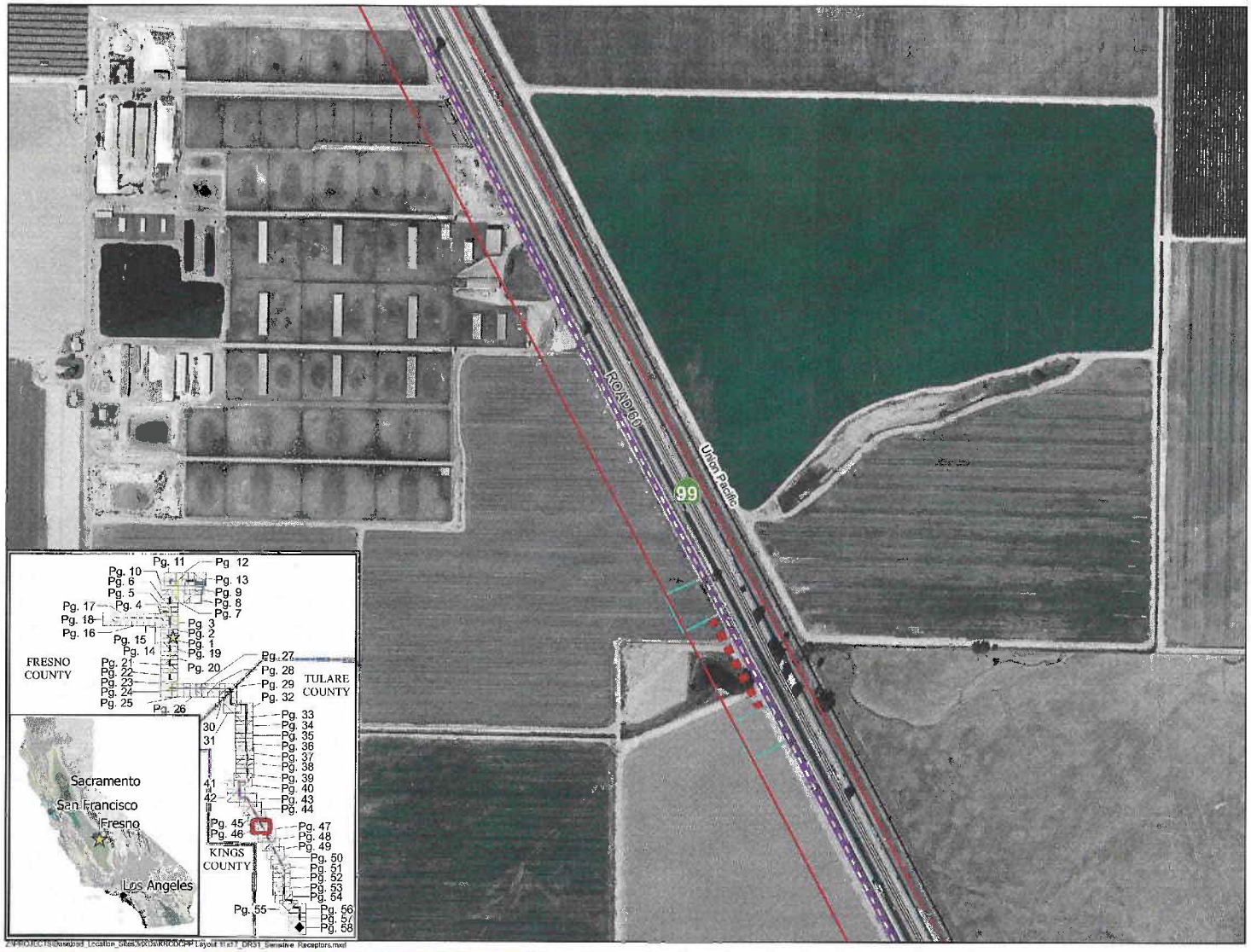
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 46 of 58

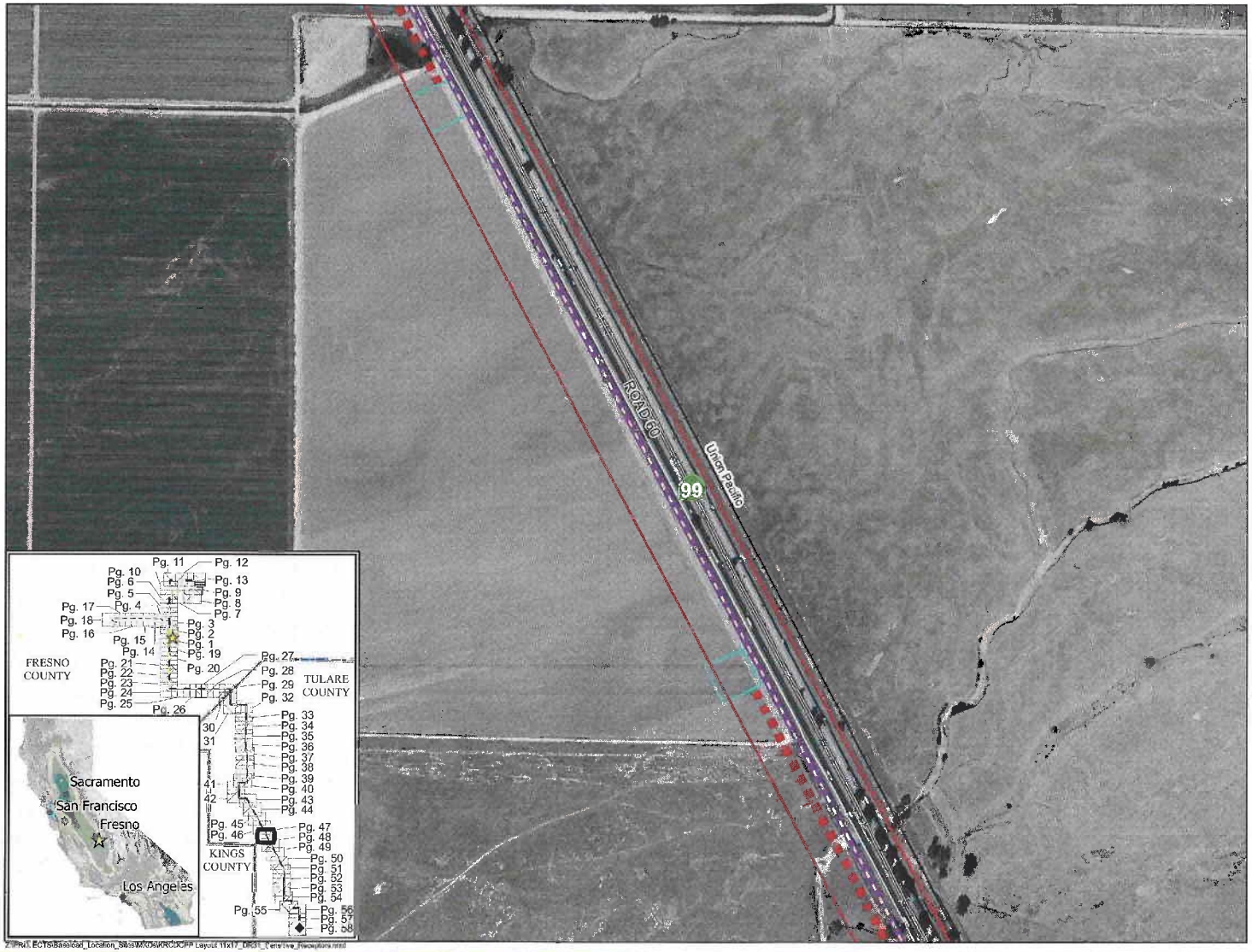
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 47 of 58

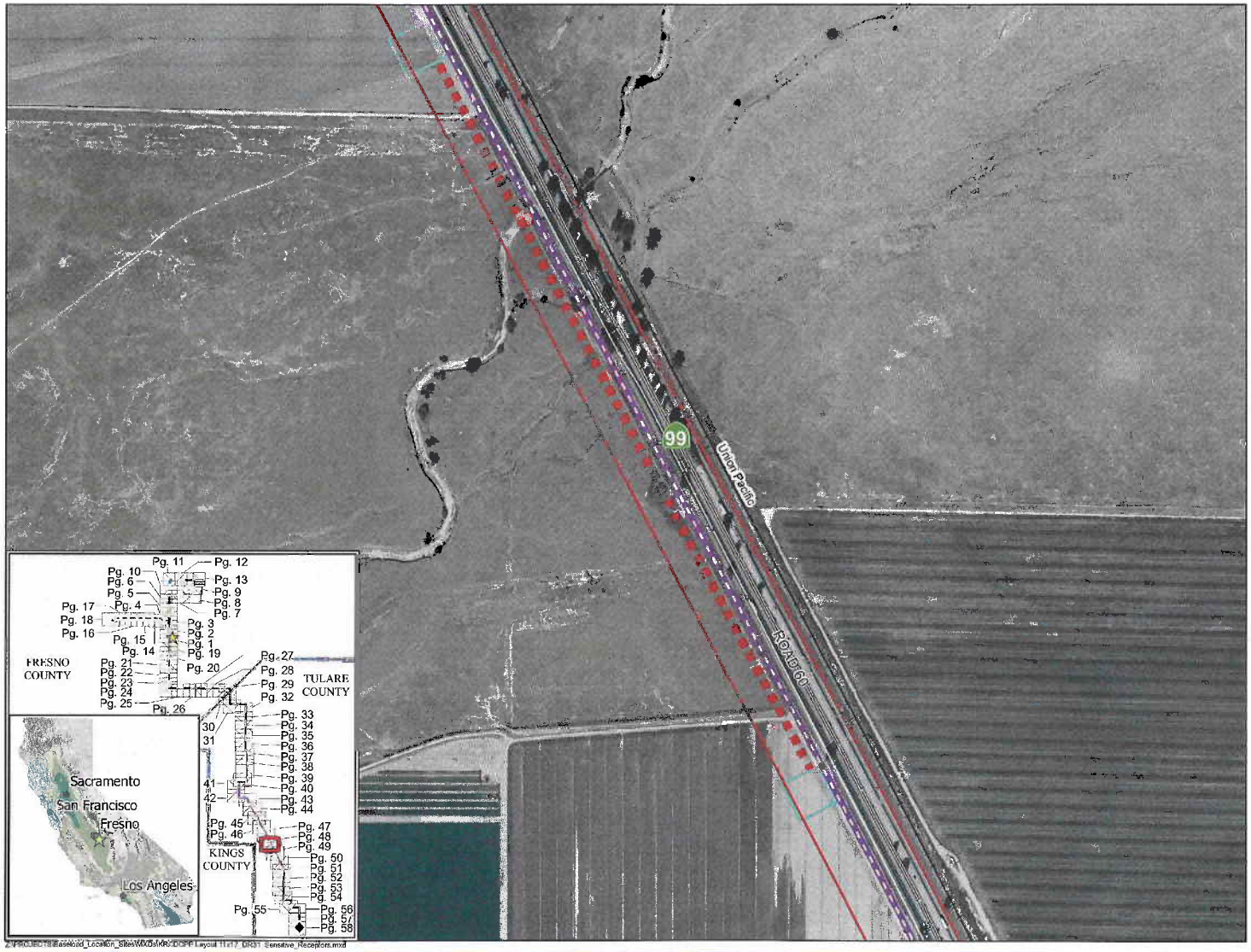
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 48 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant

KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 49 of 58

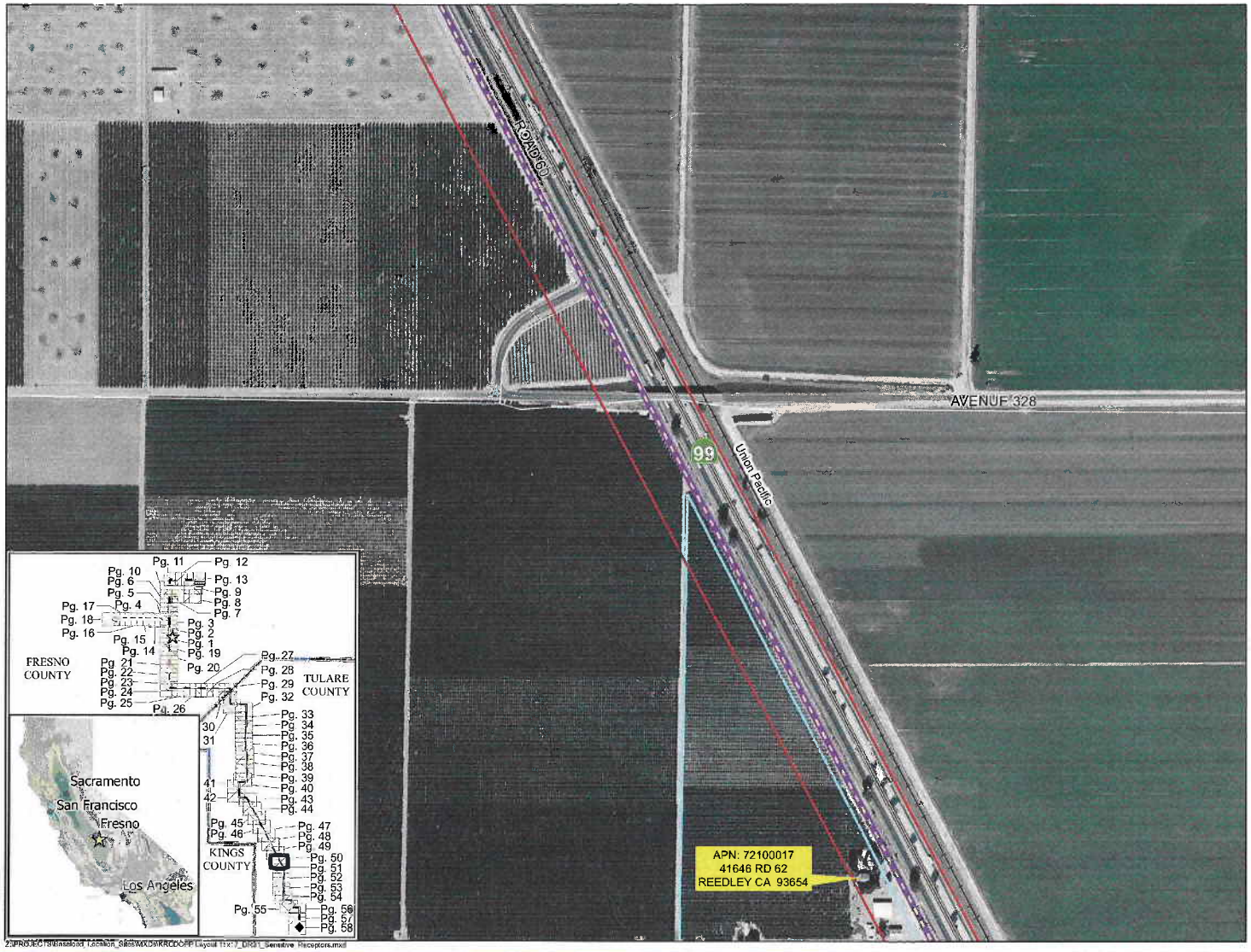
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 50 of 58

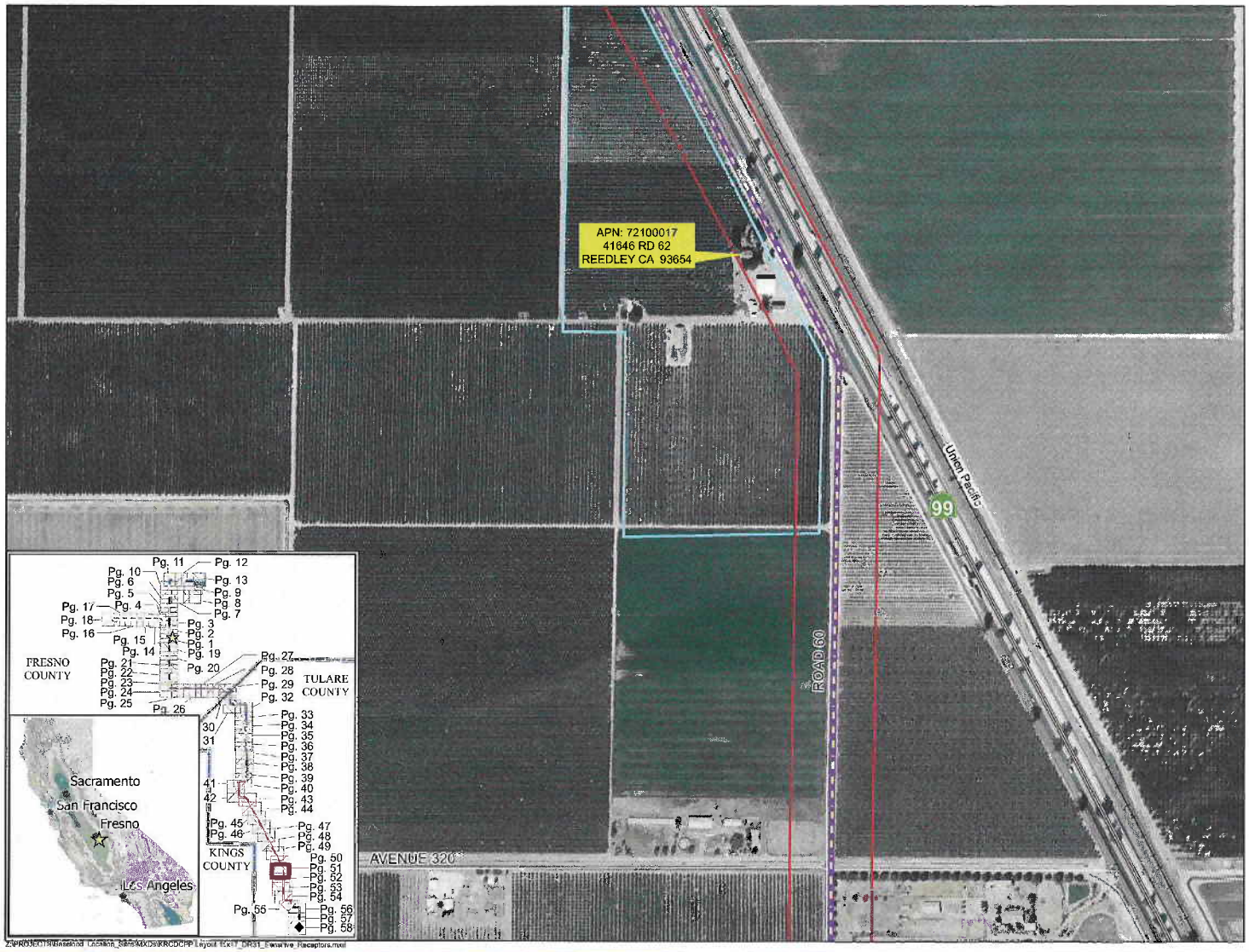
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

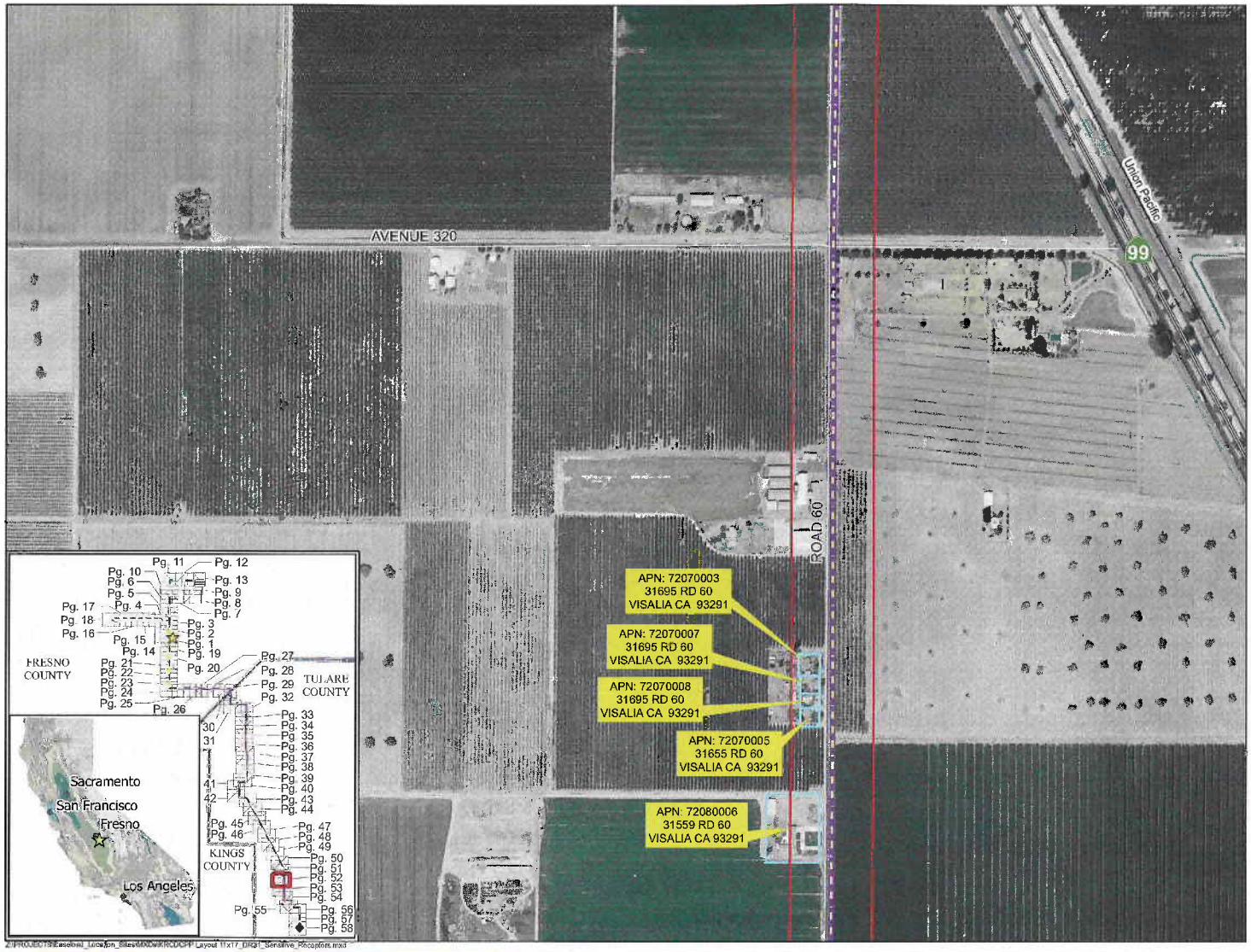
Page: 51 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 52 of 58

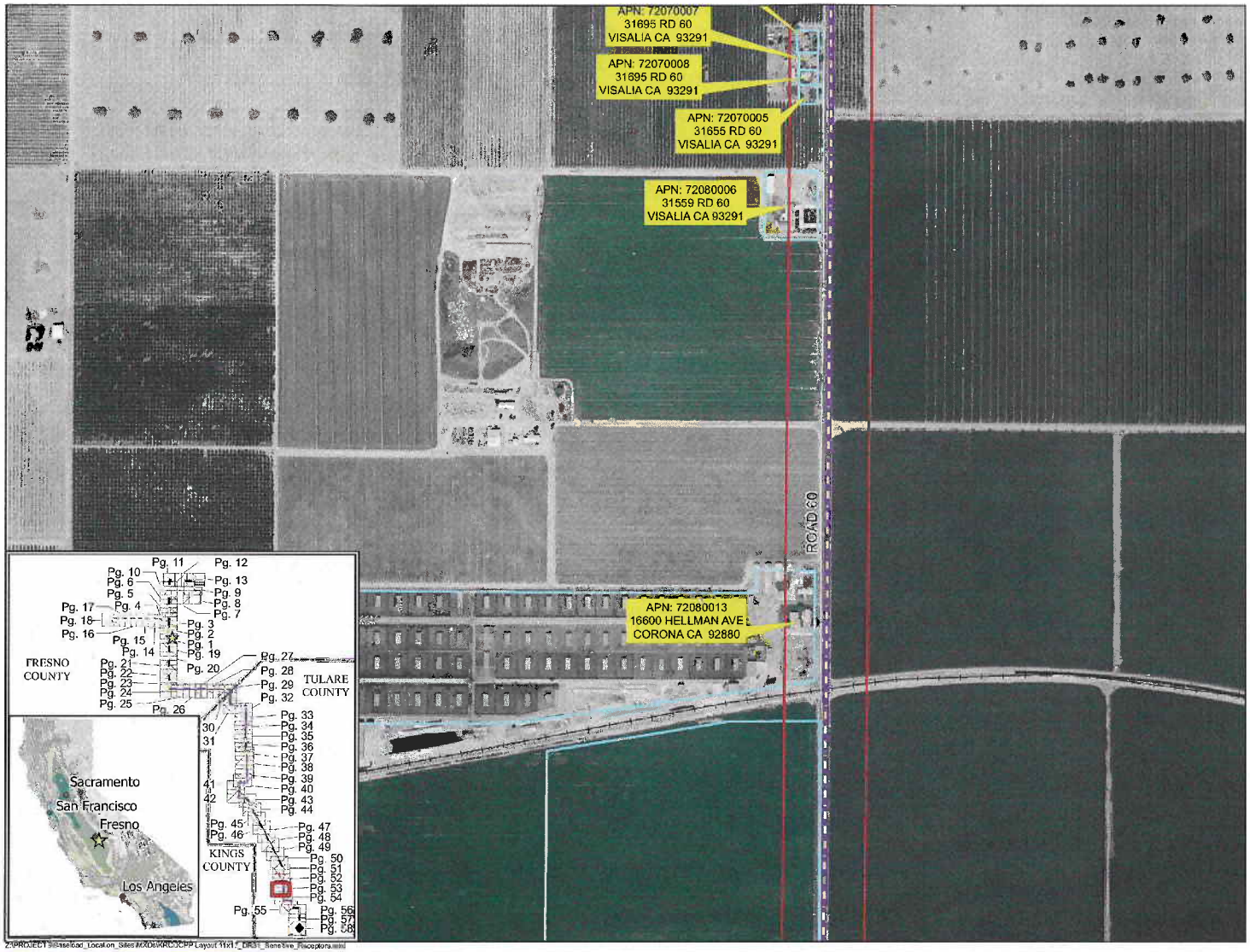
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 53 of 58

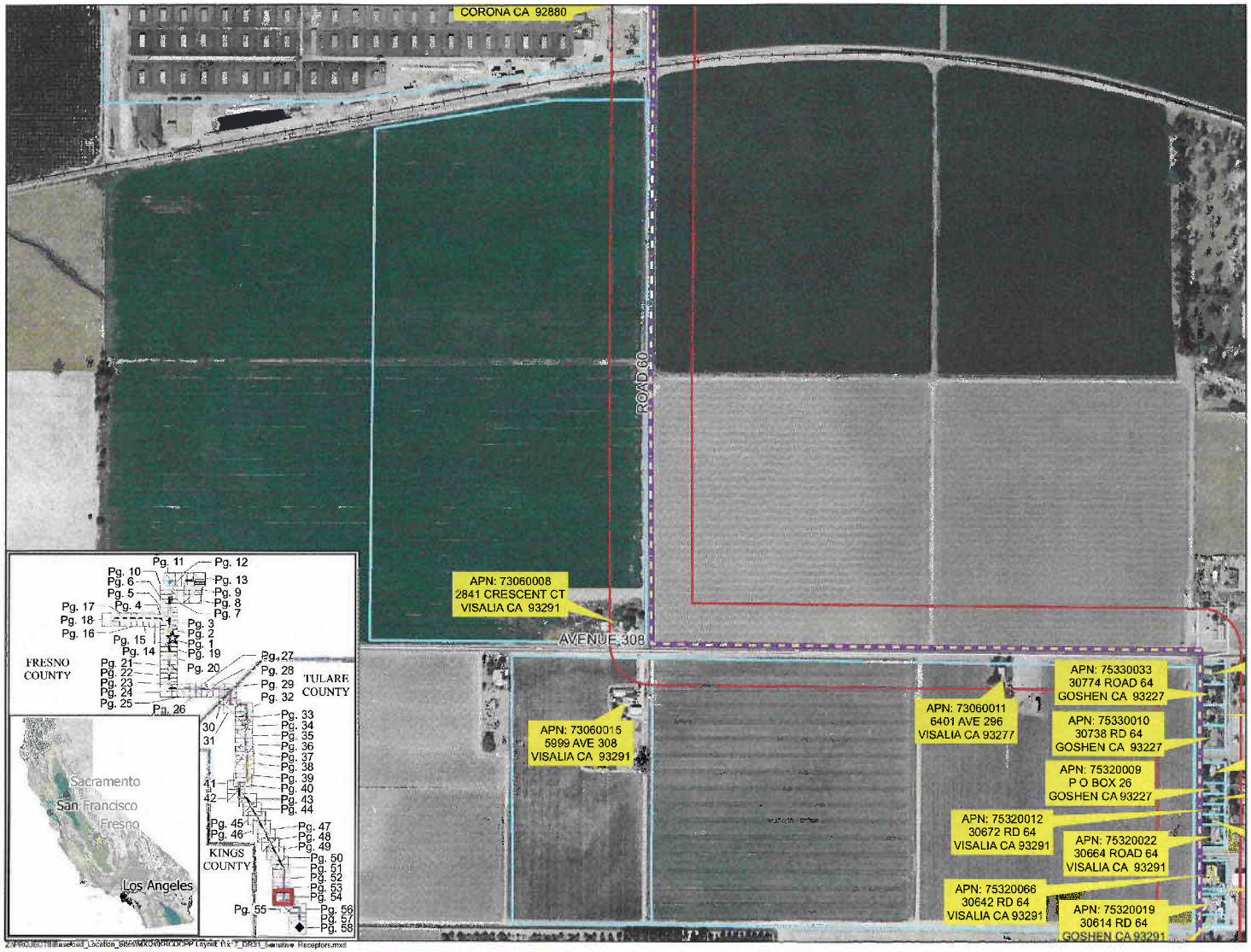
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

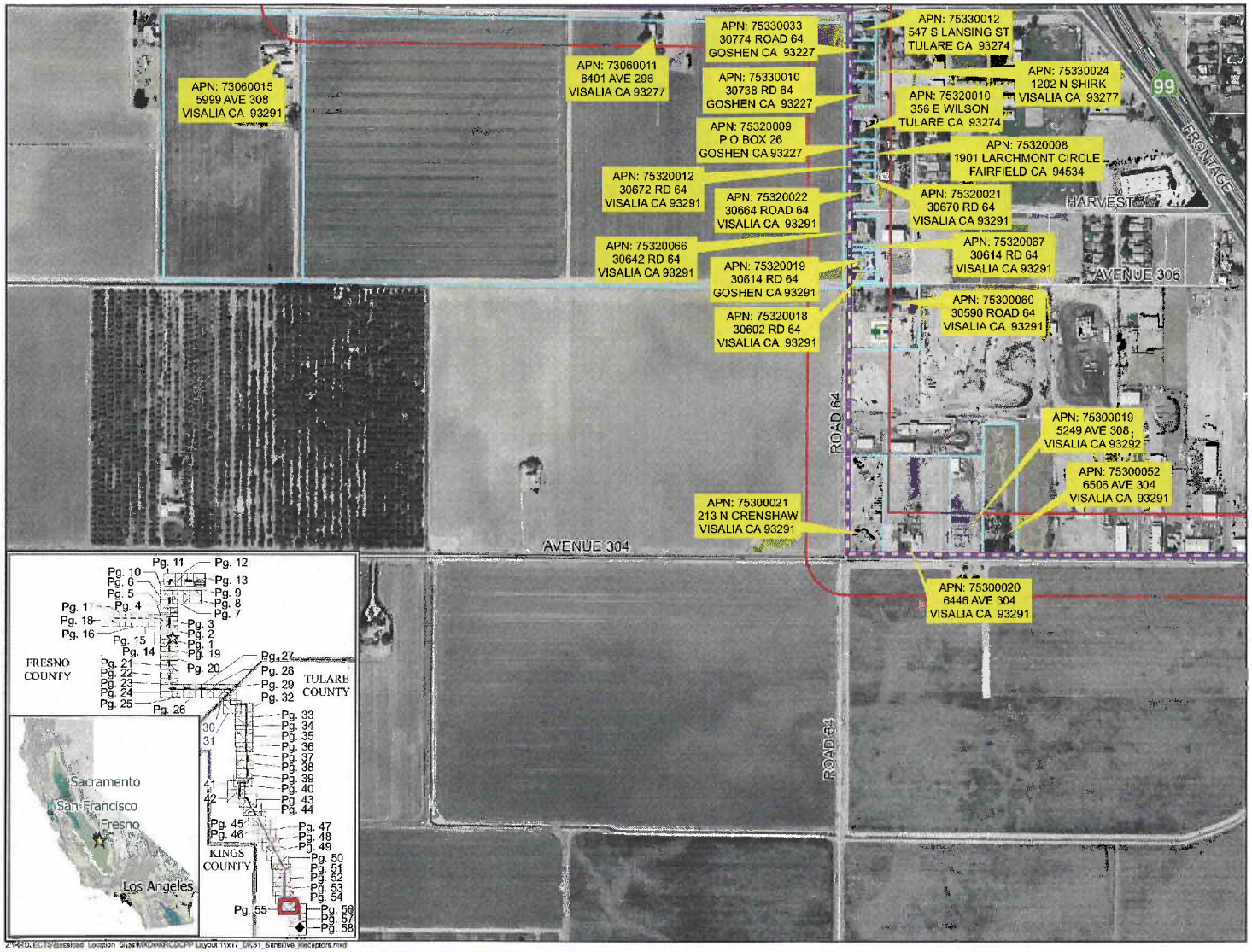
Page: 54 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

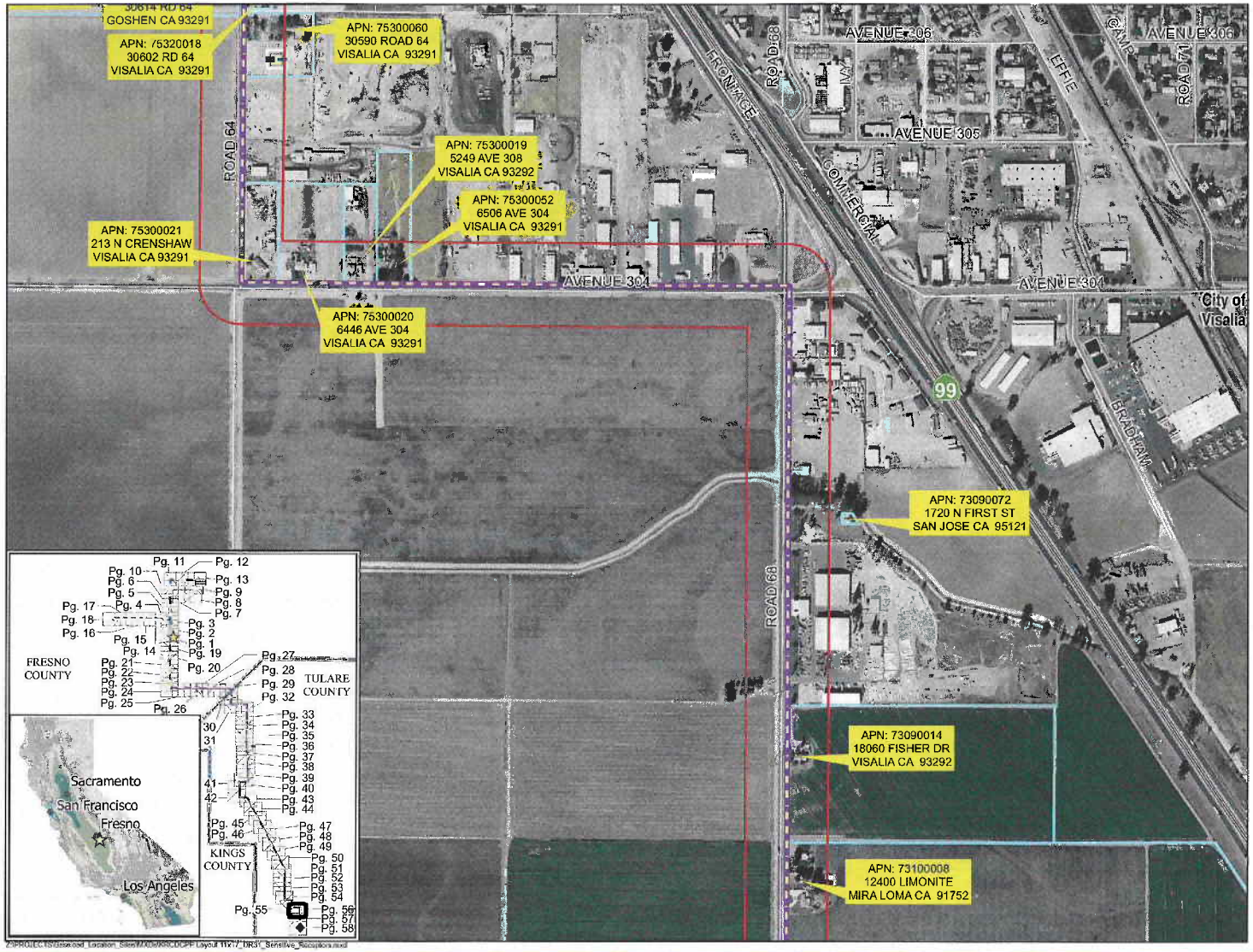
Page: 55 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

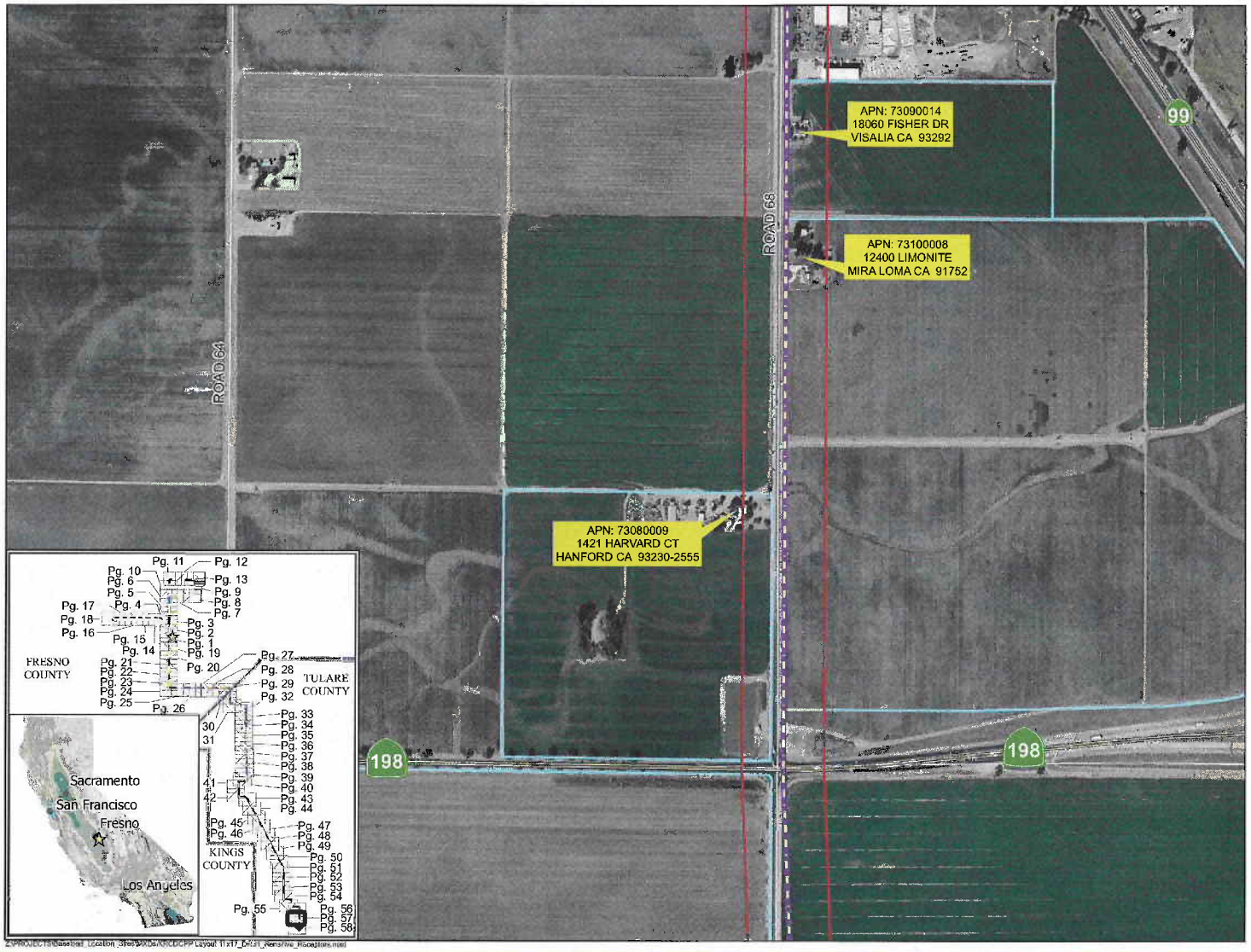
Page: 56 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N 0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 57 of 58

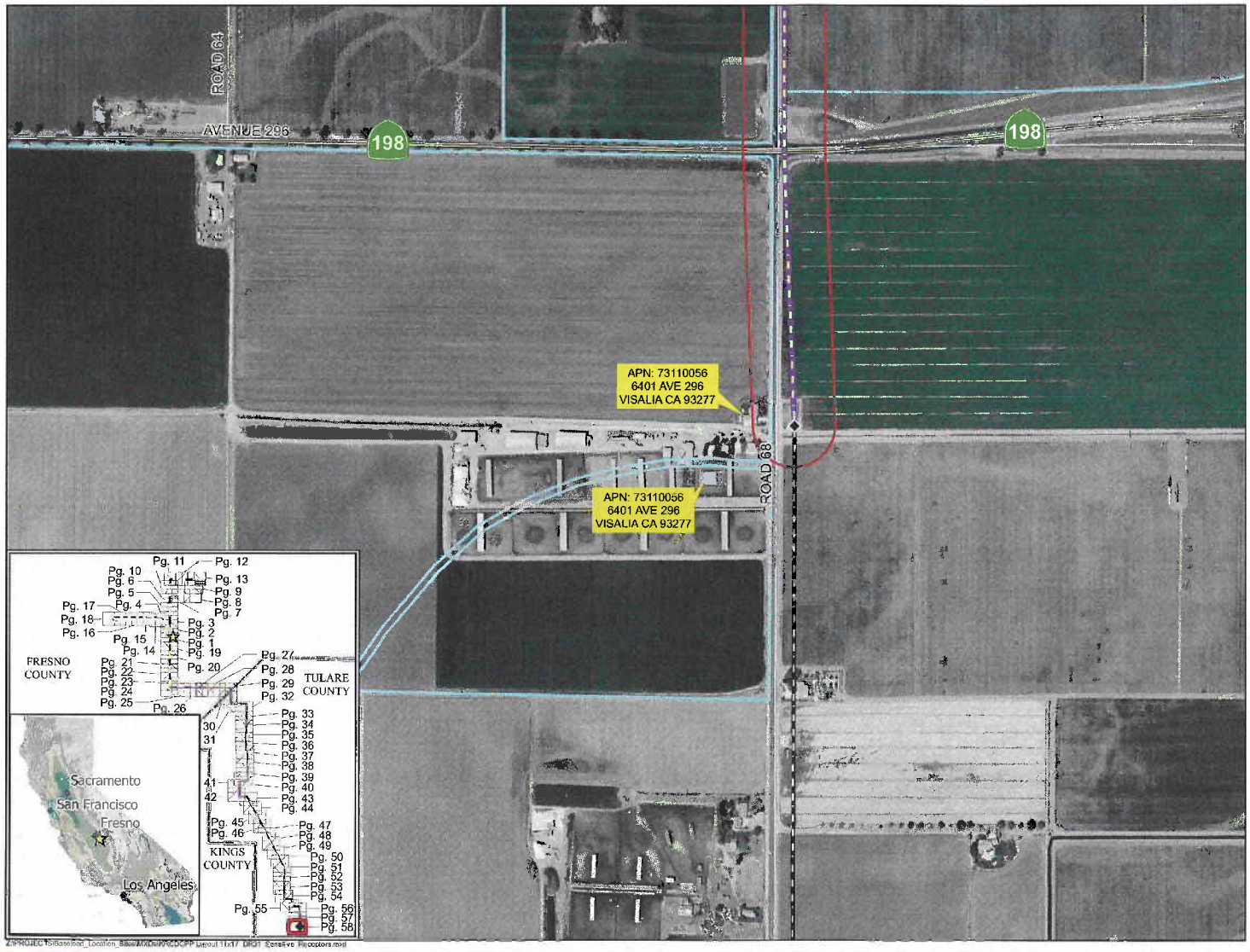
- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Private Sensitive Receptors Within 200ft of Project Linears

Page: 58 of 58

- KRCD Community Power Plant
- 200ft Sensitive Receptor Buffer
- Sensitive Receptor Parcel
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- HDD Bore / Laydown Area
- HDD Bore Span
- Freeway
- Street
- Railroad
- County Boundary
- City Boundary

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Technical Area: Socioeconomics

Data Request 48:
Please provide the number of annual short-term (contract) operation workers.

Initial Response:
The following response was submitted to the CEC by electronic mail on February 28, 2008:

A budget of $250,000 would equate to approximately one full-time equivalent (FTE) worker. Short-term contract workers are anticipated to include several forms of out-sourced workforce including testing, maintenance, capital projects or operations consulting. While any number of individuals may be involved at any given time, these contractors are not generally expected to be engaged in KRCD CPP activities for more than a week or two at a time, making an estimate of the number of individuals involved difficult to estimate and making such an estimate irrelevant to a determination of socioeconomic impact. To place such employment in context, if we assumed an average hourly wage of $125, a budget of $250,000 would lead us to determine 2000 hours of work ($250,000/$125 = 2000) – this is one FTE. The estimated hourly wage of $125 is a reasonable estimate of a "fully-loaded" wage (assumed to include taxes and benefits, it could also be expressed as a standard hourly billing rate from an independent contractor or consultant).

Technical Area: Socioeconomics

Data Request 49:
Please verify whether the estimates of employment and income secondary economic impacts included short-term (contract) operation workers with an annual payroll of $250,000 or not.

Initial Response:
The following response was submitted via email on February 28, 2008:

The estimated $250,000 expense and one FTE in short-term contract work do not include any secondary income or employment impacts. The nature of this workforce does not lend itself to such a calculation because of their temporary and transient nature. Short-term contract workers, whether they come from inside or outside the region, are not expected to contribute any additional meaningful economic impact to the region. Short-term contract workers that reside outside of the region would be expected to be paid by the firm they contract through in their residence. These earnings would be resident and spent outside the region and would not lead to any significant indirect or induced economic impact to the region. Short-term contract workers that reside inside of the region would also be expected to be paid by the firm they contract through in their residence. These earnings, however, are expected to occur through their employer regardless of the contract work with KRCD CPP and would not lead to any significant additional indirect or induced economic impact to the region.

Technical Area: Socioeconomics

Data Request 50:
If not, please recalculate the secondary employment and income secondary impacts for operations in Fresno County.

Initial Response:
The following response was submitted via email on February 28, 2008:

Please see response to Data Request 49.

Technical Area: Transmission System Engineering

Data Request 52:
The SIS indicated that the San Joaquin Valley Energy Center project (SJVEC) is ahead of the CPP in the California ISO generation queue. Having included the SJVEC in the study assumptions, the addition of the CPP will cause overload on the 70-kV, 115-kV, and 230-kV transmission line which will require a 187.57 miles of line reconductoring. Without the SJVEC project, the addition of the CPP will require the reconductoring of 53.5 miles of 70-kV, 115-kV, and 230-kV lines. Please provide an environmental analysis sufficient to meet CEQA requirements for an indirect project impact of the required transmission line reconductoring both with and without the SJVEC project.

Response:
The Interconnection System Impact Re-study Report, dated July 28, 2008, which is included as a Attachment to Data Request 53, preliminarily identifies the following areas of transmission line reconductoring:

- Re-conductor the Borden-Gregg 230-kV Line with 477 thousand circular mil (kcmil) aluminum conductor steel supported (ACSS) or equivalent conductors (about 6 miles)
- Re-conductor the McCall-Sanger # 3 115-kV Line with 954 kcmil ACSS or equivalent conductors (about 6.5 miles)
- Re-conductor the Oro Loma Canal #1 70-kV Line (Oro Loma-Dos Palos section) with 715.5 Al kcmil or equivalent conductors (about 2.5 miles)
- Re-conductor the Barton-Sanger 115-kV Line (Airways J2-Sanger) with 795 kcmil ACSS or equivalent conductors (about 6 miles)
- Re-conductor the Manchester - Sanger 115-kV Line (Sanger - Airway J1-Las Palmas) with 795 kcmil ACSS or equivalent conductors (about 6 miles)

The required reconductorings will be finalized when the Facilities Study and Interconnection Agreement are finalized. When the list of reconductorings is final, KRCD will complete the required environmental analysis.

Technical Area: Transmission System Engineering

Data Request 53:
Please provide the Facility Study Report.

Updated Response:
The Draft Facilities Study Report for the KRCD CPP is not yet available. The California Independent System Operator (CAISO) completed a Interconnection System Impact Re-study for the KRCD CPP, dated July 28, 2008. A copy of this report is included as Attachment TSE-1. A restudy was required to more adequately address Category C contingency events and to account for projects that have dropped out of the CAISO interconnection queue since the original SIS was completed in July 2007. The original SIS (dated July 30, 2007) was included as Appendix 4-2 to the KRCD CPP AFC. The CAISO will soon be issuing a draft Facilities Study based on the Interconnection System Impact Re-study, which will be forwarded to the CEC when available.

ATTACHMENT TSE-1

Interconnection System Impact Re-Study Report

Note:

This report was provided under separate cover.

Technical Area: Visual Resources

Data Request 55:
Please provide the cooling tower manufacturer and model number information and a fogging frequency curve from the cooling tower vendor, if available.

Updated Response:
KRCD has still not selected the cooling tower manufacturer and does not have any additional cooling tower technical information. Additional updates will be provided to the CEC as this information becomes available.

Technical Area: Waste Management

Data Request 58:
Please conduct an asbestos survey and provide an estimate of the amount of asbestos in demolition/construction table. Indicate the method and location of disposal.

Initial Response:
KRCD will have a licensed environmental contractor conduct a pre-demolition asbestos and lead survey prior to demolition of the existing on-site residence and structures. In the event it is needed, the asbestos or lead disposal method will be done in accordance the appropriate environmental protocol and in compliance with all applicable laws and regulations.

Technical Area: Waste Management

Data Request 59:
Please collect and analyze soil samples around the 500-gallon tank. Provide information on the method of disposal to be used for the 500-gallon underground storage tank.

Initial Response:
KRCD will have soil samples taken and analyzed by a professional environmental assessment contractor around the 500-gallon underground storage tank (UST) prior to construction. If it is determined in the sample analysis that there is fuel contamination around the UST, then it will be remediated in accordance with Fresno County Environmental Health Department requirements. Removal and disposal of the UST will be conducted in accordance with State of California and Fresno County UST, ordinances, regulations, and standards.

The demolition and remediation of the structures and UST will be included in the mobilization responsibilities of the power plant construction contractor.

Technical Area: Waste Management

Data Request 60:
Please provide a draft engineering report per the provisions of Title 22 Code of Regulations Section 60323 that identifies:

a) all agencies or entities that will be involved in the design, treatment, distribution, construction, operation and maintenance of the recycle facilities;
b) description of any legal arrangements outlining authorities and responsibilities between the agencies with respect to treatments; and
c) a description of arrangements for coordinating all reuse-related activities between the two WWTPs and the Applicant.

Initial Response:
The Report of Wastewater Reclamation, which was prepared per the provisions of Title 22 Code of Regulations Section 60323, is included as Attachment Waste-1. The Report of Wastewater Reclamation was also submitted to the Central Valley Regional Water Quality Control Board and the Department of Health Services.

Technical Area: Waste Management

Data Request 65:
When and how will the water well and septic tank be abandoned? What agencies will be involved with the abandonment of the well and tank? What are the procedures and schedule for abandoning the well and tank?

Initial Response:
Well and septic tank decommissioning for the project site falls under Fresno County jurisdiction. The water well serving the abandoned on-site residence will be deconstructed by a licensed contractor possessing a C-57 Water Well Contractors License in accordance with the State of California Water Code, Section 13750.5 and Well Standards Ordinance, Section 2.4.3 as required by Fresno County. Well deconstruction will be performed in accordance with applicable Fresno County Water Code requirements (Part III, Section 20-23, Bulletins 74-81 and 74-90). A permit for this work is required and will be obtained through the Fresno County Department of Public Health. Well deconstruction will take place at the beginning of plant construction.

The septic tank serving the abandoned on-site residence will be deconstructed, as required by Fresno County Department of Public Works and Planning, according to the standards of California State Plumbing Code, Appendix K-11 (2007). Septic tank deconstruction will take place at the beginning of plant construction.

Technical Area: Waste Management

Data Request 66:
When and how will the agricultural well be abandoned? What agencies will be involved with the abandonment of the well and tank?

Initial Response:
The on-site agricultural irrigation well will not be abandoned.

As noted in the AFC Volume 1 – Water Resources, Section 8.5.3.2, the on-site agricultural irrigation well will be used as an irrigation well to meet on-site landscape water demands.

Technical Area: Waste Management

Data Request 67:
Please provide a Phase I ESA for the 26-mile 20-inch diameter underground natural gas pipeline corridor, the approximately five mile long 18-inch underground wastewater supply pipeline routes, and the approximately five mile long 230-kV transmission interconnection route which, according to ASTM 2000 guidelines crosses the following:

a) Property where contamination is known, or suspected at an up-gradient or adjoining site.
b) Property, which is, or has been used for industrial/manufacturing purposes. Adjoining property with this type of usage should also be included in the investigation.
c) Property for which any prior environmental investigation indicated the potential for contamination.
d) Property displaying evidence of hazardous waste storage on-site, whether permitted or not. For example, the existence of a former dry cleaner or gas station, which utilized underground or above ground storage tanks. Agricultural properties, where pesticides were stored/mixed and potentially released, should also be investigated.
e) Property with visible staining.
f) Property where contaminants exceeding drinking water standards have been detected.
g) Property where state/federal agency notices of violation have been issued.
h) Property on which equipment containing PCBs was stored.
i) Property where fill dirt has been brought that has, or may have originated from a contaminated site.
j) Property with known or suspected discharges of wastewater (other than storm-water and sanitary waste) into a storm water drain.
k) Property with an environmental lien on it (imposed either by CERCLA 42USC / 9607(1) or similar state and local laws).
l) Property along existing or past railroad tracks.
m) For agricultural areas, please provide a representative sample (at least 10 percent) of all parcels randomly selected for a Determination of Pesticide Use assessment.

Updated Response:
The Phase I Environmental Site Assessments for the natural gas pipeline, water pipeline (Option 1 and Option 2), transmission line, and newly proposed 60-acre staging area are included as Waste-2.

Technical Area: Waste Management

Data Request 68:
The assessment shall identify the type of crops grown over as long a period as records indicate, the historical use and identity of pesticides (including organic and inorganic pesticides as well as herbicides), and a statement of the likelihood of finding, along the pipeline route, levels of pesticides which might present a risk to pipeline workers and/or the public.

Initial Response:
The information requested is included as part of the response to Data Request 67.

Technical Area: Waste Management

Data Request 69:
Please provide and implement a groundwater Sampling and Analysis Plan for the site. Please also discuss the remediation steps to be taken if groundwater sampling and analysis indicates contamination.

Initial Response:
Based on further clarification from CEC staff on this data request, we understand that no additional sampling is required on the project site at this time. The Phase I and Phase II Environmental Site Assessments (ESAs) were included as appendices to the KRCD CPP AFC.

In response to Data Request 67, Phase I ESAs were also completed for the natural gas pipeline, water pipeline (Option 1 and Option 2), transmission line, and newly proposed 60-acre staging area. These report were filed under separate cover. None of the Phase I ESAs identify any recognized environmental conditions (RECs) nor do any of the Phase I ESAs recommend that Phase II investigations should be completed. Therefore, the need for preparing and implementing any groundwater Sampling and Analysis plans is deemed unnecessary at this time.

ATTACHMENT WASTE-1

Report of Wastewater Reclamation

REPORT OF WASTEWATER RECLAMATION

KINGS RIVER CONSERVATION DISTRICT COMMUNITY POWER PLANT

KINGS RIVER CONSERVATION DISTRICT

April 28, 2008

Prepared By:

EST. 1968
PROVOST & PRITCHARD ENGINEERING GROUP

2505 Alluvial Avenue
Clovis, California 93611-9166
(559) 326-1100
FAX (559) 326-1090

REGISTERED PROFESSIONAL ENGINEER
ALAN JAY DOHAAI
C- 054062
Exp. 12/31/09
CIVIL
STATE OF CALIFORNIA

REPORT OF WASTEWATER RECLAMATION

KINGS RIVER CONSERVATION DISTRICT COMMUNITY POWER PLANT

PARLIER, CA

April 28, 2008

Prepared for:

KINGS RIVER CONSERVATION DISTRICT

Prepared by:

Provost & Pritchard Engineering Group, Inc.
Clovis, California

COPYRIGHT 2008 by PROVOST & PRITCHARD ENGINEERING GROUP, INC.
ALL RIGHTS RESERVED

Provost & Pritchard Engineering Group, Inc. expressly reserves its common law copyright and other applicable property rights to this document. This document is not to be reproduced, changed, or copied in any form or manner whatsoever, nor are they to be assigned to a third party without first obtaining the written permission and consent of Provost & Pritchard Engineering Group, Inc. In the event of unauthorized reuse of the information contained herein by a third party, the third party shall hold the firm of Provost & Pritchard Engineering Group, Inc. harmless, and shall bear the cost of Provost & Pritchard Engineering Group, Inc.'s legal fees associated with defending and enforcing these rights.

Table of Contents

1 Introduction 1
1.1 Background 1
2 Recycled Water Project 3
2.1 General 3
2.2 Rules and Regulations 3
2.3 Relationships Between Producer, Distributor, and User 4
2.4 Secondary Treated Wastewater Characterization 4
2.4.1 Wastewater Flow Factors 4
2.4.2 Total Average Daily Flow 5
2.4.3 Power Plant Design 6
2.4.4 Influent Characteristics 7
2.5 Treatment Process 7
2.5.1 Influent Pumping 7
2.5.2 Filtration 7
2.5.3 Chlorine Disinfection 8
2.5.4 Effluent Pumping 8
2.6 Supplemental Water Supply 8
2.7 Monitoring and Reporting 8
2.8 Contingency Plan 9
2.8.1 Reliability Provisions 9
2.8.2 Off-Spec Water 9
3 Transmission and Distribution System 10
4 Use Areas 11
4.1 Type of Reuse Proposed 11
4.2 Parties Responsible for Use and Distribution 11
4.3 Use Area Design 11
4.4 Use Area Inspections and Monitoring 11
4.5 Employee Training 11
4.5.1 Worker Safety 12
5 References 13

List of Figures

Figure 1. KRCD Community Power Plant Location Map
Figure 2. Tertiary Treatment Plant Process Flow Schematic
Figure 3. Tertiary Treatment Plant Layout

List of Attachments (to be completed later)

- Will Serve Letter from the City of Parlier
- Will Serve Letter from the City of Sanger

1 INTRODUCTION

This Report of Wastewater Reclamation has been prepared by Provost & Pritchard Engineering Group, Inc. under contract to Kings River Conservation District (KRCD). This report is intended to serve as the basis for a request for a Wastewater Reclamation Permit from the California Department of Health Services. A companion report entitled "Report of Waste Discharge" has also been prepared; that report is intended to describe the proposed project for review by the Regional Water Quality Control Board (RWQCB), along with the Form 200 application for Waste Discharge Requirements.

KRCD is proposing to develop the KRCD Community Power Plant (power plant), a nominal 565-megawatt (MW) natural gas fired combined-cycle base-load facility. KRCD will be the public agency that has the authority to furnish facilities and services to collect and treat wastewater and distribute treated wastewater to meet process water demands at the power plant. To do this, the construction of a new 4.2 million gallon per day (mgd) capacity tertiary treatment plant at the power plant site is being proposed, with extraction wells available for times when effluent flows do not meet power plant demands.

The current State of California Water Recycling Criteria (adopted in December 2000) require the submission of an engineering report to the California Regional Water Quality Control Board (RWQCB) and the Department of Health Services (DHS) before recycled water projects are implemented. Therefore, the purpose of this engineering report is to describe the manner by which this water-recycling project complies with the Water Recycling Criteria contained in Sections 60301 through 60355, inclusive, of the California Code of Regulations, Title 22. This report contains sufficient information to assure the regulatory agencies that the degree and reliability of the proposed treatment is commensurate with the requirements for the proposed use, and that the proposed distribution and use of the recycled water will not create a health hazard or nuisance.

1.1 Background

The power plant will be located on an approximately 31-acre site near Parlier, California. Process water demands for the power plant will be met with wastewater effluent from the Sanger and Parlier Wastewater Treatment Plants (WWTP) treated to tertiary treatment standards at the proposed tertiary treatment plant, adjacent to the power plant. The wastewater will be piped to the power plant via a new underground pipeline. **Figure 1** shows the location of the project site, wastewater treatment plants, existing effluent percolation ponds, proposed storage ponds, and the proposed pipelines that would deliver the effluent to the power plant.

The California Code of Regulations outlines restrictions and requirements for the use of recycled water (wastewater effluent). In particular Title 22, Section 60306 – Use of Recycled Water for Cooling, states:

"Recycled water used for industrial or commercial cooling or air conditioning that involves the use of a cooling tower, evaporative condenser, spraying or any mechanism that creates mist shall be disinfected tertiary recycled water".

This regulation is intended to protect power plant personnel from bacteria and viruses in the water mist. Therefore, to be used as cooling water, the secondary wastewater effluent must receive tertiary treatment and disinfection. The Sanger and Parlier WWTPs only treat their wastewater to a secondary level, so construction and operation of a tertiary treatment facility is required to use the water at the power plant. Alternatively, the wastewater effluent could be percolated (which will provide some treatment through filtration in the soils), pumped from wells, disinfected, and then used at the power plant. The California Code of Regulations does not specifically address the suitability of percolated effluent as cooling water.

The Kings River Conservation District has selected a water system incorporating both alternatives with water treated and disinfected at the tertiary treatment plant used as a base water supply and disinfected groundwater as a backup water supply. The tertiary treatment plant will be able to accommodate the peak daily process demand (4.2 MGD or 2,920 gpm), and the extraction wells will be able to accommodate the maximum monthly process demand (3.7 MGD or 2,600 gpm).

2 RECYCLED WATER PROJECT

2.1 General

Process water demands at the power plant include cooling water and water for cleaning and other maintenance purposes. Cooling water is circulated through cooling towers to condense steam, and represents the vast majority of the process water demands.

State Water Resources Control Board, Resolution No. 75-85, "Water Quality Control Policy on the Use and Disposal of Inland Waters Used for Powerplant Cooling", adopted June 19, 1975, encourages the protection of beneficial uses of the State's water resources. The intent of this resolution is "to keep the consumptive use of freshwater for powerplant cooling to that minimally essential for the welfare of the citizens of the State." The resolution goes on to encourage the use of reclaimed wastewater as cooling water, stating the following: "The State Board encourages water supply agencies and power generating utilities and agencies to study the feasibility of using wastewater for powerplant cooling. The State Board encourages the use of wastewater for powerplant cooling where it is appropriate."

The proposed power plant will require a constant and reliable water source. Reclaimed wastewater will be available from the nearby Parlier and Sanger WWTPs on a daily basis in fairly predictable quantities. Therefore, this is an ideal water source for the power plant process water. All water received from the municipal treatment plants will be used in the power generation process; the power plant will not discharge reclaimed liquids to the waters of the State.

All of the process water demands will be met with the wastewater effluent, either piped directly to the tertiary treatment plant or percolated and recovered with wells. The wastewater effluent is currently delivered to percolation ponds. Data on current effluent flows are available for the Sanger and Parlier WWTPs. Future effluent flows can be estimated based on per capita wastewater generation and estimated population growth. Such calculations assume that per capita wastewater generation will remain unchanged.

2.2 Rules and Regulations

Primarily, enforceable rules and regulations for wastewater treatment plants and the use of recycled water are promulgated by the Porter-Cologne Water Quality Control Act, the California Safe Drinking Water Act and other statutory Acts. These legislative acts are codified into law in the California Water Code and the California Health and Safety Code. Regulatory criteria include the California Code of Regulations Titles 17, 22 and 23. Rules and policies drafted in accordance with law and regulation and adopted by state regulatory agencies include the State Water Resources Control Board (SWRCB) and the State of California, Department of Health Services, Division of Drinking Water and Environmental Management (DHS). The SWRCB and DHS are charged with

enforcement of similar and sometimes overlapping reclaimed water law. A 1988 Memorandum of Agreement (MOA) between the SWRCB and DHS set forth the regulatory and enforcement duties of each agency. According to the MOA, reclamation requirements will be issued by the RWQCB, which must consult with and consider the recommendations of DHS.

2.3 Relationships Between Producer, Distributor, and User

KRCD shall provide two agreement letters: one between KRCD and Parlier and one between KRCD and Sanger. The agreement letters shall include the following:

- KRCD will use effluent from the Sanger and Parlier WWTPs;
- KRCD will construct the transmission pipelines and install pumps to convey treated wastewater from the Sanger WWTP and the Parlier WWTP to the tertiary treatment plant;
- KRCD will construct a facility to treat and disinfect effluent to tertiary treatment standards;
- KRCD will operate and maintain the new tertiary facility;
- Parlier WWTP will accept backwash water from the filters at the tertiary treatment plant;
- KRCD accepts all tertiary monitoring and reporting requirements.
- KRCD will not discharge to the waters of the State

A copy of each letter of agreement is provided as an attachment to this report.

2.4 Secondary Treated Wastewater Characterization

2.4.1 Wastewater Flow Factors

The Sanger WWTP uses an activated sludge process with anaerobic digestion; the plant generally produces an excellent quality effluent. The plant's effluent BOD_5 (the five-day biochemical oxygen demand) during the seven years from 1999 through 2005 has been 10 mg/L on average. The seven-year average for the BOD_5 removal rate was 94.6 percent. The plant's seven-year average total suspended solids (TSS) was approximately 12 mg/L. The average TSS removal rate during this same time period was 95.8 percent.

The Parlier WWTP treatment process consists of the headworks facility, complete mixed aerated lagoons, and partially suspended lagoons. The plant produces effluent of noticeably lower quality than that of the Sanger WWTP. Effluent data from January of 2006 through August of 2006 indicates that the average BOD of the plant's effluent was 36.5 mg/L, over 3.5 times that of the Sanger WWTP. The average TSS during this same time period was 41.4 mg/L, also 3.5 times that of the Sanger WWTP.

The Sanger WWTP is comprised of two separate wastewater treatment facilities running in parallel, one for domestic effluent and one for industrial effluent originating from a winery and a baby food processor plant located in Sanger. The treated industrial wastewater effluent is used to supplement the irrigation demand of 140 acres of City owned land. This industrial effluent will not be transferred to the proposed tertiary treatment plant or used for process water at the power plant.

2.4.2 Total Average Daily Flow

Current effluent flows from the Sanger and Parlier WWTPs combined is approximately 3.2 mgd, or 3,600 AF/yr. The total population served by the two WWTPs is approximately 34,000. In 2004, the population of Sanger was 20,612 people. Between the years of 2000 and 2004, Sanger experienced an annual growth rate of approximately 3.2 percent. Wastewater generation is presently 80 gallons/capita/day in Sanger (Carollo, 2006). The population of Parlier in 2004 was 12,058 people. Giersch (2006) estimated population growth in Parlier to be 3 percent with wastewater generation at 120 gallons/capita/day.

Table 1 includes historic effluent volumes and populations in 2005 and estimated annual values in 5-year increments up to 2040, based on recent growth rates and historical wastewater generation rates for these areas. Note that the WWTPs presently produce enough effluent, on an annual basis, to meet annual average power plant demands. However, summertime demand is a concern, which is why groundwater wells will be available for backup supply.

Table 1 – Estimated Wastewater Effluent (2005-2040)

	Population			Wastewater Effluent (AF/year)		
Year	**Sanger**	**Parlier**	**Total**	**Sanger**	**Parlier**	**Total**
2005	21,230	12,420	33,650	1,903	1,670	3,572
2010	24,611	14,398	39,010	2,206	1,935	4,141
2015	28,531	16,691	45,223	2,557	2,244	4,801
2020	33,076	19,350	52,426	2,964	2,601	5,565
2025	38,344	22,432	60,776	3,436	3,015	6,452
2030	44,451	26,005	70,456	3,984	3,496	7,479
2040	59,739	34,949	94,688	5,354	4,697	10,051

* Population growth rate assumed to be 3% per year in Sanger and Parlier.
* Per capita wastewater generation assumed to be 80 gallons/capita/day in Sanger based on Carollo (2006), and 120 gallons/capita/day in Parlier based on Giersch (2006).

2.4.3 Power Plant Design

Process water demands include cooling water, boiler make-up water, and water for cleaning and other maintenance purposes. **Table 2** shows expected process water demands by month.

Table 2 – Estimated Process Water Demands

Month	Acre-feet	Gal/min
Jan	254	1,920
Feb	239	1,800
Mar	274	2,070
Apr	280	2,110
May	309	2,330
June	317	2,390
July	343	2,590
August	338	2,550
Sept	315	2,380
Oct	300	2,260
Nov	261	1,970
Dec	255	1,920
Average	290	2,190
Total (AF/yr)	3,485	-

The water demands average 290 AF/month with seasonal demands varying by +/- 18% from the average. Maximum daily demands are projected to be 4.2 mgd, which will be the design capacity of the tertiary treatment plant.

All water demands at the power plant are summarized in **Table 3**. Potable and landscaping demands will be met by onsite wells, and will not be treated at the tertiary treatment plant.

Table 3 – Estimated Power Plant Water Demands

Description	Water Demand
Process	3,485 AF/year
Potable	2 AF/year
Landscaping	1 AF/year
Total	3,488 AF/year

2.4.4 Influent Characteristics

The tertiary treatment plant influent flow is the combined secondary treated effluent from Parlier and Sanger WWTPs. Generally, the tertiary treatment plant will receive slightly greater than 50 percent of its flow from the Sanger WWTP and just under 50 percent of its flow from the Parlier WWTP. In this case the influent quality will be approximately the average of the two effluent qualities, yielding a BOD of approximately 23 mg/L and TSS of approximately 27 mg/L. Influent quality may be higher or lower on occasion if a greater percentage of the influent flow is delivered from Sanger versus Parlier.

The secondary effluent from the Sanger and Parlier WWTPs, which will be the influent flow to the tertiary treatment plant, will be delivered to one of two clay-lined storage ponds with a combined 10-day storage capacity, located at the Parlier WWTP site. From these storage ponds, the secondary effluent will flow by gravity to the tertiary treatment plant. Influent pumps located at the tertiary treatment plant will then pump the influent flow through the filters.

2.5 Treatment Process

The tertiary treatment plant influent will flow by gravity from the storage ponds located at the Parlier WWTP. The tertiary treatment plant process consists of filtration and disinfection. Filtered, disinfected effluent will be pumped to the power plant for use as process water. There will be no discharge of reclaimed water to ground or to waters of the State. Solids removed by filtration will be returned to the Parlier wastewater treatment plant. All dissolved solids remaining will be removed from the cooling tower and trucked to landfill.

2.5.1 Influent Pumping

Under normal conditions, secondary effluent flows to the tertiary treatment plant site where influent pumps pump it through the filters. When groundwater is required to supply or supplement the power plant demands, percolated effluent will be pumped from a well to the filtered effluent pipeline to the chlorine contact tank. Groundwater will be effectively filtered during percolation and will not go through filtration at the tertiary treatment plant.

2.5.2 Filtration

Secondary effluent entering the new treatment facility will go through one of four disk filters (three on-line and one standby) designed to remove turbidity from the secondary effluent. Two turbidimeters (turbidity meters) will be provided, one on the filter influent line, and one on the filter effluent. Any time the filter influent flow exceeds 5 nephelometric turbidity units (NTU) or the filter effluent flow exceeds 2 NTU, polymer from an on-site storage tank will be added at an injection point upstream of the filters. Polymer dosage will be manually adjusted, and the feed rate will vary with the number

of filters in service in order to improve filter efficiency. Normal filter operation allows each of the cloth filter disks to be backwashed using filtered water; the backwash water will be pumped back to the Parlier WWTP influent for reprocessing.

2.5.3 Chlorine Disinfection

Filter effluent will flow by gravity to a pair of chlorine contact tanks, after being injected with sodium hypochlorite solution. Sodium hypochlorite will be stored in solution on-site in a double-walled chemical storage tank, and pumped to the injection point by means of a chemical dosing pump. The dosing rate will be manually controlled, and the feed rate paced off the flow rate measured by a flow meter located on the pipeline entering the chlorine contact tank. Each contact tank will be large enough to allow proper contact time for disinfection should the second tank be out of service. Each contact will contain baffle walls to induce a serpentine flow through the tank, thus providing sufficient contact time for disinfection. Chlorine residual will be measured at the chlorine contact tank outlet, and used to calculate adequate CT time for the flow.

2.5.4 Effluent Pumping

Two effluent pumps with variable speed drives, each capable of pumping the design flow, will be provided to pump treated effluent from the chlorine contact tank to the power plant for use as process water.

2.6 Supplemental Water Supply

When secondary effluent from the two municipal facilities is insufficient, for any reason, to fully supply the power plant, wells at the power plant site will be used to recover percolated effluent and transfer it to the tertiary treatment plant site for disinfection. These supply wells will be located at the percolation ponds.

2.7 Monitoring and Reporting

The treatment plant water product will be disinfected tertiary recycled water in accordance with Title 22. Monitoring and reporting will be conducted in accordance with Standard Provisions for Monitoring and Reporting as issued by the State Water Resources Control Board and local conditions set by the California Regional Water Quality Control Board – Central Valley Region. Monitoring and reporting will be conducted by a California Certified Lab.

The effluent will be monitored as required by permit for total coliform bacteria. Turbidity analyses will be conducted continuously using a continuous monitoring and recording turbidimeter on both the filter influent and filter effluent. Compliance with the daily average operating filter effluent turbidity of 2 NTU will be determined by averaging the levels of recorded turbidity taken at a minimum of four-hour intervals over a 24-hour period. Compliance with the turbidity standard of not exceeding 5 NTU more than 5

percent of the time over a 24-hour period will be determined using the levels of recorded turbidity taken at intervals of no more than 1.2-hours over a 24-hour period. The results of daily average turbidity determinations will be reported at least quarterly.

Continuous chlorine residual monitoring will be provided. Compliance with CT (contact time) requirements will be determined at least daily.

2.8 Contingency Plan

2.8.1 Reliability Provisions

Redundancy will be provided throughout the tertiary treatment plant. Four filters will be provided (three on-line and one standby), with sufficient capacity to filter the design flow with one unit out of service. A second chemical dosing pump as well as a second polymer pump will also be provided for redundancy in the chlorine and polymer dosing. The chlorine contact tank will include a center wall dividing the contact tank in half with each half of the contact tank designed for the complete 4.2 million gallons per day (mgd) design flow. Two vertical turbine pumps will be provided at the end of the contact tank, each also having capacity to pump the entire flow.

2.8.2 Off-Spec Water

Redundancy of facilities and a backup power supply as described in Section 8.1, limit the possibility of failures causing the effluent to fall short of water quality requirements. However, in the event that effluent from the tertiary treatment plant does not meet the water quality requirements, provisions will be made to ensure this off-spec water is not used at the power plant. Off-spec water will be returned to the Parlier WWTP for reprocessing.

3 TRANSMISSION AND DISTRIBUTION SYSTEM

Once the wastewater has been treated at the tertiary treatment plant, effluent will be pumped from the chlorine contact tank to a storage tank at the power plant for distribution as process water. Distribution system piping will be assembled of purple PVC pipe and fittings or steel pipe and fittings, painted purple with pipe identification markers conforming to ANSI Standard A13.1-1996. Signage regarding use of non-potable water will be provided in compliance with Title 22. Transmission and distribution beyond the storage tank will be the responsibility of the power plant designer.

4 USE AREAS

4.1 Type of Reuse Proposed

All of the effluent from the proposed tertiary treatment plant will be used as process water for the Kings River Conservation District Community Power Plant.

4.2 Parties Responsible for Use and Distribution

KRCD, or their licensed operator, will retain full responsibility for all new facilities described.

4.3 Use Area Design

(Not Applicable)

4.4 Use Area Inspections and Monitoring

Use area inspections and monitoring will not be defined in this report because the owner and operator of the tertiary treatment plant will be the same entity as the owner and operator of the power plant. Use area inspections and monitoring will therefore be done internally.

4.5 Employee Training

Generally, the treatment plant superintendent will supervise and train the other operators to ensure compliance with water recycling criteria by developing procedures, restrictions, and other requirements for the use of recycled water for the power plant process water.

Power plant personnel will operate and maintain the recycled water distributions system at the power plant. These persons will be trained in the handling of recycled wastewater through available classes, including instruction on the specific requirements of the RWQCB, DHS, and the County Health Department. A copy of Guidelines for Use of Recycled Water prepared by the DHS and the Waste Discharge Requirements issued by the RWQCB will be discussed with the staff and given to the recycled water coordinator.

Power plant and treatment plant workers will also be instructed in the prevention of cross-connections between the recycled water, raw water, and potable water distribution systems. Outside contractors working with any of these systems will be informed of the use of recycled water and given information sheets on the prevention of cross-connections.

4.5.1 Worker Safety

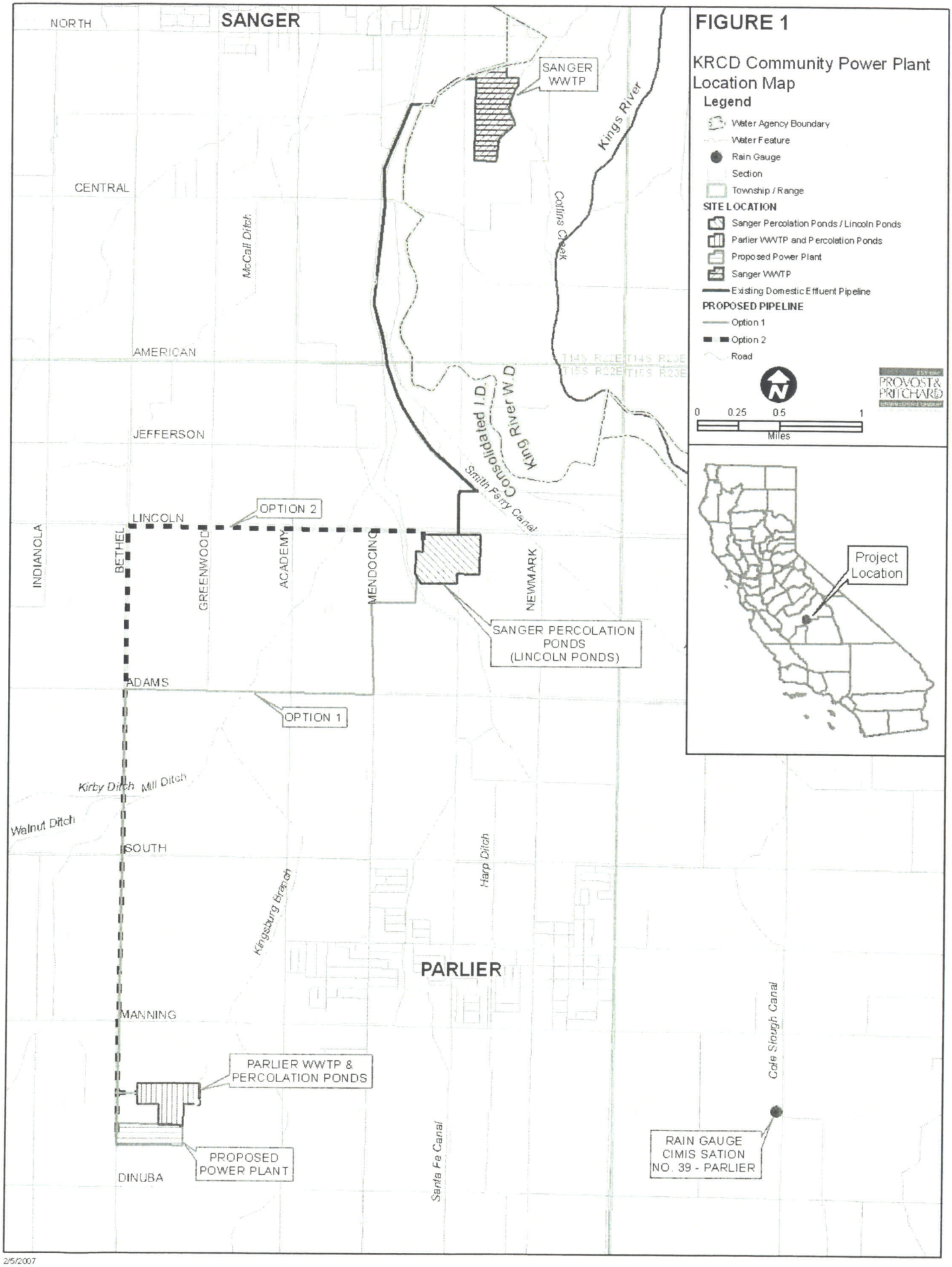
- All workers will be informed of the potential health hazards involved with contact or ingestion of recycled water and should be educated regarding proper hygienic procedures to protect themselves and their families. The workers should receive the same immunizations given to wastewater treatment plant employees.
- Safe drinking water will be supplied for power plant and treatment plant workers.
- Hand washing facilities will be provided.
- Workers will be notified that recycled water is in use. This notification includes the posting of conspicuous warning signs with proper working of sufficient size to be clearly read. These signs will be in printed in English and Spanish.
- An adequate first aid kit will be available on-site.

5 REFERENCES

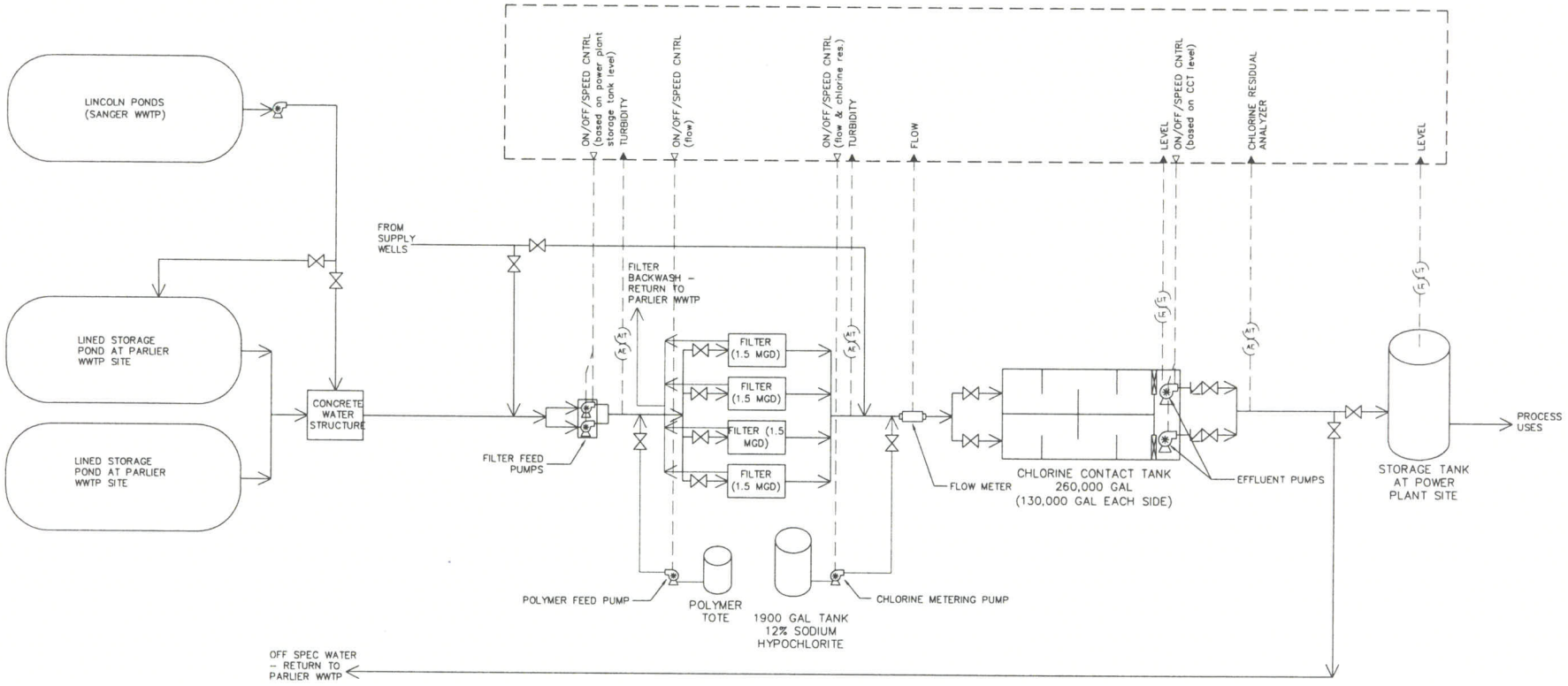
Carollo Engineers, Wastewater Treatment Plant Master Plan Project Report, City of Sanger, January 2006.

Giersch & Associates, Inc., City of Parlier, Fresno County California, Preliminary Report for the Findings of Compliance, Wastewater Treatment Master Plan with Land Acquisition, January 2006.

Navigant Consultants, Inc., KRCD Community Power Plant – Application for Certifications, September 27, 2007.



2/5/2007
\\huntington\gis\Clients\Kings River CD_1364\1364000\WR\Maps\Figure1.mxd



Call Two Working Days Before You Dig!

1-800-227-2600

PRELIMINARY
NOT FOR CONSTRUCTION
02/26/2007

No.	REVISION	BY	DATE

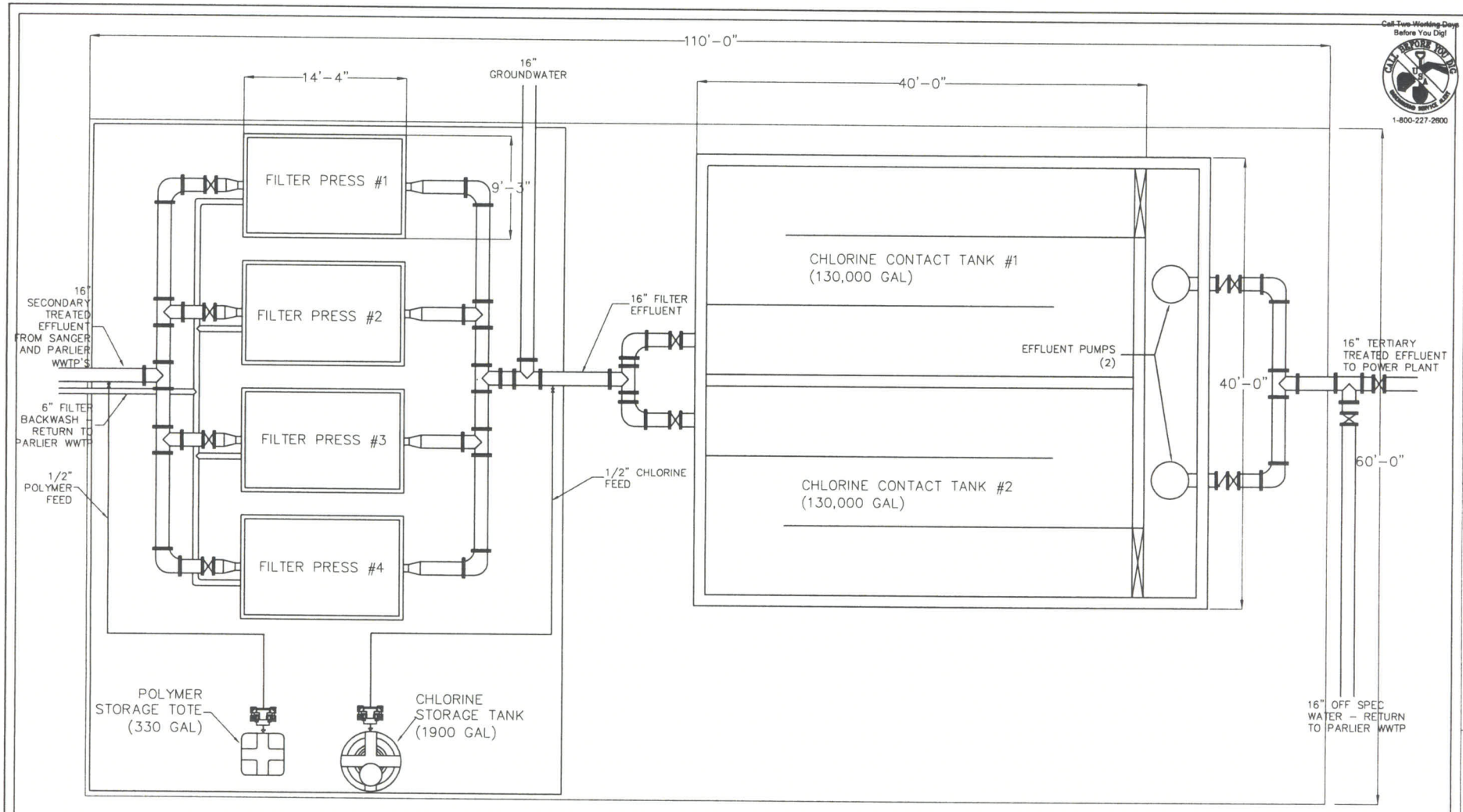
PARLIER POWER PLANT
TERTIARY TREATMENT PLANT
KINGS RIVER CONSERVATION DISTRICT
FRESNO COUNTY

FIGURE 2 PROCESS FLOW SCHEMATIC

PROVOST & PRITCHARD
CONSULTING GROUP
CERTIFIED FIRM
1800 30th STREET, SUITE 280
BAKERSFIELD, CALIFORNIA 93301
661/616-2600 FAX 661/616-2690
www.provost.com

DESIGN ENGINEER:
LICENSE NO: CE 55,555
DRAFTED BY: XYZ
CHECKED BY: XYZ
SCALE: AS SHOWN
DATE: 02/27/07
JOB NO: 13640603
DWG. NO.
SHEET 1 OF 2

7/28/2007 2:33 PM G:\Clients\Kings River Conservation Dist - 136+\3640603-Parlier Power Plant\dwg\PRELIMINARY\3640603-SC-Tertiary Treatment Plant.dwg Wayne Walker



NOTES:

1. LAYOUT BASED ON FLOW = 4.2 MGD, W/ 3 FILTER UNITS ON AND 1 STANDBY.
2. INLET FLOW CONTROL SYSTEM NOT SHOWN.
3. STORAGE FACILITIES, IF NEEDED, NOT SHOWN.
4. ROOF STRUCTURE ABOVE FILTERS, NOT SHOWN FOR CLARITY.
5. CHEMICAL STORAGE VOLUMES ARE APPROXIMATE FOR 14 DAYS OPERATION.
6. CHLORINE CONTACT TANK WATER DEPTH = 22 FEET, VOLUME APPROXIMATE FOR 45 MIN, EACH SIDE, AT 4.2 MGD.

PRELIMINARY
NOT FOR CONSTRUCTION
02/26/2007

No.	REVISION	BY	DATE

PARLIER POWER PLANT
TERTIARY TREATMENT PLANT
KINGS RIVER CONSERVATION DISTRICT
FRESNO COUNTY

FIGURE 3 PLANT LAYOUT

PROVOST & PRITCHARD
EST. 1968
CERTIFIED PUBLIC ACCOUNTANTS
An Employee Owned Company
1000 30th STREET SUITE 300
BAKERSFIELD, CALIFORNIA 93305
661/395-8000 FAX 661/395-1349
WWW.PPCPA.COM

DESIGN ENGINEER: ADH	
LICENSE NO: 54072	
DRAFTED BY: MSM	CHECKED BY: XYZ
SCALE: AS SHOWN	
DATE: 02/27/07	
JOB NO: 13640603	
DWG. NO:	
SHEET 2 OF 2	

2/27/2007 9:00 PM S:\Other\Village River Conservation Dist - 13640\13640603-Parlier Power Plant\dwg\PRELIMINARY\2 TERTIARY TREATMENT PLANT LAYOUT.dwg - 14x22 landsc

ATTACHMENT WASTE-2

Phase I Environmental Site Assessments

Note:
Reports were provided under separate cover.

Technical Area: Water and Soil Resources

Data Request 70:

Please provide a draft DESCP containing elements A through I listed below. These elements will outline site management activities and erosion/sediment control Best Management Practices (BMPs) to be implemented during site mobilization, excavation, construction, and post-construction activities. The level of detail in the draft DESCP should correspond to the current level of planning for site construction and corresponding site grading and drainage. Please provide all conceptual erosion control information for those phases of construction and post-construction that have been developed or provide a statement when such information will be available.

a) Vicinity Map: A map(s) at a minimum scale 1"=100' shall be provided indicating the location of all Project elements and depictions of all significant geographic features including swales, storm drains, and sensitive areas.
b) Site Delineation: All areas subject to soil disturbance, such as the construction area, laydown area, parking area, all linear facilities, and landscaping areas shall be delineated showing boundary lines and the location of all existing and proposed structures, pipelines, roads, and drainage facilities.
c) Watercourses and Critical Areas: The DESCP shall show the location of all nearby watercourses including swales, storm drains, and drainage ditches. Indicate the proximity of those features to the project construction, laydown, and landscape areas and all transmission and pipeline construction corridors.
d) Drainage Map: The DESCP shall provide a topographic site map(s) at a minimum scale 1"=100' showing existing, interim, and proposed drainage systems and drainage area boundaries. On the map, spot elevations are required where relatively flat conditions exist. The spot elevations and contours shall be extended off-site for a minimum distance of 100-feet in flat terrain.
e) Drainage of Project Site Narrative: The DESCP shall include a narrative of the drainage measures to be taken to protect soil and water resources on-site and downstream. The narrative shall include a summary of the hydraulic analysis prepared by a professional engineer/erosion control specialist. The narrative shall state the watershed size in acres that was used in the calculation of drainage measures. The hydraulic analysis should be used to support the selection of BMPs and structural controls to divert off-site and on-site drainage around or through the construction and laydown areas.
f) Clearing and Grading Plans: The DESCP shall provide a delineation of all areas to be cleared of vegetation and areas to be preserved. The plan shall provide elevations,

slopes, locations, and extent of all proposed grading as shown by contours, cross-sections, or other means. The locations of any disposal areas, fills, or other special features shall also be shown. Illustrate existing and proposed topography tying in proposed contours with existing topography.

g) Clearing and Grading Narrative: The DESCP shall include a table with the quantities of material excavated or filled during construction in all areas such as the construction area, laydown area, and transmission and pipeline corridors. This table shall identify whether the materials removed and brought in were temporarily or permanently added or removed and the amount of such material brought in or removed.

h) Best Management Practices Plan: The DESCP shall identify on the topographic site map(s) the location of the site specific BMPs to be employed during each phase of construction, initial grading, project element excavation and construction, and final grading/stabilization. BMPs shall include measures designed to prevent wind and water erosion. Treatment control BMPs used during construction should enable testing of groundwater and/or stormwater runoff prior to discharge.

i) Best Management Practices Narrative: The DESCP shall show the location (as identified in H above), timing, and a maintenance schedule of all erosion and sediment control BMPs to be used prior to initial grading, during project excavation and construction, final grading/stabilization, and post-construction. Separate BMP implementation schedules shall be provided for each phase of construction. The maintenance schedule should include post-construction maintenance of structural control BMPs or a statement provided when such information will be available.

Updated Response:

The draft DESCP is included as Attachment Water-1. The draft DESCP includes the newly proposed 60-acre construction staging area and gas pipeline staging areas as well as the revised transmission line route. These areas are being evaluated in KRCD CPP Supplement B, which is scheduled for submittal in October 2008.

Technical Area: Water and Soil Resources

Data Request 71:
Please submit a jurisdictional delineation to the United States Army Corps of Engineers and a section 401 water quality certification application to the RWQCB.

Updated Response:
A letter was sent to the US Army Corps of Engineers in January 2008 to request whether or not a formal Wetland Delineation or Nationwide Permit #12 application would be required for the impact of 0.003 acres of wetlands in the Manning Recharge Basin.

Background Information

Three areas in the project action area were identified to have wetlands and/or waters of the US. There areas included the Manning Recharge Basin near Selma, the Kings River near Kingsburg, and intermittent drainages in the Cross Creek area near Traver. Through the implementation of numerous preventive mitigation measures, no fill, dredging, excavations, or negative impacts will occur in those areas, except for minor impacts at the Manning Recharge Basin. At the basin, four transmission line towers will be placed in the bed of the recharge basin which will impact 0.003 acres of poor-quality wetland habitat and a temporary impact will occur to about one-acre of poor-quality wetland habitat for a construction laydown area. The laydown area will be restored after installation of the towers.

The KRCD CPP AFC, noted that a Federal Clean Water Act 404 Permit (Nationwide Permit #12) might be required by the U. S. Army Corps of Engineers (Corps) if they have jurisdiction over such areas as the Manning Recharge Basin which is a man-made, groundwater recharge basin. Halstead & Associates contacted the Corps by letter on January 22, 2008 asking if a permit will be required for the project. A copy of that letter was previously provided to the CEC in February 2008, as part of the original response to this data request.

A formal Wetland Delineation was not been submitted to the Corps as it was unknown if a Federal 404 permit would be required by the Corps. If a permit was required by the Corps, then a corresponding State 401 Water Quality Certification (Waiver) would be required from the Regional Water Quality Control Board.

The KRCD CPP AFC also noted that a Federal Clean Water Act 404 Permit would not be needed with the Corps for the undercrossings at the Kings River near Kingsburg and intermittent

drainages in the Cross Creek area because all work would occur outside the bed, bank, and riparian habitat and that no impacts would occur to those resources. Furthermore, numerous preventive measures (such as buffer zones, fencing, restricted work areas, signage, educational program, on-site biologist, pre- and post-monitoring) were incorporated into the project to completely avoid any potential impacts.

Upon a subsequent email from Halstead and Associates to the Corps (July 18, 2008) and a phone conservation with Mr. Ramon Aberasturi (Corps, Sacramento) on July 21, 2008, the Corps provided the following guidance:

1. The Manning Recharge Basin, with its low-quality wetland habitat that is disced annually, will not fall under the Corps' jurisdiction, will not require a permit from them, and no notification is required by the Corps. The basin can be considered a non-jurisdictional, dead-end, and isolated wetland or simply a non-jurisdictional sump. Thus, permitting is not required by the Corps to install the four transmission line towers in the bed of the recharge basin that will impact 0.003 acres of poor-quality wetland habitat. Also, no permitting is necessary for the temporary impact to about one-acre of poor-quality wetland habitat for a construction laydown area in the bed of the recharge basin. The laydown area will be restored after installation of the towers.

2. Concerning the installation of the natural gas pipeline under the Kings River and the intermittent drainages in the Cross Creek area, the Corps does not think that a permit will be necessary due to the implementation of the proposed preventive avoidance measures, work areas are completely outside the waters/wetland areas, large no-impact buffer zones occur away from the waters/wetland areas, and because no impacts will occur to the river/creeks and their waters/wetlands.

The Corps requested the following items to evaluate the location of HDD work areas in relationship to the river/creeks and to ensure that no impacts will occur to waters/wetlands: (1) a Frac-out Plan for the HDD work, (2) aerial maps of the HDD work locales, and (3) photographs of the entrance and exit sites for the HDD work. A copy of the Halstead & Associates response memo providing this information to the Corps is included as Attachment Water-2.

Technical Area: Water and Soil Resources

Data Request 72:
Please discuss in detail whether a 401 certification is required. If required, please discuss compliance with the 401 certification requirement, and include a copy of the application and a schedule for completion of the certification.

Response:
As discussed in the response to Data Request 71, a permit from the Corps is not required for the project. Since a Federal 404 Permit is not required by the Corps, then a corresponding State 401 Water Quality Certification (waiver) would not be required from the RWQCB.

Technical Area: Water and Soil Resources

Data Request 74:
To identify the volume of wastewater supply, please provide the monthly and yearly total effluent wastewater volume from each WWTP for the last 10 years (1997 to 2007) and expected volume during the first 10 years of plant operation.

Initial Response:
Included as Attachments Water-3 and Water-4 are monthly and yearly wastewater effluent volume totals from the City of Parlier and City of Sanger Wastewater Treatment Plants.

Technical Area: Water and Soil Resources

Data Request 80:
Please provide a list of wells that could be affected by the project's use of groundwater.

Initial Response:
KRCD expects to file a response to this data request within the next few weeks.

Technical Area: Water and Soil Resources

Data Request 81:
Using Kings Basin Integrated Groundwater Surface Water Model, MODFLOW, or comparable model, please quantify the impact on those wells under the two scenarios listed below and identify all assumptions and data used.

a) Supplementing the wastewater supply with pumped groundwater during times when peak demand for water from the power plant exceeds the ability of the two wastewater treatment pants to supply water to the power plant project; and
b) During times of a short and long interruption in the supply of wastewater.

Initial Response:
KRCD expects to file a response to this data request within the next few weeks.

Technical Area: Water and Soil Resources

Data Request 87:
Please provide physical and chemical data on the groundwater proposed to be pumped.

Initial Response:
While KRCD does not propose to pump directly from the groundwater currently in the basin, the characteristics of the percolated effluent at Parlier Wastewater Treatment Plant monitoring wells is reported in AFC Volume 2, Appendix 8.5-1, "Effluent and Ground Water Quality Data". This represents the captured percolated effluent that would be used during supply system outages.

Technical Area: Water and Soil Resources

Data Request 88:
Please provide modeling or numerical calculations that describe how the percolated wastewater would be captured by the proposed groundwater wells.

Initial Response:
The wells are proposed to be located in the percolation zones of the Parlier Wastewater Treatment Plant. The well depths will be set to capture and pump from above the ground water, which will be fed by percolation from the Parlier ponds.

ATTACHMENT WATER-1

Drainage, Erosion Control and Sedimentation Plan

DRAINAGE, EROSION AND SEDIMENT CONTROL PLAN

FOR THE

KINGS RIVER CONSERVATION DISTRICT
COMMUNITY POWER PLANT

REGISTERED PROFESSIONAL ENGINEER
OWEN KUBIT
No. C66552
EXPIRES: 6-30-10
Civil
STATE OF CALIFORNIA

DATE SIGNED: 8-27-08

AUGUST 2008

PROFESSIONAL GEOLOGIST
SHAY WILLIAM OVERTON
No. 8424
Geology
STATE OF CALIFORNIA

Date Signed 8/27/08

PREPARED BY:

PROVOST AND PRITCHARD
ENGINEERING GROUP, INC.

www.ppeng.com
EST. 1968
PROVOST & PRITCHARD INC
ENGINEERING GROUP
An Employee Owned Company

TABLE OF CONTENTS

1.0 - INTRODUCTION 1
1.1 - Overview 1
1.2 - Description of Existing Site 1
2.0 - DRAINAGE 5
2.1 - Power Plant Site and Construction Laydown Area 5
2.2 - Pipelines 6
2.3 - Electric Transmission Line 6
3.0 - CLEARING AND GRADING 8
4.0 - BEST MANAGEMENT PRACTICES 10
4.1 - General Erosion and Sediment Control Measures 10
4.2 - Power Plant Site and Construction Laydown Area 12
4.3 - Pipelines 14
4.4 - Electric Transmission Lines 19
5.0 - INSPECTION AND MAINTENANCE DURING CONSTRUCTION 21
5.1 - Inspection Requirements 21
5.2 - Maintenance Requirements 22
6.0 - STORMWATER MANAGEMENT MEASURES 24
6.1 - Stormwater Management Basins 24
6.2 - Oil/Water Separator 24
6.3 - Permanent Vegetation 24
6.4 - Maintenance of Storm Water Management System 24
7.0 - REFERENCES 26

Attachments

1-1 Regional Area Map
1-2 Project Location Map
1-3 Water Resources Map
2-1 Existing Site Topography
2-2 Proposed Project Site Development - Best Management Practices
2-3 Construction Laydown Area - Best Management Practices
4-1 Typical Jack and Bore Construction
4-2 Horizontal Directional Drilling Location Maps

Appendices

A - Best Management Practices Fact Sheets
B - Hydrologic and Drainage Calculations

List of Abbreviations

BMP	Best Management Practices
CBC	California Building Code
CEC	California Energy Commission
CPP	Community Power Plant
DESCP	Drainage, Erosion and Sediment Control Plan
EC	Erosion Control
FASL	Feet above sea level
FEMA	Federal Emergency Management Agency
HDD	Horizontal Directional Drilling
KRCD	Kings River Conservation District
MW	Megawatts
NRCS	Natural Resources Conservation Service
NS	Non-Stormwater Management
PG&E	Pacific, Gas & Electric Company
SCG	Southern California Gas Company
SCS	Soil Conservation Service
SE	Sediment Control
SWPPP	Storm Water Pollution Prevention Plan
TC	Tracking Control
USCS	Unified Soil Classification System
USDA	United States Department of Agriculture
WE	Wind Erosion Control
WM	Waste Management
WWTP	Wastewater Treatment Plant

1.0 - INTRODUCTION

1.1 - Overview

This report provides a Drainage, Erosion and Sediment Control Plan (DESCP) for the proposed Kings River Conservation District Community Power Plant (CPP or Power Plant) in Parlier, California. This report, prepared at the request of the California Energy Commission, includes a description of the proposed drainage and grading plans, recommended Best Management Practices (BMPs) for drainage, erosion and sediment control, and inspection and maintenance procedures.

A Storm Water Permit for Construction Activity and Storm Water Permit for Industrial Activity will be required for this project. These permits will be acquired from the Regional Water Quality Control Board and will require the development and implementation of Storm Water Pollution Prevention Plans (SWPPPs). SWPPPs are similar to this report and will also include Best Management Practices to limit flooding, erosion, and sedimentation to levels of insignificance. This DESCP can serve as a guide for preparing the SWPPPs.

This is a Draft DESCP and was prepared based on the current level of planning and design for the project. This plan is an evolving document and will have to be amended as the design progresses. Throughout this report, it is noted in italics when design details are not finalized or when the DESCP will be modified in the future using more detailed design information.

1.2 - Description of Existing Site

Project Overview

The Kings River Conservation District (KRCD) is proposing to develop the KRCD Community Power Plant (CPP or power plant), an approximately 500 megawatt (MW) natural gas fired combined-cycle base-load power plant. The power plant would be located on an approximately 31-acre site on South Bethel Avenue between East Dinuba and East Manning Avenues, near the City of Parlier, in Fresno County. The project site is located in an area with low density, rural houses; this site is currently zoned for agriculture and is currently used for growing vineyards. Approximately 60-acres located northwest of the project site will be used as a temporary construction laydown area. **Attachment 1-1** is a regional area map and **Attachment 1-2** is a project location map. The project involves four basic components including the power plant site, natural gas pipeline, water pipeline, and transmission lines. *Detailed drawings for these features are not yet available, and only conceptual drawings have been prepared.* The power plant site, water pipeline, and transmission lines will occur in Fresno County. The gas pipeline will be in both Fresno and Tulare Counties.

Topography
The project vicinity is located within the San Joaquin Valley. Slopes on the project site are relatively flat (approximately 0.003 ft/ft). The base elevation in the area immediately surrounding the project site is approximately 327 feet above sea level (FASL). The San Joaquin Valley is bordered by the Coast Ranges to the west, the Sierra Nevada to the east, and the Tehachapi Mountains to the south.

Climate
The climate of the San Joaquin Valley includes hot, dry summers and mild winters. Rainfall typically occurs during November through April. Precipitation is variable from year to year, but is generally around 11 inches.

Natural Gas Pipeline
Natural gas will be provided by a new approximately 26-mile long 20-inch diameter underground pipeline interconnection to the Southern California Gas Company (SCG) Line 7000 near the City of Visalia, California. The new gas pipeline will typically follow existing roads and be primarily located in public right-of-way. Three construction staging areas and six horizontal directional drilling staging areas have also been identified for use during pipeline construction, each with an approximate size of 200 feet by 200 feet. Refer to **Attachment 1-3** for a map showing the entire gas pipeline route and staging areas. The natural gas pipeline will be constructed below-grade along its entire route, except at line termination points at the project site and the connection to the SCG Line.

Water Pipelines
Recycled water will be the primary source of process water for the KRCD CPP. Some pumped groundwater may also be used. The recycled water will be delivered by new underground pipelines connected to the Parlier Wastewater Treatment Plant (WWTP) and the Sanger WWTP effluent percolation and evaporation ponds located on Lincoln Avenue (i.e. Lincoln Ponds). The Parlier WWTP is located adjacent to the north of the plant site, and the interconnection will be located at the northern project site boundary. The proposed interconnection to the Lincoln Ponds is approximately 5 miles north and a pipeline will be located primarily along existing roadways. Currently two options are being considered for the water pipeline interconnection to Lincoln Ponds. Refer to **Attachment 1-3** for a map showing the locations of the proposed water pipelines, Parlier WWTP and Sanger percolation ponds.

Electric Transmission Line
The KRCD CPP will deliver electric power to the Pacific Gas & Electric (PG&E) transmission grid through a new approximately 5-mile long 230 kilovolt (kV) radial transmission line between the on-site 230 kV switchyard site and PG&E's McCall

substation. The transmission line will be primarily located on private property. See **Attachment 1-3** for a map with the transmission line alignment.

Hydrologic Setting

The proposed project site is located in the Tulare Lake Basin along the eastern edge of the Central Valley bordering the Sierra Nevada Mountain range. The Kings River is the major hydrologic feature in the area and is located about 5 miles east of the project site. A section of the natural gas pipeline will pass under the River (see **Attachment 1-3**). Numerous irrigation canals and ditches are also found in the area. The gas pipeline and water pipeline will cross several of these. The gas pipeline will also traverse a creek (Cross Creek) and run adjacent to some wetland ponds and vernal pools. Manning Recharge Basin is another local hydrologic feature. It is an approximately 800 feet wide natural depression that is operated as a groundwater recharge basin. The electric transmission line will pass over the basin (see **Attachment 1-3**).

Water Inundation Zones

The Federal Emergency Management Agency (FEMA) prepared floodplain maps of the project area. The project site, the water pipeline and transmission towers are all located outside of the FEMA 100-year floodplain. The nearest areas with concerns of flooding, as established by FEMA, are along the Kings River and isolated areas within the City of Parlier. These designated floodplains are several miles from the proposed power plant site. Most of the natural gas pipeline will be located outside of the 100-year floodplain, however some portions will cross the 100-year floodplain. These include: 450 foot section under Kings River, 2,600 feet near Avenue 368 and Highway 99 intersection, 1,500 feet near Cross Creek, and 1,400 feet near Goshen, for a total of about 6,000 feet. Refer to **Attachment 1-3** for the location of floodplains on and near the project facilities.

Soils Related Drainage and Erosions Concerns/Hazards

Potentially affected soil resources in the KRCD CPP project area have been described using information from the Eastern Fresno Soil Survey and the Soil Survey of Tulare County, CA-Western Part, prepared by the Natural Resources Conservation Service (NRCS). A total of 17 soils series, represented by 32 soil map units occur within the KRCD CPP project and pipeline areas. Soils within the boundary of the project and along the pipeline alignments are discussed in detail in the KRCD CCP, Application for Certification, Section 8.12.

Soils at the project site range from sand to fine sandy loam using the USDA, SCS classification system. These soils types correspond to well graded sands (SW) to fine silty sands (SM) in the Unified Soil Classification System (USCS). Pertinent physical characteristics important to the DESCP and implementation of the appropriate BMP's include moderate to high wind blowing hazard and wind erosion (Wind Erodibility

Groups 1 to 3), drainage is somewhat excessive to well, and the water erosion hazard is slight to moderate (K factor of 0.32 to 0.37).

During construction of the project, approximately 30 acres of land will be cleared of crops (vineyards), graded and leveled. The proposed power plant site contains topsoil consisting of Hanford fine sandy loam, Hanford sandy loam and Delhi sand. According to the NRCS Soil Survey, the Hanford fine sandy loam and sandy loam have a slight to no erosion hazard, but the Delhi sand has a high blowing hazard. The site has very little slope (about 0.003 ft/ft) and experiences little rainfall, but winds can be moderate to high at times. After construction, landscaping throughout the power plant site will reduce soil erosion on the exposed soil surfaces. Furthermore, the already shallow slopes on the site will be leveled, further reducing the threat of runoff and erosion.

Soils within one quarter of a mile of the pipeline alignments range from sand to silt loam (USDA, SCS). In the unified classification system the range is from well graded sand to silt. The majority of soils in the vicinity of the pipelines are in the range of silty sand to fine silty sand. The important physical characteristics of these soils include moderate to high wind blowing hazard (Wind Erodibility Groups 2 to 5), they are somewhat excessive to poorly drained, and the water erosion hazard is slight to moderate.

Soils impacts along the pipeline alignments are expected to be less than significant because the majority of excavation, storage, and backfilling will occur in road rights of way where trenching and development for roadways and existing infrastructure and lines have resulted in the existing soil being highly disturbed and unproductive for most other purposes.

Soil erosion along the transmission tower alignment is not a major concern since the powerlines will be placed above ground. As a result, detailed information on the soils along the alignment are not provided herein. Nevertheless, some soil erosion measures will be used, particularly around the tower footings and in Mannings recharge basin, as discussed in Section 4.4

2.0 - DRAINAGE

2.1 - Power Plant Site and Construction Laydown Area

The proposed power plant site has mild topographic relief. Based on a visual observation of a topographic survey the slopes appear to be 3 feet/1,000 feet. There are no significant water features in the area and runoff is characterized as sheet flow. The sheet flow will ultimately, under very large storms, flow to Fresno Slough. A preliminary topographic survey revealed that there is a low area oriented north-south in the middle of the power plant site. The survey also suggests that surface water from the western two-thirds of the property will drain to the south and southeast, and the surface water from the eastern one-third of the property will drain to the northwest. These areas will be leveled for the power plant construction and runoff will be directed to an on-site stormwater retention basin. Refer to **Attachment 2-1** for the existing topography at the site.

Development of the facility will cause an increase in impervious area and hence increase runoff during rainfall events. However, the design will include a stormwater basin able to accommodate a 10-day 100 year storm (see hydrologic calculations in **Appendix B**). The stormwater retention facilities will keep all runoff on-site until it either evaporates or infiltrates. The project will have no off-site discharges to surface water for storms smaller than the design storm, and therefore would not violate water quality standards or waste discharge requirements nor degrade surface water quality.

The project site is located in rural unincorporated Fresno County. The site does not fall within the Fresno Metropolitan Flood Control District or within the City of Parlier Master Drainage Plan. Fresno County will be the permitting agency for any stormwater and pond designs and calculations. Fresno County confirmed that the Rational Method can be used for the drainage and stormwater pond design.

The pond volume can be calculated using Q=CIA, where Q equals the volume required ($V_{REQ'D}$) in Ac-Ft, C equals the runoff coefficient, and A equals the area in acres. A value of 0.5 is used for I (Intensity) which represents a 6 inch 10 day – 100 year storm. Two foot of freeboard is required above the required volume elevation of the pond. According to Fresno County, in certain circumstances depending upon the soil conditions and percolation values, the I value could be reduced to 0.28 ft (3.36 inches). Reducing the I value would depend on the soil boring logs found in the geotechnical report.

Using the 0.5 value for the Intensity, the required pond volume will be 4.94 Ac-Ft. Including two foot of freeboard, the pond would need to have an area of approximately 45,600 SF at the top of the berm and be approximately 10 feet deep using 4:1 slopes. Using the 0.28 value for the Intensity, the required pond volume will be 2.76 Ac-Ft.

Including two foot of freeboard, the pond would need to have an area of approximately 36,200 SF at the top of the berm and be approximately 7 feet deep using 4:1 slopes.

Drainage design for the project will include a series of 13 catch basins connected to high density polyethylene pipe with a diameter ranging from 18 to 24 inches. All of the project site will be sloped to direct runoff to the catch basins. All drainage water will be conveyed through the pipelines to a retention pond.

The first construction task will include clearing the project site and leveling the land. The underground facilities, including the drainage system and retention pond, will be constructed first. As a result, the full drainage system will be in place during most of the construction period. Preferably, this work would be performed in the non rainy season (May to September, but if necessary could be completed in the rainy season of October to April). Refer to **Attachment 2-2** for a drawing of the drainage plan.

Construction Laydown Area

The construction laydown area consists of 60 acres of fallow agricultural land located northwest of the project site and west of Bethel Avenue. The laydown area comprises three 20-acre parcels. Refer to **Attachment 2-3** for a topographic map of the laydown area. Previous documents have referenced a laydown area just south of the project site, but this new area was selected primarily because it is larger and still in close proximity to the project site. The laydown area has relatively flat slopes ranging from 0.5 ft/1,000 ft to 2 ft/1,000 ft. In addition, soils in the area are relatively sandy, therefore runoff from the site is expected to be low. Fresno County guidelines do not specifically state that a retention basin is needed on construction laydown areas. However, drainage swales are recommended on the downslope sides of the laydown area to collect runoff.

The eastern part of the project site will be a long-term laydown area. Stockpiles will be stored in this area during construction. This area will be covered with gravel or seeded after construction is complete.

2.2 - Pipelines

The water and natural gas pipelines will be buried and the ground surface will be returned to original grade. Therefore, their installation will not permanently impact drainage. The pipelines will be constructed primarily on road right-of-ways and usually in the road shoulder. Since the roads have crowns, sandbags, excavated trench material or other water barriers will have to be implemented to prevent runoff from entering the pipeline trenches.

2.3 - Electric Transmission Line

Transmission tower footings will be slightly elevated above the existing ground surface. Therefore, water will flow away from the transmission towers. The footing will only

cover a small area (4 feet x 4 feet each) and will not interfere with drainage. All areas surrounding the footings will be restored to their original grade to maintain current drainage characteristics. Compacted roads and construction areas should be ripped and graded upon completion of construction activities.

3.0 - CLEARING AND GRADING

Regulatory Compliance and Standards

The contractor will be required to conduct clearing and grading in compliance with the applicable building codes, the project geotechnical report, the project plans, the project specifications, and the County of Fresno and Tulare requirements, whichever is more stringent. Site development activities will also require certification by a Professional Geotechnical Engineer and a Professional Engineering Geologist during and following construction, in accordance with the California Building Code (CBC), Chapter 70. The professional Geotechnical Engineer and the Professional Engineering Geologist will certify the placement of earthen fills and the adequacy of the site for structural improvements. Both the Professional Geotechnical Engineer and the Professional Engineering Geologist will address CBC Chapter 70, Sections 7006 (Grading Plans), 7011 (Cuts), 7012 (Terraces), 7013 (Erosion Control) and 7015 (Final Report).

Project Site

The project is located on approximately 31 acres of relatively flat agricultural land. Grape vines on the project site will be cleared for construction. An abandoned house and some farm buildings will be demolished and removed from the site. The site will be graded so water drains to several catch basins and ultimately flows to an on-site stormwater basin (see **Attachment 2-2**).

Construction Laydown Area

The construction laydown area includes about 60 acres of relatively flat agricultural land. The land is fallow and there are no structures on the site, so no land clearing will be needed. No grading is proposed as the land is sufficiently flat to prevent significant erosion from runoff. Drainage and runoff is expected to flow naturally to temporary drainage swales on the downslope ends of the laydown area (see **Attachment 2-3**).

Excavation and Fills

For all areas where earthwork will be executed, materials suitable for compaction will be stockpiled in designated locations on site. Materials not suitable for compaction will be stored in separate stockpiles and reused on the site, as appropriate. Any contaminated materials encountered during excavation will be disposed of in accordance with applicable laws, ordinances, regulations and standards.

Table 1 shows the volume of soils striped, excavated, and imported onto the site. Soils will not be excavated on the 60-acre laydown area.

Table 1 – Site Soil Volumes Stripped, Excavated and Imported

Type of Soil Materials	Volume in Cubic Feet	Volume in Cubic Yards
Topsoil Stripped – Clearing	503,506	18,648
Underlying Soils Excavated	544,075	20,151
Suitable Fill Imported	331,180	12,266

Fill materials will be procured from a local supplier and transported to the site. *Details on the pipeline design are not yet available to determine if there will be surplus material or if backfill material will need to be imported.*

4.0 - BEST MANAGEMENT PRACTICES

The following sections present standard construction Best Management Practices (BMP's) which are described in the California Storm Water Best Management Practice Handbook (2003). This resource handbook provides detailed, comprehensive descriptions on how to implement BMP's, and thus should be obtained and reviewed by all construction contractors that may have an impact on drainage, erosion or sediment control. **Appendix A** contains the California Storm Water Best Management Practice Handbook (2003) BMP fact sheets and the following sections discuss the appropriate BMP's to be considered for each area of construction. These fact sheets discuss implementation, inspection and maintenance practices for each BMP. Implementation practices are discussed below, and inspection and maintenance are discussed in Section 5.

The following sections present recommended construction BMP's for drainage, erosion, and sediment control at the Power plant site, construction laydown area, pipeline alignments, and electrical transmission lines. While performing the work, contractors may implement additional control measures if necessary. The BMPs are named along with the BMP code provided by the California Storm Water Quality Certification in their handbook. For instance (EC-1) refers to erosion control BMP no. 1 and (SE-5) refers to sediment control BMP no. 5 in their handbook.

4.1 - General Erosion and Sediment Control Measures

The greatest potential direct impacts to soil resources are associated with wind and water erosion during stripping, excavation, cutting, and filling activities at the proposed power plant site. Because the KRCD CPP project area is relatively flat (a slope less than 0.003 feet/feet) the potential for mass wasting at the site or along the pipeline alignments is considered low to negligible. However, drainage and erosion problems are still possible and need to be addressed.

Construction is expected to proceed as expeditiously and efficiently as possible, thereby ensuring the amount of soil disturbed is minimized and exposed for as short a time as possible. BMP's will be used to help maintain water quality, protect property from erosion damage, and prevent accelerated soil or wind erosion, and dust generation. Temporary erosion control measures should be implemented prior to the beginning of construction and they should be evaluated and maintained during construction. These measures typically include revegetation, preservation of existing vegetation, mulching, physical stabilization, dust suppression, berms, swales, ditches, and sediment barriers. These measures (except for revegetation) would be removed from the site after completion of construction.

A mitigation monitoring plan will be developed in conjunction with CEC staff to set performance standards and monitor the effectiveness of BMP's. This plan will address

the timing and methods of such measures as well as reporting and response. In addition, personnel will receive training to recognize and report any abnormal or adverse situations so they can be quickly corrected.

Scheduling

In order to limit the duration and amount of soil exposed a schedule of construction activities should be prepared prior to beginning construction (see BMP EC-1). The schedule should be a written plan including sequences of construction activities and implementation of erosion and sediment control BMP's. The schedule should include provisions for local climate and alternative BMP's that can be implemented in the event of extreme precipitation or wind events.

Recommended BMPs

A summary of all of the Recommended BMPs presented in this report is listed below:

Erosion Control

- Scheduling (EC-1)
- Preservation of Existing Vegetation (EC-2)
- Hydraulic Mulch (EC-3)
- Hydroseeding (EC-4)
- Soil Binders (EC-5)
- Earth Dikes and Drainage Swales (EC-9)
- Velocity Dissipation Devices (EC-10)

Sediment Control

- Silt Fence (SE-1)
- Sediment Basin (SE-2)
- Sediment Trap (SE-3)
- Fiber Roles (SE-5)
- Street Sweeping and Vacuuming (SE-7)
- Sand Bag Barrier (SE-8)
- Straw Bale Barrier (SE-9)
- Side Drain Inlet Protection (SE-10)

Tracking Control

- Stabilized Construction Entrance/Exit (TC-1)
- Stabilized Construction Roadway (TC-2)
- Entrance/Outlet Tirewash (TC-3)

Wind Erosion Control

- Wind Erosion Control (WE-1)

Non-Stormwater Management

- Dewatering Operations (NS-2)
- Vehicle and Equipment Cleaning (NS-8)
- Vehicle and Equipment Fueling (NS-9)
- Vehicle and Equipment Maintenance (NS-10)

Waste Management
- Material Delivery and Storage (WM-1)
- Material Use (WM-2)
- Stockpile Management (WM-3)
- Spill Prevention and Control (WM-4)

The above listed BMP's are meant to be implemented based on the current level of planning and only includes those BMP's appropriate for erosion and sediment control under current site conditions and foreseeable construction conditions. If, during the course of construction, sediment and erosion control conditions change, managers and contractors may implement appropriate BMP's listed in the California Stormwater Quality Association's Management Practice Handbook. BMP's for each area of construction activity are listed below in Sections 4.2, 4.3 and 4.4.

4.2 - Power Plant Site and Construction Laydown Area

Off-site Drainage
The Power Plant site and construction laydown area will be constructed on relatively level ground; therefore sediments will be managed primarily by peripheral silt fences around the project site and laydown area (**Attachment 2-2**). In the event that offsite drainage occurs then earth dikes and drainage swales can be employed to direct water and sediments away from the perimeter to the on-site drainage facilities and into the onsite sedimentation basin. The preliminary design includes a berm and drainage swale on the west, east and north end of the project site. These will prevent runoff from leaving the project site. The following BMP's can be implemented to control offsite drainage:

- Silt Fence (SE-1)
- Earth Dikes and Drainage Swales (EC-9)

On-site Drainage
On-site drainage (**Attachment 2-2**) will be managed by a series of catch basins and pipelines that direct surface runoff to an on-site stormwater basin. The power plant site will be graded to ensure interior drainage to the catch basins. The 31-acre project site will be an isolated drainage basin and will only collect runoff from direct precipitation onto the project site. Since no flows will leave the site no testing of surface water runoff is proposed. During the construction period, silt fences will be constructed around each catch basin to help reduce the volume of sediments delivered to the stormwater basin.

In the event that silt fences cannot contain the amount of sediment being delivered to the catch basins, then sediment traps can be employed. If the proposed drainage control facilities are inadequate earth dikes and drainage swales can be employed to direct water to the sediment basin.

On-site drainage in the construction laydown area will include drainage swales on the downslope ends of the property. A silt fence will also surround the property to prevent sediment from being transported off site.

The following BMP's can be implemented to control onsite drainage and erosion:

- Earth Dikes and Drainage Swales (EC-9)
- Silt Fence (SE-1)
- Sediment Basin (SE-2)
- Sediment Trap (SE-3)
- Fiber Roles (SE-5)
- Storm Drain Inlet Protection (SE-10)

Heavy Traffic Areas and Construction Laydown Area

Heavy traffic areas on the site will include the construction laydown area, entrances/exits to the project site, and associated roads to the areas of construction. Construction entrances/exits should incorporate temporary tracking control BMP's to alleviate tracking of sediment off-site by vehicles leaving the site. In addition, BMP's should be employed to stabilize the construction roads and laydown areas against erosion by using gravel or crushed rock placed according to specifications outlined in the BMP's. All surfaces should be watered regularly to reduce dust, but should not be watered excessively as to create runoff. If sediment and erosion is problematic around the construction entrances/exits then they may require periodic top dressing with additional gravel. The construction laydown areas will be regraded to original conditions.

All construction equipment will be maintained to control leaks and spills, and fueling will be conducted in designated, contained areas. Soils contaminated from fueling or leaking vehicles should be removed and disposed of properly.

The construction laydown area will be returned to natural grade and planted with alfalfa by the landowner after construction is complete. In addition, after construction all areas of the project site will either have hard surfaces (roof or pavement) or will be stabilized with vegetation or crushed rock/gravel to minimize erosion.

The following BMP's can be implemented to control sediment and erosion in heavy traffic areas:

- Stabilized Construction Entrance/Exit (TC-1)
- Stabilized Construction Roadway (TC-2)
- Entrance/Outlet Tire Wash (TC-3)
- Wind Erosion Control (WE-1)
- Preservation of Existing Vegetation (EC-2)
- Vehicle and Equipment Cleaning (NS-8)
- Vehicle and Equipment Fueling (NS-9)
- Vehicle and Equipment Maintenance (NS-10)
- Material Delivery and Storage (WM-1)
- Material Use (WM-2)
- Spill Prevention and Control (WM-4)

Sediment Basin
The onsite stormwater pond will be constructed during the initial site leveling and grading activities and maintained for the duration of construction activities. This pond will provide stormwater retention during construction and after completion of the facilities. The basin should be designed according to the following BMPs:

- Sediment Basin (SE-2)
- Velocity Dissipation Devices (EC-10)

Stock Piles
Construction spoils stock piles consisting of soil will be stabilized to prevent dust and alleviate wind erosion. Watering of the stock piles will occur on a schedule that satisfies the requirements of the San Joaquin Valley Air Pollution Control District, yet does not induce runoff or erosion of the stock piles. In addition, in lieu of watering, small stock piles can be covered with tarps to prevent rain or wind induced erosion. If rainfall causes excessive erosion and sedimentation, temporary silt fences can be installed around the stock piles. Stockpiles should be kept as low as practical to reduce the potential for sloughing. If stock piles are left undisturbed for a lengthy period of time, a soil binder can be applied in lieu of a regular watering schedule. The following BMPs will be employed to alleviate wind erosion and prevent dust derived from the stock piles:

- Stockpile Management (WM-3)
- Wind Erosion Control (WE-1)
- Soil Binders (EC-5)
- Silt Fence (SE-1)

4.3 - Pipelines
Pipeline construction will primarily be via the open trench method, however, the jack and bore method may be used for the crossings of irrigation canals, railroad tracks,

creeks, certain road and highway crossings and for certain ditches subject to encroachment permits from various owners. A depiction of the jack and bore technique is shown on **Attachment 4-1**. Horizontal directional drilling (HDD) is proposed where the natural gas pipeline will pass under the Kings River and Cross Creek and its tributaries.

Jack and Bore

A 50-foot buffer zone of no equipment/construction activities will occur on either side of any intermittent drainages where jack and bore construction techniques will be used. A qualified biologist will assist the engineers and construction crew in flagging and staking the buffer zones prior to construction.

Stock piles generated from the construction of the jack and bore entry and receiving pits and drilling spoils will be stabilized to prevent dust and alleviate wind erosion. Watering of the stock piles will occur on a schedule that satisfies the requirements of the San Joaquin Valley Air Pollution Control District, yet does not induce runoff or erosion of the stock piles. In addition, in lieu of watering, small stock piles can be covered to prevent rain or wind induced erosion.

The Dewatering BMP (NS-2) will be followed if the jack and bore entry and receiving pits encounter groundwater. This may be required at irrigation canals, depending on the time of year and the presence of irrigation flows.

Cross Creek Area

Horizontal Directional Drilling will also be performed in the Cross Creek area, as shown on **Attachment 4-2**. This will include approximately 4,000 feet where the pipeline crosses Cross Creek and its tributaries, some wetland ponds and a vernal pool. HDD staging areas will be located at the beginning and end of each HDD reach.

The endangered Vernal Pool Tadpole Shrimp was observed in one of the wetland ponds. Special precautions in these areas will likely include additional setbacks and erosion and sediment control BMP's. In addition, while construction related activities occur in these areas, inspection of erosion and sediment control BMP's will be conducted by a qualified biologist. The guidelines listed below are provided as additional requirements in biologically sensitive areas and will be used in conjunction with the appropriate BMP's to ensure that construction activities do not damage sensitive biological features. These were acquired from the Application for Certification (Appendix 8.16-3: Wetlands and Waters Evaluation.)

Requirements in Biologically Sensitive Areas (Creeks, Wetlands and Vernal Pools)

- An educational program will be conducted by a qualified biologist for all project managers, engineers, contractors and construction crews prior to work to inform

them of the wetlands and wildlife resources on the adjacent private land, the need to avoid damaging any pools, drainages, ponds and/or the endangered tadpole shrimp, and possible penalties for noncompliance.

- Signs denoting the adjacent lands as sensitive wetland and wildlife habitat will be posted at 100-foot intervals along the silt fence and maintained throughout construction.

- A qualified biologist will be on-site at all times during construction in the Cross Creek area and visually view and inspect that the measures are implemented.

- Runoff from the construction zone will be captured via trenches or other structures and drained away from the hydrologic features.

- No vehicle fueling or maintenance should be conducted in the vicinity of biologically sensitive areas.

The following BMP's should be employed in the Cross Creek area for all construction related activities:

- Preservation of Existing Vegetation (EC-2)
- Silt Fence (SE-1)
- Sediment Trap (SE-3)
- Fiber Roles (SE-5)
- Gravel Bag Berm (SE-6)
- Street Sweeping and Vacuuming (SE-7)
- Sand Bag Barrier (SE-8)
- Straw Bale Barrier (SE-9)
- Wind Erosion Control (WE-1)
- Earth Dikes and Drainage Swales (EC-9)
- Soil Binders (EC-5)
- Dewatering Operations (NS-2)
- Stockpile Management (WM-3)

<u>Kings River and Cross Creek Areas</u>
The gas pipeline will pass under the Kings River at the Avenue 408 prolongation (see **Attachment 4-2**). The crossing will be performed using horizontal directional drilling (HDD). The entry and exit points will be set back 500 feet from the Kings River. Utilizing HDD methods will eliminate disturbances to the bed and bank of the Kings River and associated riparian habitat. The equipment use, construction, and laydown areas will occur in the upland habitat on surrounding agricultural lands or in County road rights-of-way.

A 500-foot buffer zone of no equipment/construction activities will occur on either side of the river where HDD techniques will be used. The zone will be measured outward from the outer edge of the river's riparian habitat. A qualified biologist will assist with staking the buffer zone.

Sediment, erosion, drainage and dewatering BMP's will need to be closely monitored during construction activities related to the crossing of the Kings River. Existing roads will be used to access the construction and laydown areas. As the existing farm haul roads are dirt, wind erosion and dust control should follow an appropriate watering schedule.

Drill cuttings and the bentonite slurry used to coat the borehole generated from advancing the HDD equipment will need to be contained and removed from the site. Typically two mud trucks, one to pump the bentonite drilling slurry and the other to remove the cuttings, are utilized during HDD drilling operations. No additional stockpiles of soils or pits should be needed during the HDD operations. The entry and receiving pits are relatively small (on the order of one or two backhoe buckets) and will be used to contain the cuttings for removal on both ends of the HDD drilling operations. In the event that drill cuttings overtop the entry or receiving pits, a sand bag barrier can be used to contain the spillage.

Attachment 1-3 and **4-2** shows the location of the HDD under the Kings River and Cross Creek and the local staging and laydown areas. The following BMP's should be implemented to control sediment and erosion in the HDD laydown and construction areas:

- Preservation of Existing Vegetation (EC-2)
- Silt Fence (SE-1)
- Street Sweeping and Vacuuming (SE-7)
- Sand Bag Barrier (SE-8)
- Straw Bale Barrier (SE-9)
- Dewatering Operations (NS-2)
- Vehicle and Equipment Cleaning (NS-8)
- Vehicle and Equipment Fueling (NS-9)

<u>Erosion of Spoils</u>
Erosion and dust prevention of linear stock piles of soils along the pipeline alignments will generally follow the guidelines and BMP's as discussed in Section 4.2 - Stock Piles. However, in biologically sensitive areas (riparian, wetland and hydrologic features), inspection and maintenance of BMP's should be performed on a daily basis. In addition, while silt fences will be installed around the entire perimeter of the Power Plant site and laydown areas, employment of silt fences along the linear spoils piles will

conform to the local and county regulatory standards. In areas of low relief silt fences will likely not need to be employed, but may be needed if there is considerable relief near the pipeline alignment or soil is being eroded from rainfall. In addition, silt fences are only necessary in the rainy season (October 1 to May 1). During other times of the year, they should only be placed if there is imminent rainfall in the forecast or the spoils pile is unstable.

Several areas along the pipeline alignments have steep banks abutting the road shoulders, at these locations additional BMP's should include straw bale barriers or fiber roles to prevent erosion and sedimentation on to nearby farmland. In locations where shoulders and spoils laydown areas are narrow, street sweeping and vacuuming will be needed to keep the public right-of-way clear of construction related sediments and debris, and alleviate dust generation. Spoils associated with natural gas pipeline construction may be exposed for lengthy periods of time, in such instances soil binders could be used in place of regular watering.

The following BMP's should be employed to prevent wind and rain erosion and sedimentation associated with the linear stock piles of spoils from pipeline construction:

- Wind Erosion Control (WE-1)
- Soil Binders (EC-5)
- Silt Fence (SE-1)
- Fiber Roles (SE-5)
- Street Sweeping and Vacuuming (SE-7)
- Straw Bale Barrier (SE-9)

<u>Drainage and Erosion in Staging Areas</u>
Three construction staging areas and six horizontal directional drilling staging areas have been identified for the gas pipeline (see **Attachment 1-3**). These staging areas will be used for field offices, materials storage, dirt stockpiles and worker parking. A staging area near the Kings River will be used for trucks, drilling equipment, welding equipment and pipeline storage.

Drainage and erosion in pipeline staging areas will closely follow guidelines described in Section 4.2. The six staging areas will each cover approximately 200' X 200' and thus are not large enough to warrant building of a sediment basin. However, sediment traps will be employed as necessary to control sediment and erosion. Sediment and erosion control for the construction entrances/exits will be through the use of stabilized construction entrances/exits. The perimeter of each laydown area should have a silt fence, especially if the site is located in close proximity to a canal or other sensitive hydrologic features. Any vegetation within the boundaries of the laydown areas that can be preserved should remain intact. Upon completion of a pipeline segment the laydown

areas will be returned pre-existing conditions including vegetation. If the staging areas are cropped then they will be replanted with crops by the landowner. The following BMP's will be employed to minimize drainage and erosion in the pipeline construction staging areas:

- Stabilized Construction Entrance/Exit (TC-1)
- Sediment Trap (SE-3)
- Silt Fence (SE-1)
- Wind Erosion Control (WE-1)
- Preservation of Existing Vegetation (EC-2)
- Vehicle and Equipment Maintenance (NS-10)
- Material Delivery and Storage (WM-1)
- Material Use (WM-2)
- Spill Prevention and Control (WM-4)

Topsoiling
In cultivated areas the topsoil over the pipeline trench will be removed first and kept separate from the excavated subsoil, a process called topsoiling. As backfilling operations begin, the soil will be returned to the trench in reverse order with the subsoil put back first, followed by the topsoil. The process ensures the topsoil is returned to its original position.

4.4 - Electric Transmission Lines

Electric transmission towers will be constructed along an approximately five-mile alignment from the power plant to the PG&E McCall substation (**Attachment 1-3**). Approximately 0.003 acres of wetland habitat will be permanently impacted in the bed of Manning's Recharge Basin where two transmission line towers (with a total of eight legs) will be installed. Temporary impacts to approximately one acre of wetland habitat will also occur in the Manning Recharge Basin during construction and erection of the towers in the basin.

The existing banks and bed of the recharge basin shall be restored to their existing grades. Compacted roads and construction areas in the recharge basin will be ripped and graded. This work will be supervised, inspected and approved by a qualified biologist. Wetland vegetation will then naturally re-colonize the disturbed area. The work zone for construction and erection of the towers in the recharge basin (currently estimated at one acre) shall be the minimal area needed. This will reduce the acreage of wetlands that are temporarily disturbed. Lastly, the ingress and egress to the recharge basin by vehicles and equipment shall be restricted to the fewest number and smallest size of roads that are practical. The following BMPs shall be employed from protecting the Manning Recharge Basin soils and habitat:

- Preservation of Existing Vegetation (EC-2)
- Silt Fence (SE-1)
- Stabilize Construction Entrance/Exits (TC-1)
- Stabilize Construction Roadway (TC-2)

5.0 - INSPECTION AND MAINTENANCE DURING CONSTRUCTION

Inspection and maintenance of BMPs is important to provide greater assurance they are properly functioning during the entire construction period. Both require specific efforts on a periodic basis according to guidelines in the BMP fact sheets. To assist with these efforts, an Erosion Control/Storm Inspection Log should be maintained by a Construction Environmental Coordinator to keep record of field inspection and any maintenance and/or repair work executed. Detailed information on intensity and type of erosion should be recorded, as well as the selected control measure. Lastly, scheduling of installation, inspection and maintenance of BMPs should follow the Scheduling BMP (EC-1). Following are specific discussions on inspection and maintenance of BMPs.

5.1 - Inspection Requirements

During the rainy season (October to April), BMPs shall be inspected at least weekly to assure that the minimum requirements are being met. Inspections should also be performed within 24 hours after a precipitation event of 0.5 inches or more, and daily during extended rain events. The BMPs should also be monitored periodically during the non-rainy season to check for wind erosion, or drainage and erosion problems caused by non-stormwater discharges (i.e. construction water).

Inspection of drainage, erosion and sediment control features is discussed in the relevant BMPs (See **Appendix A**). Following is a summary of important inspection requirements, but the contractor is referred to the BMP fact sheets for more details:

Parking and Laydown Areas. Parking areas and the construction laydown areas to be inspected weekly for spills or leaks from vehicular traffic.

Dewatering. BMPs that require dewatering area to be continuously attended while dewatering takes place. Dewatering BMPs are to be implemented at all times during dewatering activities.

Silt Fences. Silt fences are to be inspected for sediment build up, tears in fabric, and proper fabric attachment to posts. Posts are to be inspected to ensure a firm set in the ground.

Soil Binders. Soil binders are to be inspected during construction to ensure even distribution, and avoid dry spots or insufficient binder.

Dikes and Swales. Earth dikes and drainage swales shall be inspected for washouts. The dikes and swales should be inspected daily if non-stormwater (i.e. construction water) is discharged to them.

Outlet Structures. Outlet structures are to be inspected periodically for proper operation and absence of sediment and debris.

Velocity Dissipation Devices. Inspection of velocity dissipation devices and slope drains shall be performed daily while non-storm water discharges occur, and after every major precipitation event. Inspect outlets for clogging and undercutting. Inspect pipes for leakage. Rip-rap should be inspected for evidence of movement or washout. Basin banks to be examined for seepage and structural soundness. Regularly inspect inlets and outlets for erosion, damages or any obstructions.

Biological Inspection. A post construction monitoring survey of all hydrologic features (Manning Basin, Kings River, Cross Creek, wetland ponds and vernal pools) will be conducted by a qualified biologist. A letter report, including before and after photographs, will be prepared and sent to the CEC.

5.2 - Maintenance Requirements

Maintenance issues are also discussed in the BMP Fact Sheets (see **Appendix A**). Some important maintenance issues are discussed below, but the contractor is referred to the fact sheets for more details.

Silt Fences. The silt fences are to be replaced or repaired when damage is evident. The life span of silt fences is generally 5 to 8 months. Sediment accumulation is to be removed when it has reached 6 inches or 1/3 the fence height, whichever is less.

Soil Binders. Soil binders are to be reapplied as soon as possible when erosion is evident to establish a stabilized surface.

Contaminated Soils. Contaminated soils caused by spills or vehicle leaks are to be removed and treated or disposed of in an approved disposal facility.

Stormwater Basins. Stormwater detention/retention basins are to be maintained in working order throughout the construction period. Significant amounts of settled sediment and foreign debris are to be removed and disposed in a proper manner. During construction, sediments are to be removed when accumulation reaches ½ the designated sediment storage volume. Standing water will be removed from the basin within 72 hours after accumulation.

Ditches and Swales. Ditches and swales are to be maintained at the required depth. Sidewall cave-ins and settled sediment material is to be removed and disposed properly.

Riprap. Riprap experiencing movement or washout is to be removed and replaced in response to the observed runoff flow patterns. Pertinent measures are to be taken to ensure anchoring and support where needed.

Inlet Structures. Inlet structures are to be cleaned and maintained to accept inflow at the design rate. At the completion of construction activities, the storm drain system shall be inspected for the presence of deposited sediment and be cleaned as necessary.

Sandbags. Sandbags exposed to sunlight to be replaced every two to three months due to degradation of the bags. Replace or reshape the sandbags as needed. Sediments on sandbags are to be removed when sediment accumulation reaches 1/3 of the barrier height. Sediment removed during maintenance to be incorporated into on-site earthwork.

Erosion Channels. Erosion channels formed in swales, slopes or around structures are to be repaired and stabilized as soon as possible after they have been discovered.

6.0 - STORMWATER MANAGEMENT MEASURES

6.1 - Stormwater Management Basins

The stormwater retention pond, at the northeast corner of the project site, will be used to catch runoff and trap sediment so it does not leave the project site. The basin is to be designed in accordance with the BMP Sediment Basin (SE-2). The basin will be primarily below ground with berms extending a few feet above ground. The berms will be constructed of soil compacted in lifts. Other facilities will include a pump, vertical riser, outfall pipe, and spillway structure.

6.2 - Oil/Water Separator

Miscellaneous general plant drainage will consist of cleanup, sample drainage, equipment leakage, and drainage from facility containment areas. Water from these areas will be collected in systems of floor drains, sumps, and pipes within the facility and discharged to an oil/water separator. In addition, power plant equipment areas such as lube oil storage areas and chemical storage areas will be provided with secondary containment to prevent contaminated storm water from exiting the site. Processed contact stormwater (from the oil-water separator) will be recycled for use as cooling water and the residual solid waste will be disposed of in an appropriate off-site landfill.

6.3 - Permanent Vegetation

All disturbed areas on the project site that will not be occupied by plant facilities or stabilized surfaces (pavement or gravel roads) will be stabilized with permanent vegetation to reduce runoff and erosion. Soil is to be tested prior to seeding, to determine soil conditions. Appropriate soil supplements or fertilizers (where permissible) are to be applied when necessary. Laydown and staging areas will be reseeded to previous conditions. However, if they were bare of vegetation they will only be regraded. Revegetation of cropped areas will be the responsibility of the landowner or farmer. The following BMPs should be followed for vegetation efforts:

- Preservation of Existing Vegetation (EC-2)
- Hydraulic Mulch (EC-3)
- Hydroseeding (EC-4)

6.4 - Maintenance of Storm Water Management System

Periodic inspections are to be conducted on the storm drains to check for any accumulated sediment and/or debris build up. Significant amounts of settled sediment and foreign debris are to be removed and disposed in a proper manner. Storm water detention/retention basins are to be maintained in working order throughout the construction and operations period. Accumulated sediments are to be removed from the basin when it reaches an average depth of 1 foot. Standing water will be removed from the basin within 72 hours after accumulation. Cleaning and removal of sediment and

debris are to be performed at least once a month during the summer months and at least every two weeks during periods of rainfall greater than 1 inch per week or as required in order to maintain the operability of the drainage system.

7.0 - REFERENCES

California Stormwater Quality Association, *California Storm Water Best Management Practices Handbook*, 2003.

Fresno County, *Fresno County Ordinance Code, Title 14 - Water and Sewage, Chapter 14.24 – Regulation of Stormwater Discharges*.

Kings River Conservation District*, Kings River Conservation District Community Power Plant Application for Certification*, September 2007.

Kings River Conservation District*, Kings River Conservation District Community Power Plant Application for Certification – Supplement A*, November 2007.

Provost & Pritchard Engineering Group, Inc., *Water Resources Analysis for the KRCD Community Power Plant*, September 2007.

Tulare County, *Tulare County Grading Ordinance, Part 7, Chapter 15, Article 7 – Excavation and Grading*.

KINGS RIVER CONSERVATION DISTRICT
COMMUNITY POWERPLANT

DRAINAGE, EROSION AND SEDIMENT CONTROL PLAN

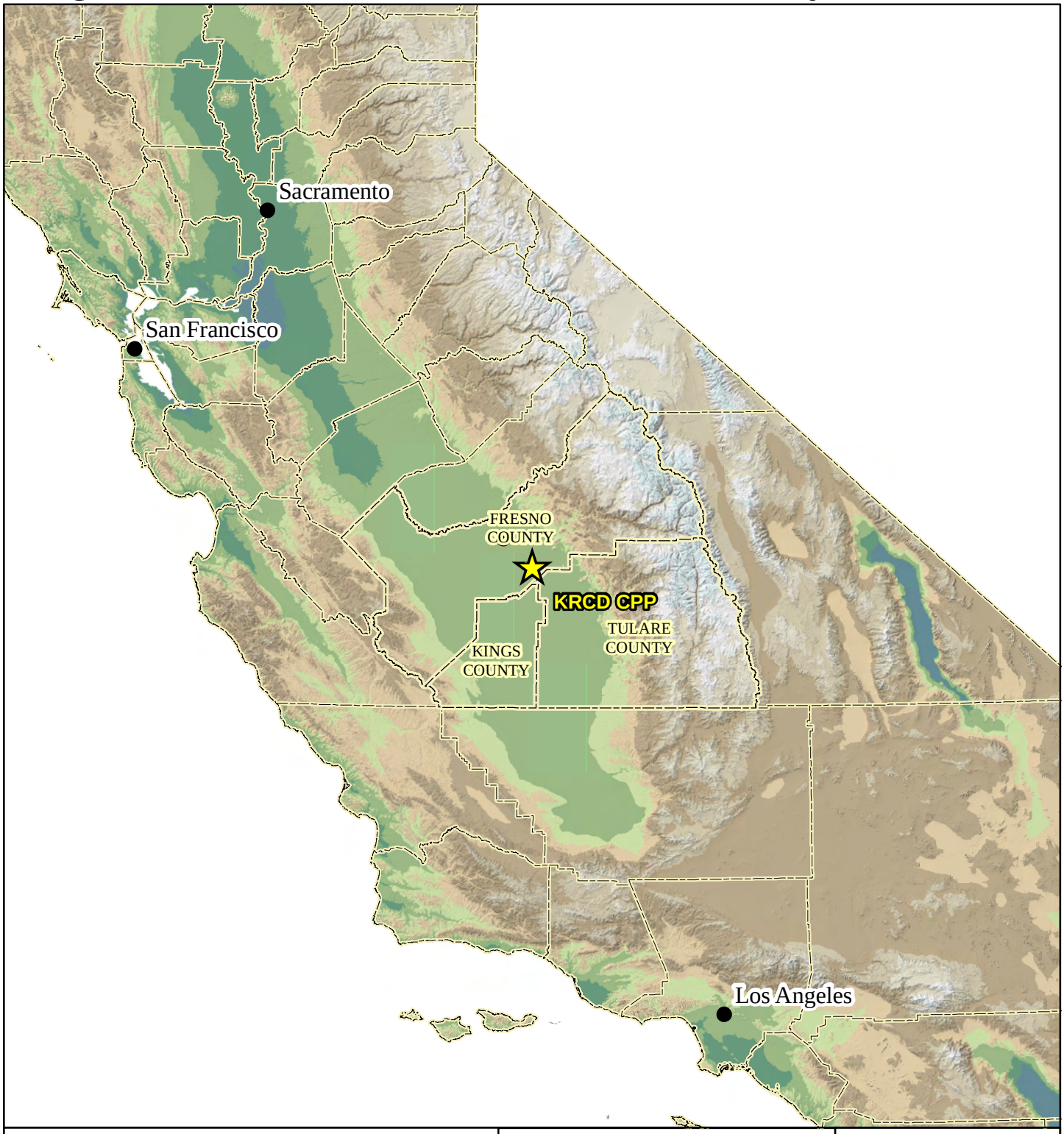
APPENDIX A - BEST MANAGEMENT PRACTICES FACT SHEETS

KINGS RIVER CONSERVATION DISTRICT
COMMUNITY POWERPLANT

DRAINAGE, EROSION AND SEDIMENT CONTROL PLAN

APPENDIX B – DRAINAGE AND HYDROLOGIC CALCULATIONS

Kings River Conservation District Community Power Plant



KRCD Community Power Plant

City

County Boundary Line

ATTACHMENT 1-1

Regional Area

N

0 25 50 Miles

1:3,500,000 Scale

2007-06-13 - Rev:[2]

KRCD COMMUNITY POWER PLANT

Energy for our Future

Kings River Conservation District Community Power Plant

KRCD Community Power Plant

KRCD CPP Proposed Project Site

Street

City Boundary

ATTACHMENT 1-2

KRCD CPP Site
Prior to Construction

N

0 250 500 Feet

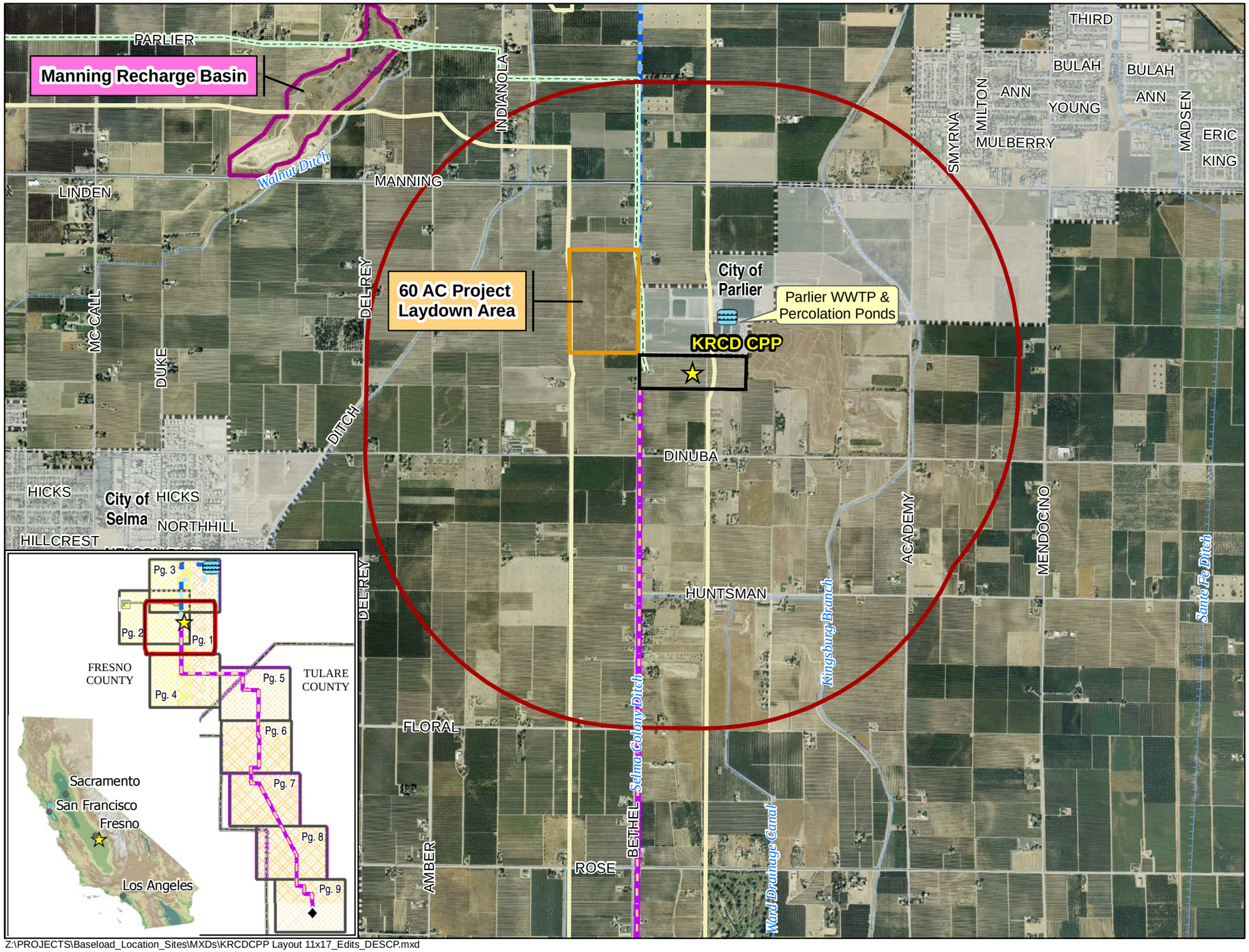
1:6,000 Scale

2007-06-13 - Rev:[2]

KRCD Community Power Plant

Energy for our Future

Kings River Conservation District Community Power Plant



Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_DESCP.mxd

KRCD COMMUNITY POWER PLANT

Energy for our Future

Drainage, Erosion, and Sediment Control Plan (DESCP)

Attachment 1-3 Page 1 of 9

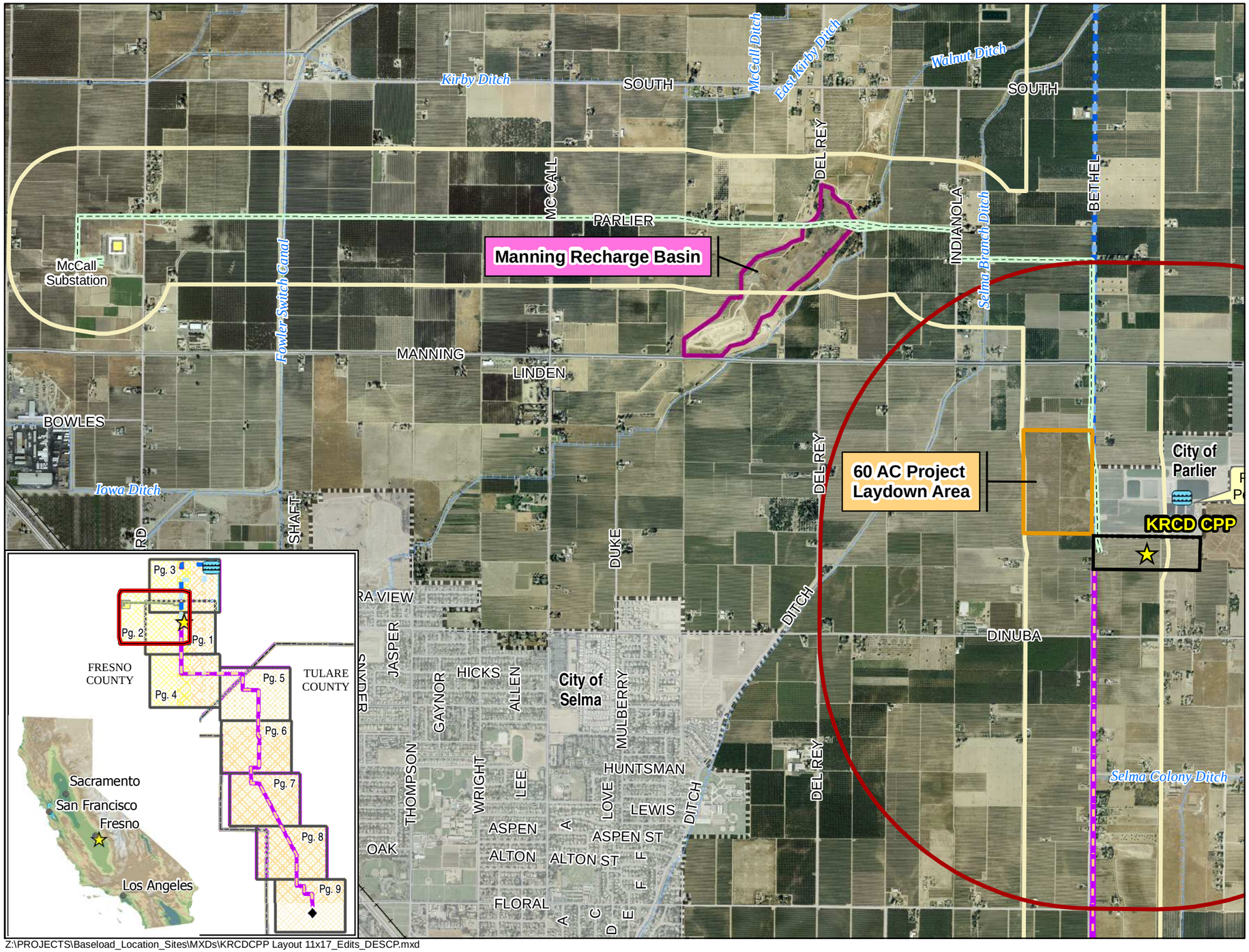
- KRCD Community Power Plant
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- KRCD CPP Site 1 Mile Buffer
- Linear 1/4 Mile Buffer
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- HDD Bore / Laydown Area
- HDD Bore Span
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- Freeway
- Street
- Railroad
- Waterway
- Canal / Pipeline
- County Boundary
- City Boundary
- FEMA 100 Year Flood Zone
- Irrigation / Water District

NOTE: Potable Water and Sewer Connections are on the project site.

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Kings River Conservation District Community Power Plant



Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_DESCP.mxd

KRCD COMMUNITY POWER PLANT

Energy for our Future

Drainage, Erosion, and Sediment Control Plan (DESCP)

Attachment 1-3 Page 2 of 9

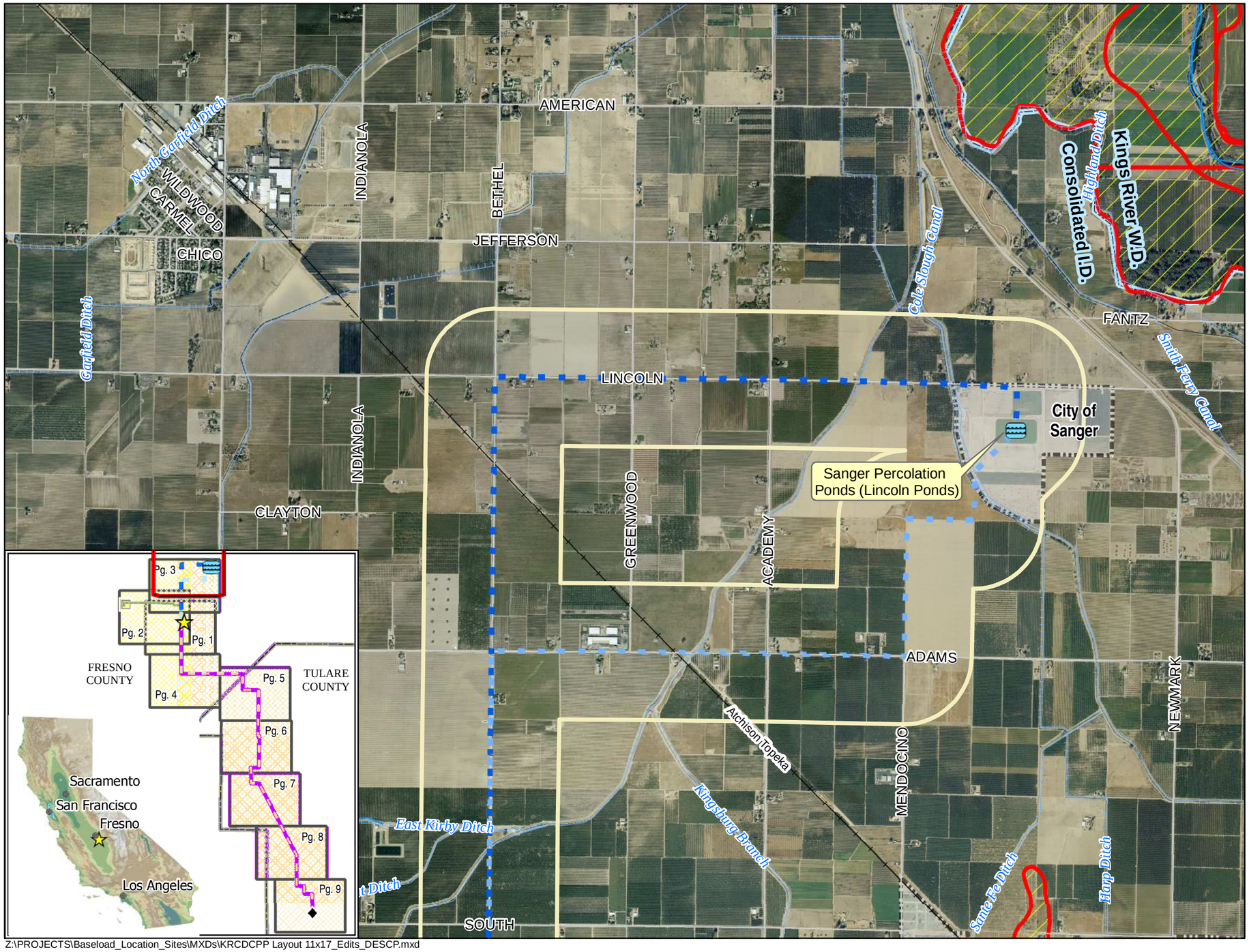
- KRCD Community Power Plant
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- KRCD CPP Site 1 Mile Buffer
- Linear 1/4 Mile Buffer
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- HDD Bore / Laydown Area
- HDD Bore Span
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- Freeway
- Street
- Railroad
- Waterway
- Canal / Pipeline
- County Boundary
- City Boundary
- FEMA 100 Year Flood Zone
- Irrigation / Water District

NOTE: Potable Water and Sewer Connections are on the project site.

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Kings River Conservation District Community Power Plant



Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_DESCP.mxd

KRCD COMMUNITY POWER PLANT

Energy for our Future

Drainage, Erosion, and Sediment Control Plan (DESCP)

Attachment 1-3 Page 3 of 9

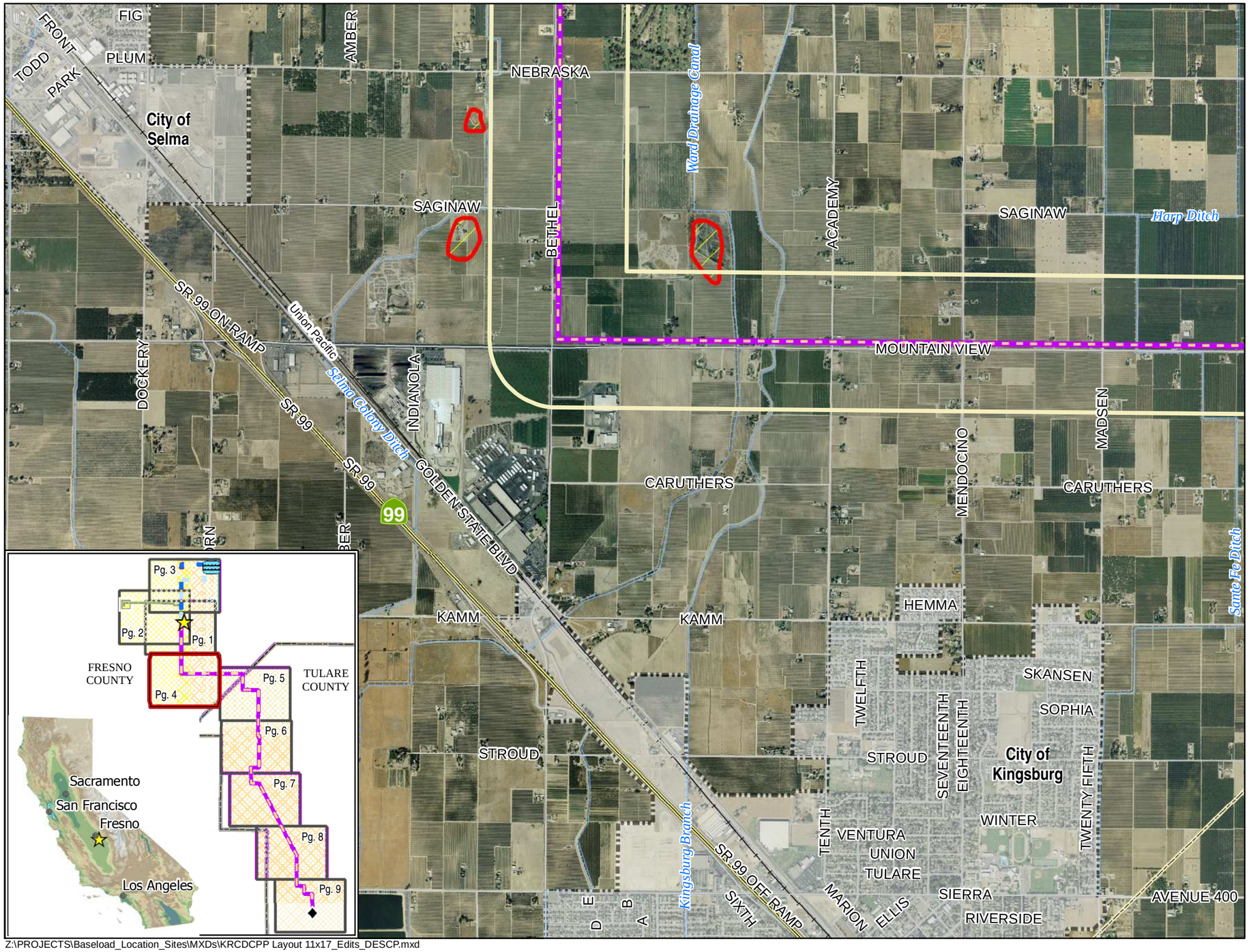
- KRCD Community Power Plant
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- KRCD CPP Site 1 Mile Buffer
- Linear 1/4 Mile Buffer
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- HDD Bore / Laydown Area
- HDD Bore Span
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- Freeway
- Street
- Railroad
- Waterway
- Canal / Pipeline
- County Boundary
- City Boundary
- FEMA 100 Year Flood Zone
- Irrigation / Water District

NOTE: Potable Water and Sewer Connections are on the project site.

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Kings River Conservation District Community Power Plant



Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_DESCP.mxd

KRCD COMMUNITY POWER PLANT

Energy for our Future

Drainage, Erosion, and Sediment Control Plan (DESCP)

Attachment 1-3 Page 4 of 9

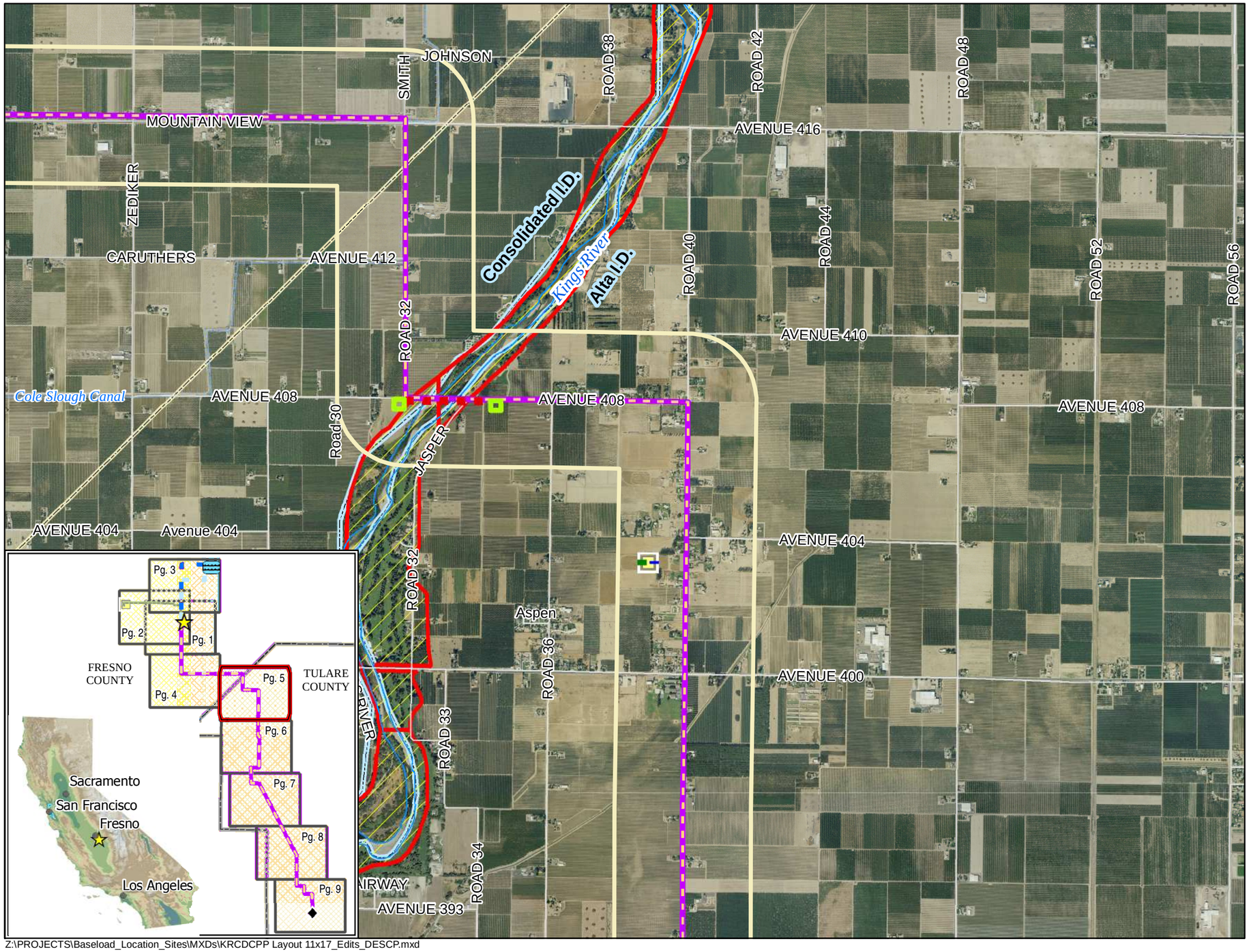
- KRCD Community Power Plant
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- KRCD CPP Site 1 Mile Buffer
- Linear 1/4 Mile Buffer
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- HDD Bore / Laydown Area
- HDD Bore Span
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- Freeway
- Street
- Railroad
- Waterway
- Canal / Pipeline
- County Boundary
- City Boundary
- FEMA 100 Year Flood Zone
- Irrigation / Water District

NOTE: Potable Water and Sewer Connections are on the project site.

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Kings River Conservation District Community Power Plant



Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_DESCP.mxd

KRCD COMMUNITY POWER PLANT

Energy for our Future

Drainage, Erosion, and Sediment Control Plan (DESCP)

Attachment 1-3 Page 5 of 9

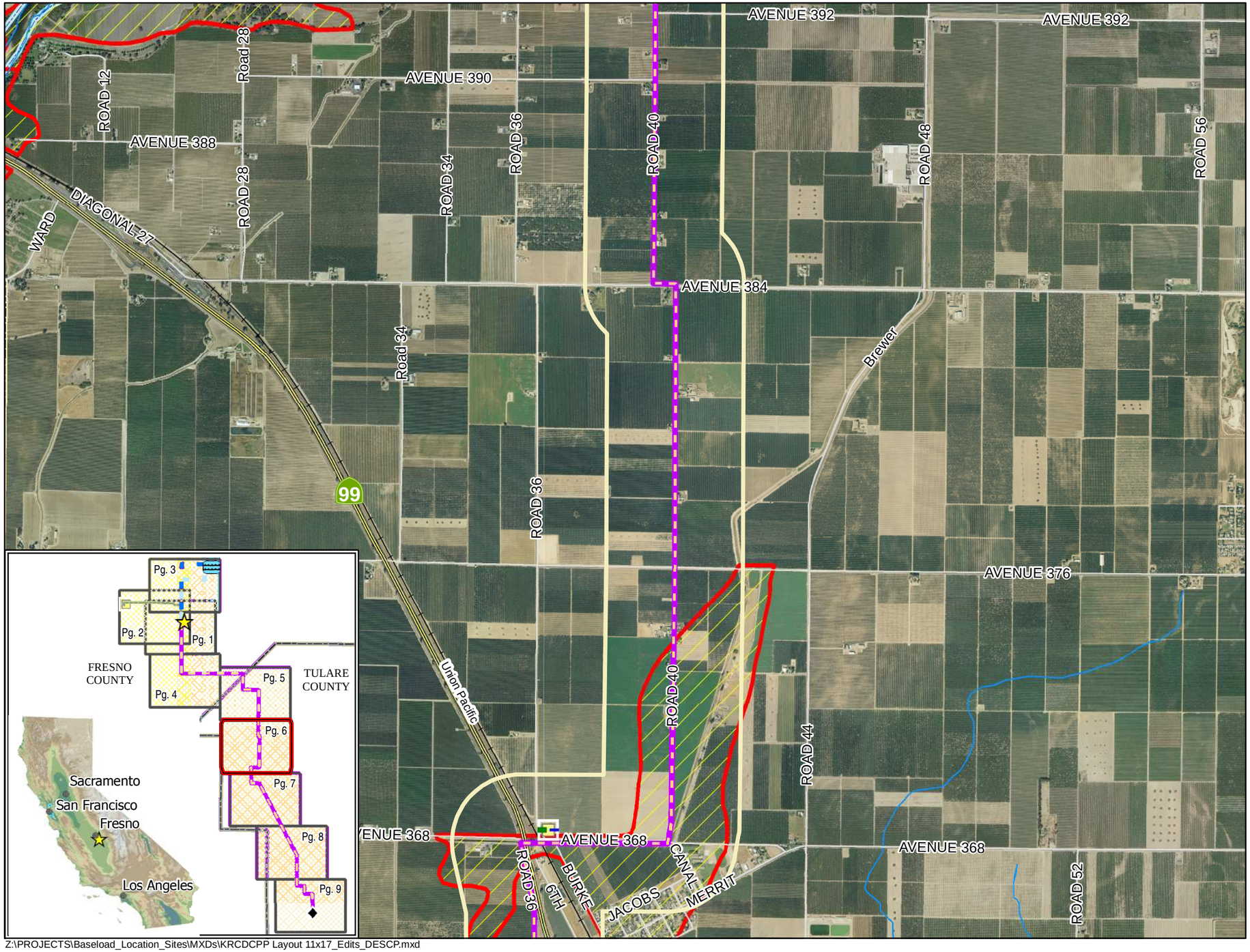
- KRCD Community Power Plant
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- KRCD CPP Site 1 Mile Buffer
- Linear 1/4 Mile Buffer
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- HDD Bore / Laydown Area
- HDD Bore Span
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- Freeway
- Street
- Railroad
- Waterway
- Canal / Pipeline
- County Boundary
- City Boundary
- FEMA 100 Year Flood Zone
- Irrigation / Water District

NOTE: Potable Water and Sewer Connections are on the project site.

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Drainage, Erosion, and Sediment Control Plan (DESCP)

Attachment 1-3 Page 6 of 9

- KRCD Community Power Plant
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- KRCD CPP Site 1 Mile Buffer
- Linear 1/4 Mile Buffer
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- HDD Bore / Laydown Area
- HDD Bore Span
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- Freeway
- Street
- Railroad
- Waterway
- Canal / Pipeline
- County Boundary
- City Boundary
- FEMA 100 Year Flood Zone
- Irrigation / Water District

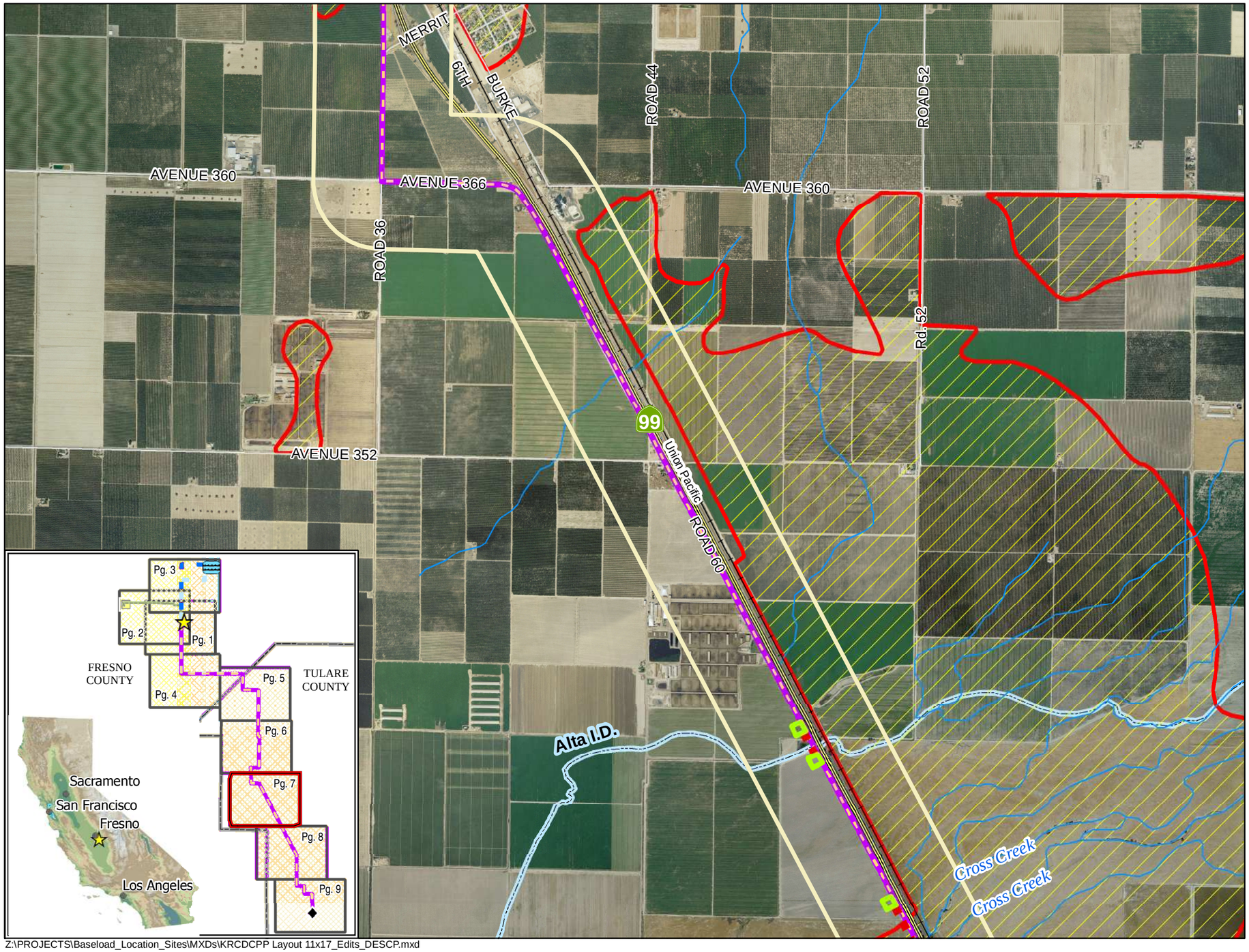
NOTE: Potable Water and Sewer Connections are on the project site.

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_DESCP.mxd

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Drainage, Erosion, and Sediment Control Plan (DESCP)

Attachment 1-3 Page 7 of 9

- KRCD Community Power Plant
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- KRCD CPP Site 1 Mile Buffer
- Linear 1/4 Mile Buffer
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- HDD Bore / Laydown Area
- HDD Bore Span
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- Freeway
- Street
- Railroad
- Waterway
- Canal / Pipeline
- County Boundary
- City Boundary
- FEMA 100 Year Flood Zone
- Irrigation / Water District

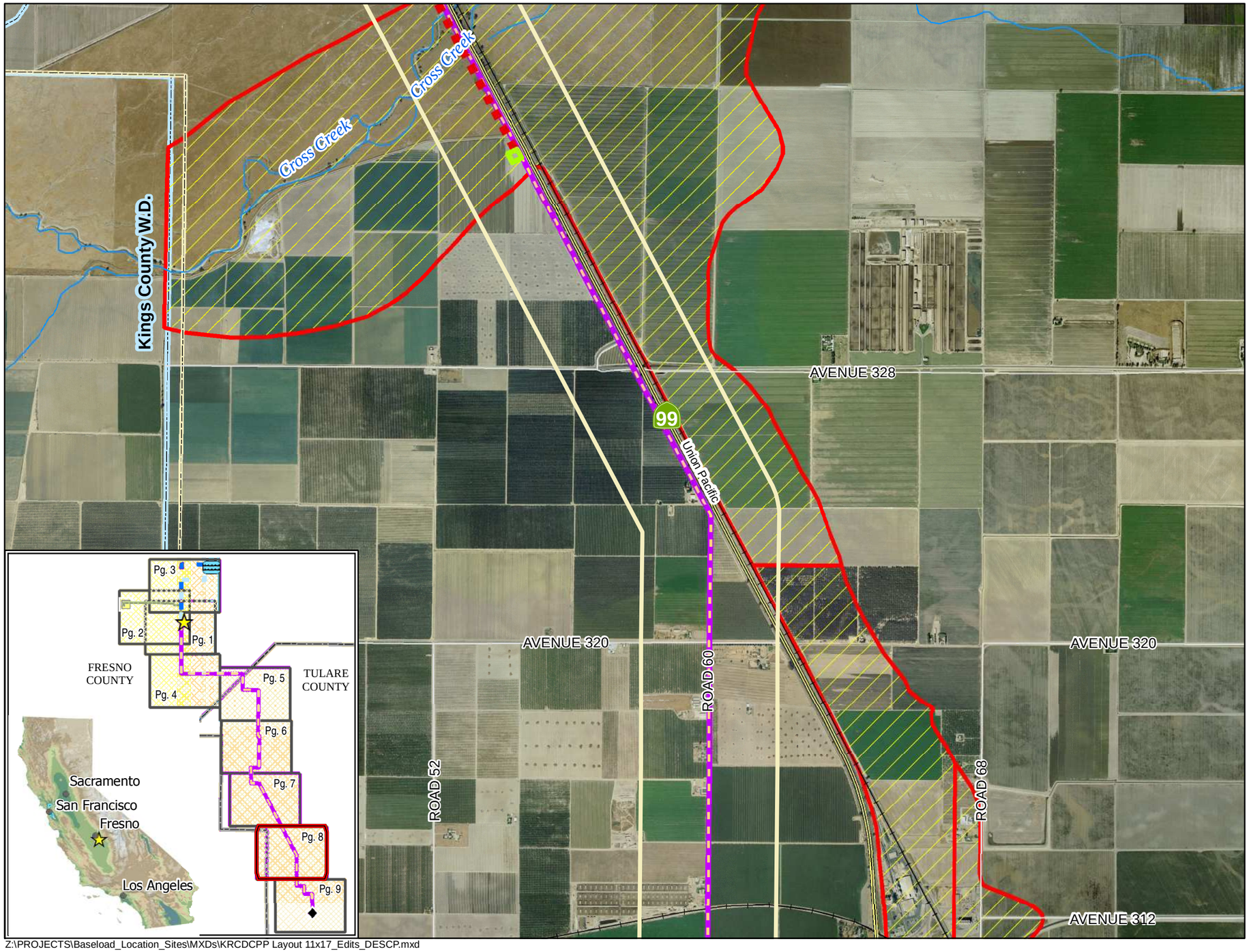
NOTE: Potable Water and Sewer Connections are on the project site.

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_DESCP.mxd

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Drainage, Erosion, and Sediment Control Plan (DESCP)

Attachment 1-3 Page 8 of 9

- KRCD Community Power Plant
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- KRCD CPP Site 1 Mile Buffer
- Linear 1/4 Mile Buffer
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- HDD Bore / Laydown Area
- HDD Bore Span
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- Freeway
- Street
- Railroad
- Waterway
- Canal / Pipeline
- County Boundary
- City Boundary
- FEMA 100 Year Flood Zone
- Irrigation / Water District

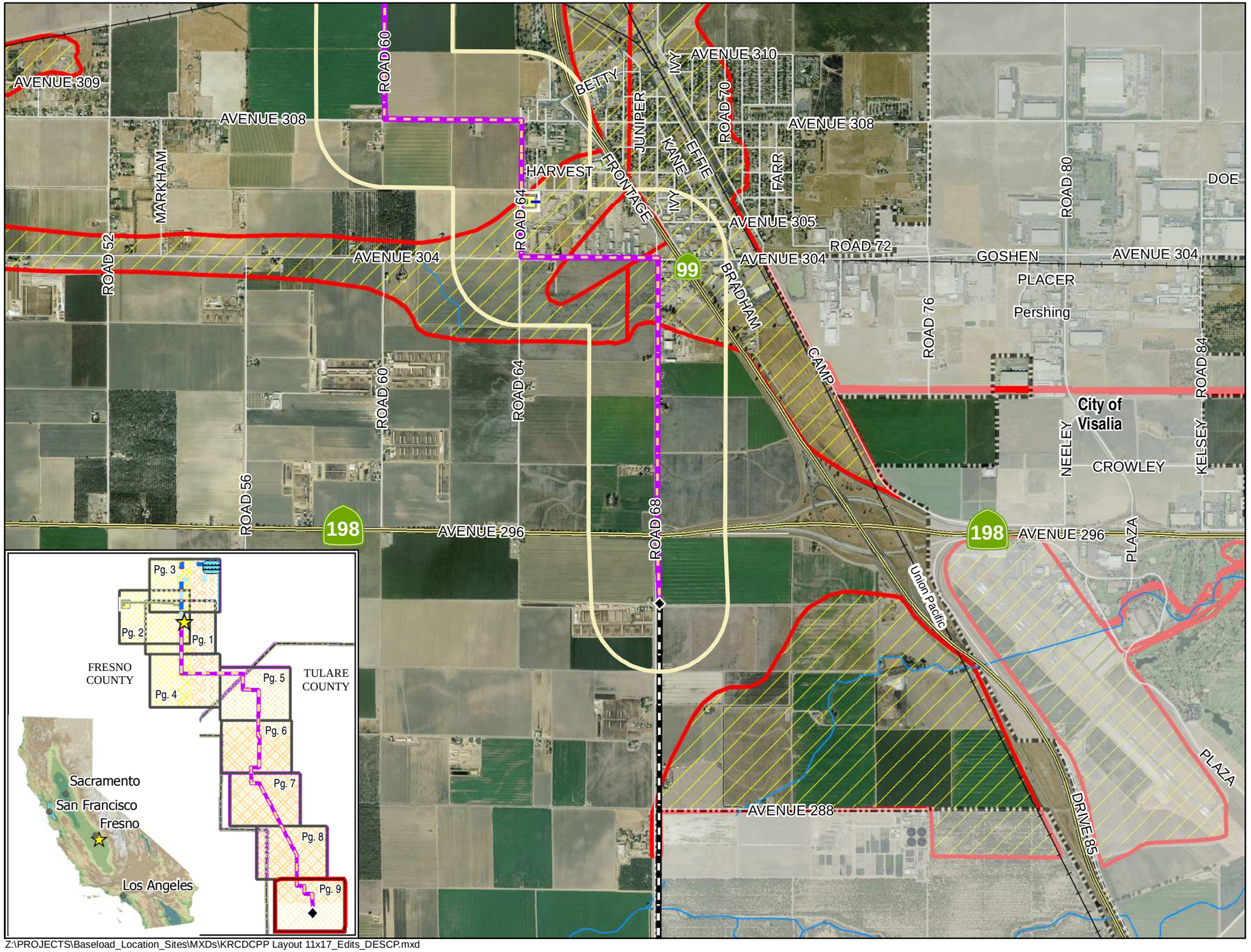
NOTE: Potable Water and Sewer Connections are on the project site.

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_DESCP.mxd

Kings River Conservation District Community Power Plant



Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Edits_DESCP.mxd

KRCD COMMUNITY POWER PLANT

Energy for our Future

Drainage, Erosion, and Sediment Control Plan (DESCP)

Attachment 1-3 Page 9 of 9

- KRCD Community Power Plant
- KRCD CPP Project Site
- KRCD CPP Project Laydown
- KRCD CPP Site 1 Mile Buffer
- Linear 1/4 Mile Buffer
- Substation
- Proposed 230KV Transmission Line
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- HDD Bore / Laydown Area
- HDD Bore Span
- Natural Gas Connection Point
- Proposed Natural Gas Laydown Area
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- Freeway
- Street
- Railroad
- Waterway
- Canal / Pipeline
- County Boundary
- City Boundary
- FEMA 100 Year Flood Zone
- Irrigation / Water District

NOTE: Potable Water and Sewer Connections are on the project site.

N 0 0.25 0.5 0.75 1 Mile

1:24,000 Scale 1 Inch equals 2,000 Feet

Kings River Conservation District
Fresno County, CA
Proposed Power Plant Site
Topographic Survey

Know what's below. Call before you dig.

COPYRIGHT 2008 by PROVOST & PRITCHARD ENGINEERING GROUP, INC. ALL RIGHTS RESERVED.
The firm of Provost & Pritchard Engineering Group, Inc. expressly reserves its common law copyright and other property rights in these plans. These plans are not to be reproduced, changed, or copied in any form or manner whatsoever, nor are they to be assigned to any third party without first obtaining the written permission and consent of Provost & Pritchard Engineering Group, Inc. In the event of unauthorized reuse of these plans by a third party, the third party shall hold the firm of Provost & Pritchard Engineering Group, Inc. harmless, and shall hereby indemnify the firm of Provost & Pritchard Engineering Group, Inc.'s legal fees associated with defending and enforcing these rights.

LEGEND

- ELETRICAL LINE
- FENCE
- WV — WATER VALVE
- POWER POLE
- CONTROL POINT
- IRRIGATION RISER

N

SCALE IN FEET

0 40 80 160

NOTE

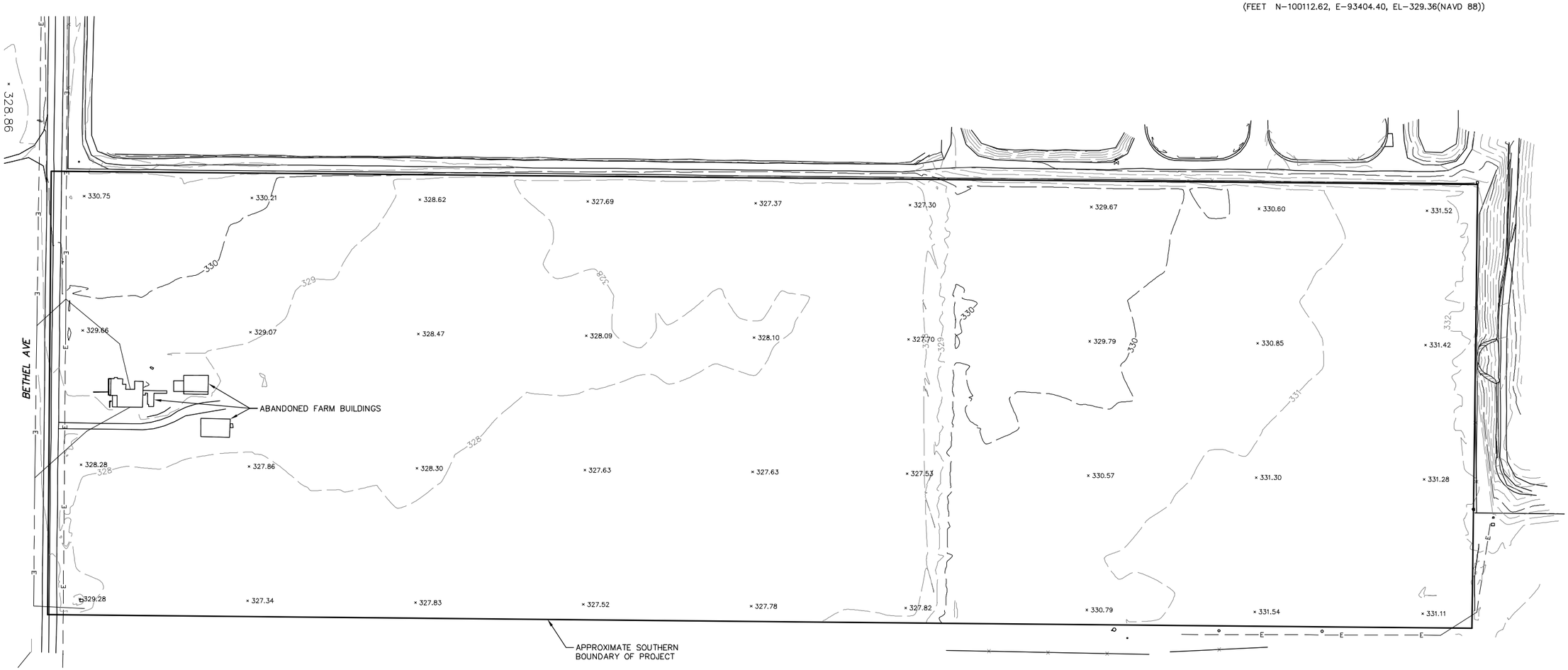
ALL ELEVATIONS SHOWN HEREON ARE BASED ON THE NAVD 88(NORTH AMERICAN VERTICAL DATUM OF 1988)
BENCHMARK IS CSRS CONTROL MONUMENT "R 366" :
ELEVATION 304.60 FEET.

FRESNO COUNTY BRASS CAP MONUMENT "LM 106"
(NGVD 29 ELEVATION – 336.626 FEET)
(NAVD 88 ELEVATION – 339.08 FEET)

SITE CONTROL:

KRCD–1: SET ALUMINUM DISK
UTM ZONE 11 COORDINATES
(METERS N–4053059.69, E–270313.18)
(FEET N–13297413.33, E–886852.51)
SITE COORDINATES
(FEET N–100505.28, E–95475.70, EL–332.02(NAVD 88))

KRCD–2: SET BRASS DISK, STAMPED "SURVEY MARK"
UTM ZONE 11 COORDINATES
(METERS N–4052953.15, E–269679.34)
(FEET N–13297063.78, E–884772.98)
SITE COORDINATES
(FEET N–100112.62, E–93404.40, EL–329.36(NAVD 88))



PRELIMINARY
NOT FOR CONSTRUCTION

No.	REVISION	BY	DATE

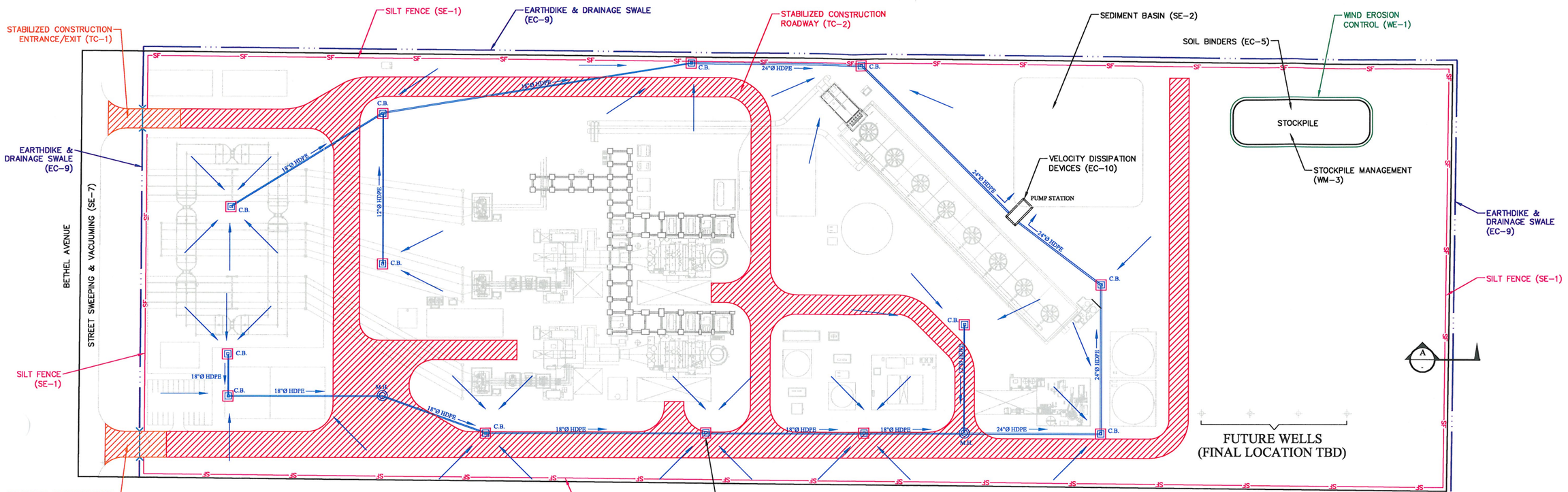
KRCD Community Powerplant
Kings's River Conservation District
Fresno County, CA

Attachment 2–1

PROVOST & PRITCHARD
ESTD 1968
ENGINEERING GROUP
An Employee Owned Company
2505 ALLUVAL AVENUE
CLOVIS, CALIFORNIA 93611–9166
559/326–1100 FAX 559/326–1090
www.ppeng.com

DESIGN ENGINEER: Owen Kubit
LICENSE NO: CE 66,552
DRAFTED BY: ASC
CHECKED BY: ----
SCALE: AS SHOWN
DATE: 05/01/08
JOB NO: 13640704
DWG. NO:
SHEET 1 OF 1

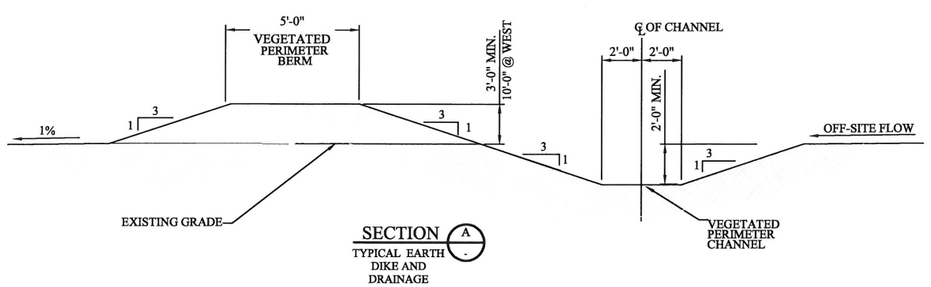
5/6/2008 9:39 AM G:\Clients\Kings River Conservation Dist – 1364\13640704–Parlier Powerplant Wtr Res\DWG\EXHIBIT\Attachment 2–1 ASC.dwg –Adam Claes



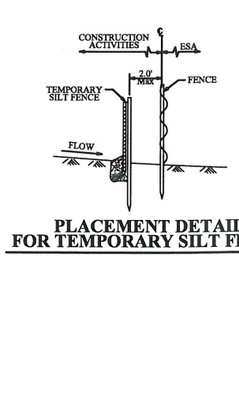
PLAN

NOTES:

1. POWERPLANT LAYOUT, TEMPORARY SILT FENCE DETAIL, AND EARTH DIKE AND DRAINAGE SWALE DETAIL PROVIDED BY UTILITY ENGINEERING.



SECTION A
TYPICAL EARTH DIKE AND DRAINAGE SWALE



PLACEMENT DETAIL FOR TEMPORARY SILT FENCE

LEGEND

- STABILIZED CONSTRUCTION ENTRANCE/EXIT (TC-1)
- STABILIZED CONSTRUCTION ROADWAY (TC-2)
- SILT FENCE (SE-1)
- DRAINAGE SWALE (EC-9)
- SURFACE WATER DRAINAGE
- STORM PIPING FLOW
- CULVERT
- STORM DRAIN INLET PROTECTION (SE-10)
- CB CATCH BASIN
- MH MANHOLE

N

SCALE IN FEET
0 40 80 160

Know what's below. Call before you dig.

COPYRIGHT 2008 by PROVOST & PRITCHARD ENGINEERING GROUP, INC. ALL RIGHTS RESERVED
The firm of Provost & Pritchard Engineering Group, Inc. retains all common law, statutory and other applicable property rights in these plans. These plans are not to be reproduced, changed, or copied in any form or manner whatsoever, nor are they to be assigned to a third party without first obtaining the written permission and consent of Provost & Pritchard Engineering Group, Inc. In the event of unauthorized reuse of these plans by a third party, the third party agrees to hold Provost & Pritchard Engineering Group, Inc. harmless, and shall bear the cost of Provost & Pritchard Engineering Group, Inc.'s legal fees associated with defending and enforcing these rights.

No.	REVISION	BY	DATE

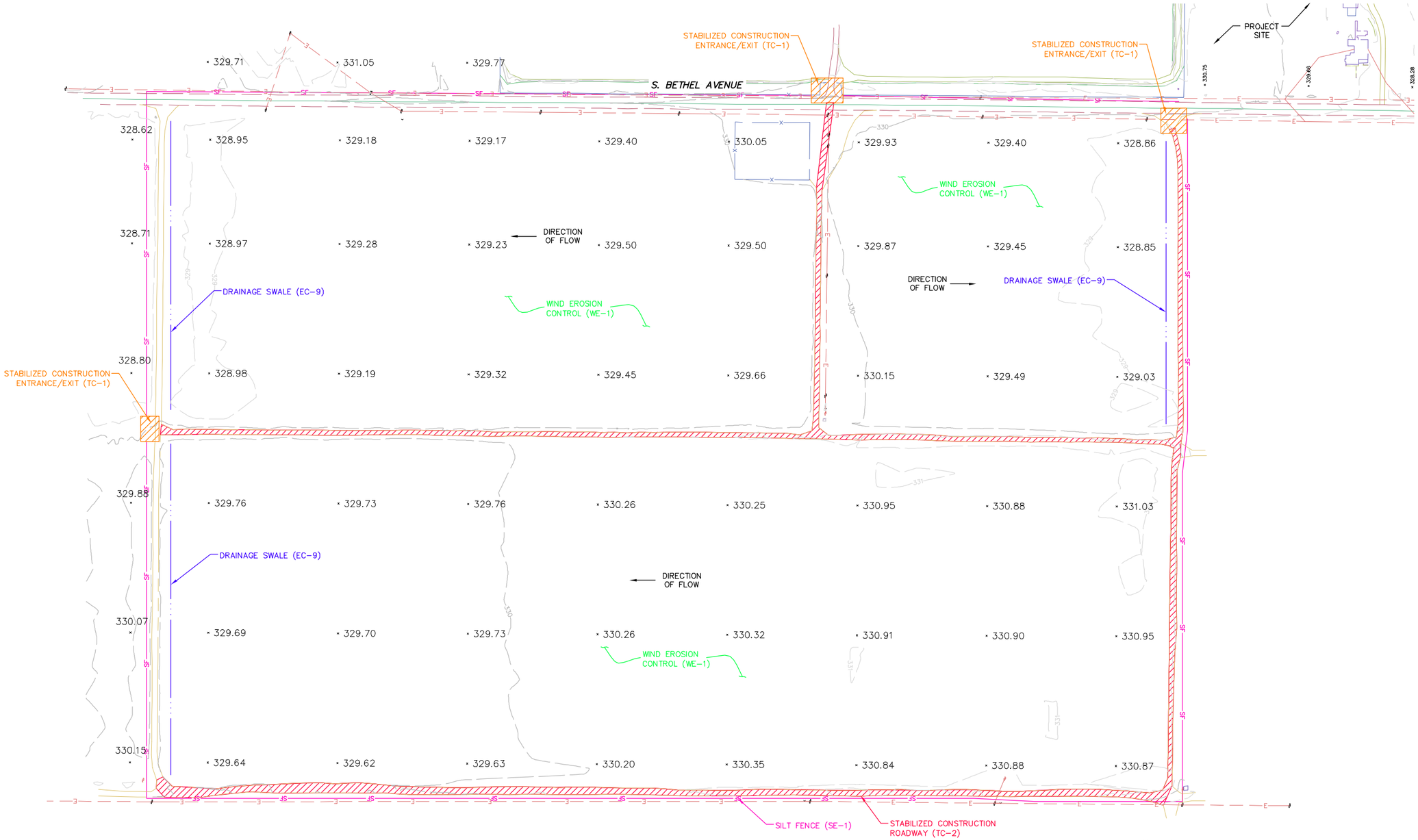
PRELIMINARY
NOT FOR CONSTRUCTION

KRCD Community Powerplant
Kings's River Conservation District
Fresno County, CA

Proposed Project Site Development
Best Management Practices
Attachment 2-2

EST. 1962
PROVOST & PRITCHARD
ENGINEERING GROUP
An Employee Owned Company
2506 ALLUVIAL AVENUE
CLOVIS, CALIFORNIA 93611-5166
559/326-1100 FAX 559/326-1090
www.ppeng.com

DESIGN ENGINEER: Owen Kubit
LICENSE NO: CE 66,552
DRAFTED BY: ASC
CHECKED BY: ----
SCALE: AS SHOWN
DATE: 05/01/08
JOB NO: 13640704
DWG. NO:
SHEET 1 OF 1



LEGEND

—x—x—x—	FENCE
—E—E—	ELECTRIC (AERIAL)
	STABILIZED CONSTRUCTION ENTRANCE/EXIT (TC-1)
	STABILIZED CONSTRUCTION ROADWAY (TC-2)
—SF—SF—	SILT FENCE (SE-1)
— · · · —	DRAINAGE SWALE (EC-9)

N

SCALE IN FEET

0 50 100 200

NOTES:

1. THE LOCATIONS FOR VEHICLE AND EQUIPMENT CLEANING (NS-8) AND VEHICLE AND EQUIPMENT FUELING (NS-9) WILL BE DETERMINED BY THE CONTRACTOR.
2. ADDITIONAL TOPOGRAPHIC DATA WAS OBTAINED BUT IS NOT SHOWN FOR CLARITY.

811 Know what's below. Call before you dig.

COPYRIGHT 2008 by PROVOST & PRITCHARD ENGINEERING GROUP, INC. ALL RIGHTS RESERVED. The firm of Provost & Pritchard Engineering Group, Inc. (hereinafter referred to as "Firm") retains all rights, title, and interest in and to its common law copyright and other applicable property rights in these plans. These plans are not to be reproduced, changed or copied in any form or manner whatsoever, nor are they to be assigned to a third party without first obtaining the express written permission and consent of Provost & Pritchard Engineering Group, Inc. In the event of unauthorized reuse of these plans by a third party, the third party agrees to hold the Firm harmless, and shall bear the cost of Provost & Pritchard Engineering Group, Inc.'s reasonable attorney's fees associated with defending and enforcing these rights.

No.	REVISION	BY	DATE

PRELIMINARY
NOT FOR CONSTRUCTION

KRCD Community Powerplant

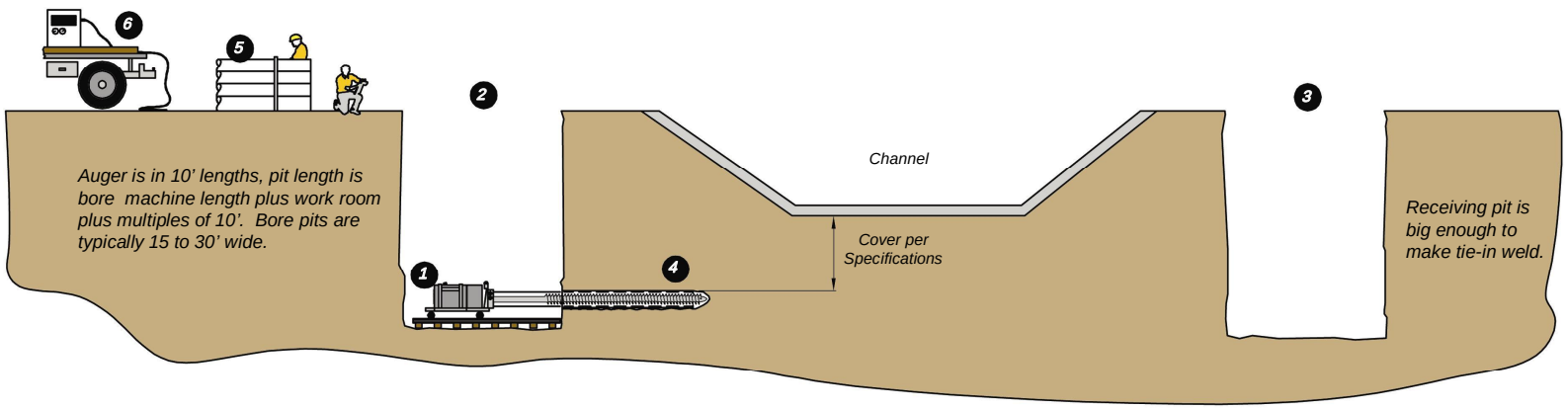
Kings's River Conservation District
Fresno County, CA

Construction Laydown Area
Best Management Practices
Attachment 2-3

EST. 1968
PROVOST & PRITCHARD
ENGINEERING GROUP
An Employee Owned Company
2505 ALLUVIAL AVENUE
CLOVIS, CALIFORNIA 93611-9166
559/326-1100 FAX 559/326-1090
www.ppeng.com

DESIGN ENGINEER: Owen Kubit
LICENSE NO: CE 66,552
DRAFTED BY: ASC
CHECKED BY: ----
SCALE: AS SHOWN
DATE: 05/01/08
JOB NO: 13640704
DWG. NO:
SHEET 1 OF 1

5/6/2008 9:42 AM G:\Clients\Kings River Conservation Dist - 1364A\13640704-Porter Powerplant Wtr Res\DWG\EXHIBIT\Attachment 2-3 ASC.dwg -Adam Closs



1 *Bore Machine*

2 *Entry Pit*

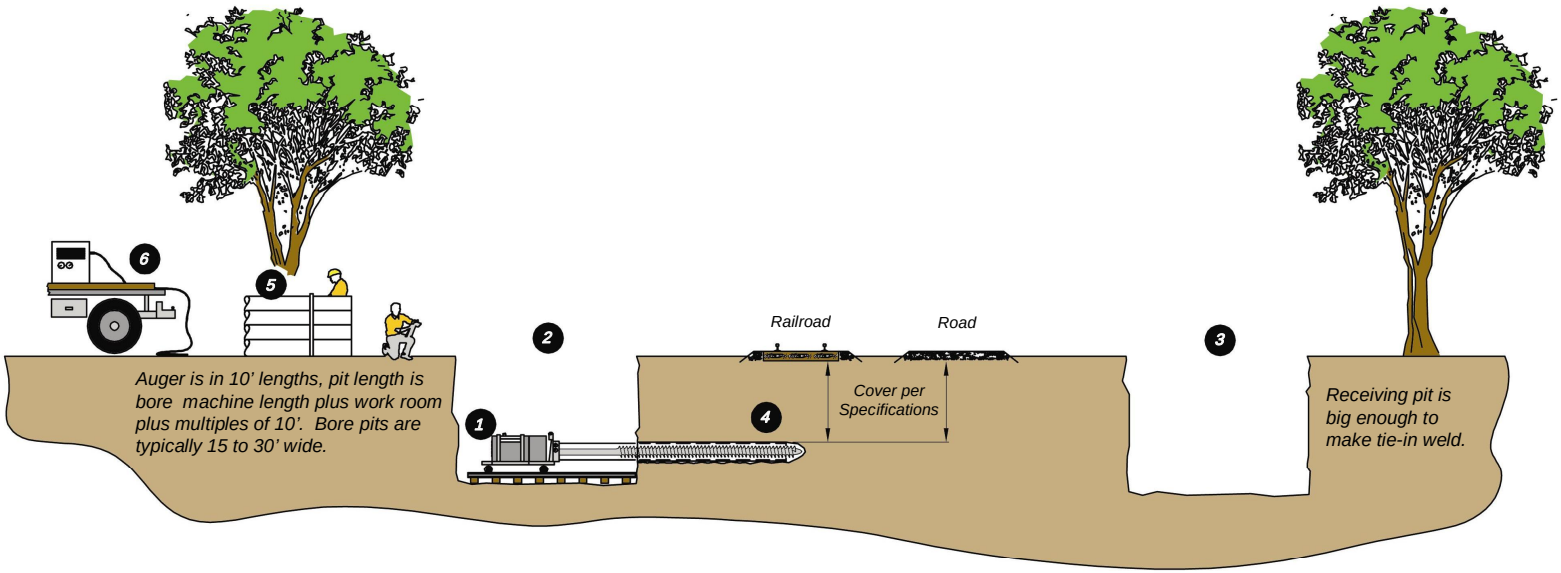
3 *Receiving Pit*

4 *Carrier Pipe*

5 *Carrier Stock Pipe*

6 *Welding Machine*

SPEC SERVICES File: 3024Fig5.doc	***Typical Jack & Bore Construction***	ATTACHMENT 4-1 Page 1
		Rev. No.: A
		Date: 12/10/03



1 *Bore Machine*

2 *Entry Pit*

3 *Receiving Pit*

4 *Carrier Pipe*

5 *Carrier Stock Pipe*

6 *Welding Machine*

SPEC SERVICES File: 3024Fig5.doc	***Typical Jack & Bore ConstructionF***	ATTACHMENT 4-1 Page 2
		Rev. No.: A
		Date: 12/10/03

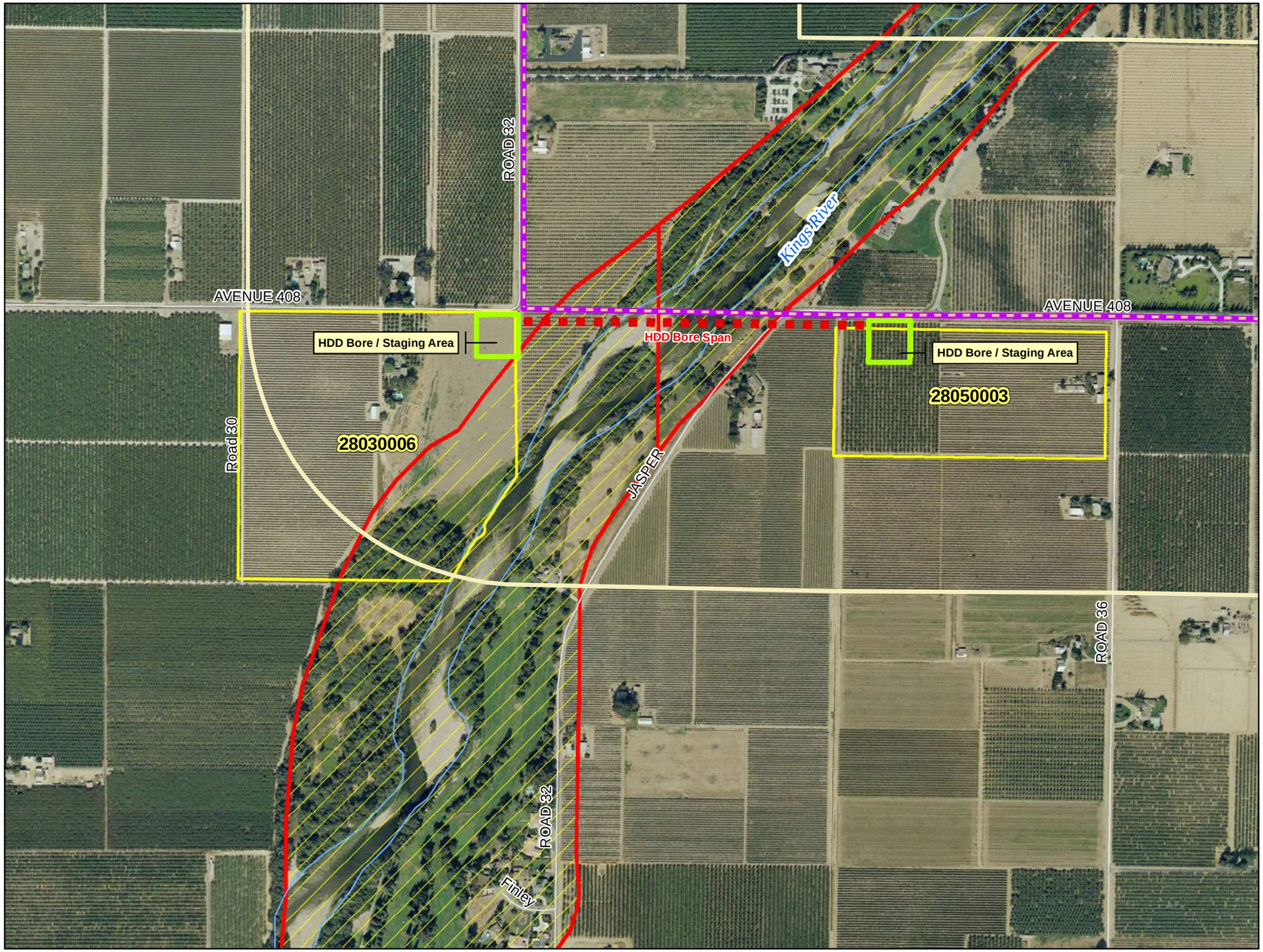
ATTACHMENT 4-2, pg. 1 of 4

KINGS RIVER CROSSING
CONCEPTUAL PIPELINE HDD LAYOUT

01/16/07
1"=400' (11X17)

K:\3828\Photos\GlobeXplorer\3828_image.dwg, 1/16/2007 3:43:05 PM, 1:400

Kings River Conservation District Community Power Plant



Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Bio-SupplementB_Rev1_Bore_Locations.mxd

KRCD COMMUNITY POWER PLANT

Energy for our Future

Drainage, Erosion, and Sediment Control Plan (DESCP)

Attachment 4-2, Page 2 of 4

- KRCD Community Power Plant
- KRCD CPP Project Site
- KRCD CPP Project Laydown (New)
- KRCD CPP Project Laydown (Originally Proposed)
- KRCD CPP Site 1 Mile Buffer
- Linears 1/4 Mile Buffer
- Substation
- Proposed 230KV Transmission Line (New)
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- HDD Bore / Laydown Area
- HDD Bore Span
- Natural Gas Connection Point
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- Freeway
- Street
- Railroad
- Parcel
- Waterway
- FEMA 100 Year Flood Zone
- County Boundary
- City Boundary

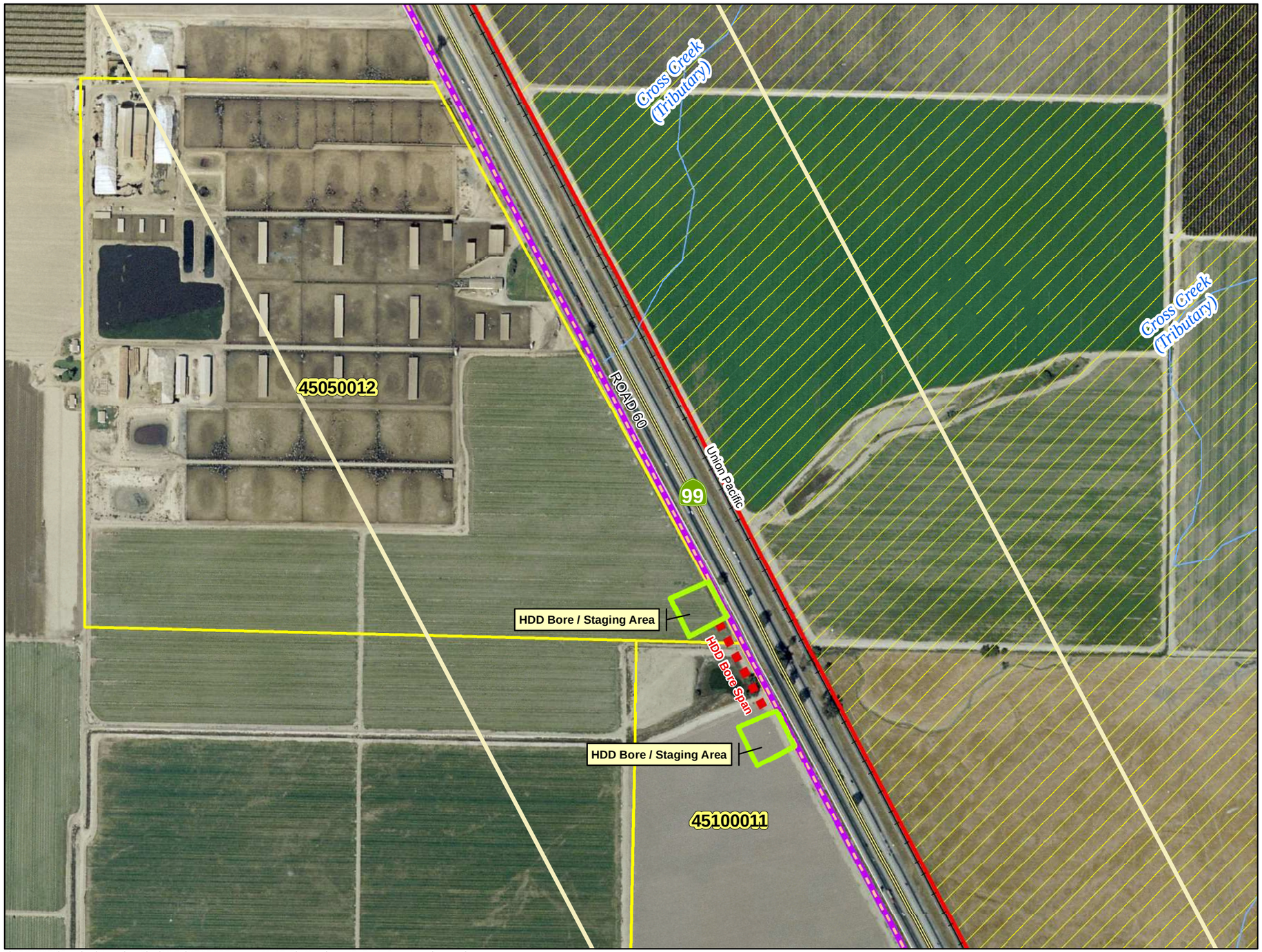
NOTE: Potable Water and Sewer Connections are on the project site.

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Kings River Conservation District Community Power Plant



KRCD COMMUNITY POWER PLANT

Energy for our Future

Drainage, Erosion, and Sediment Control Plan (DESCP)

Attachment 4-2, Page 3 of 4

- KRCD Community Power Plant
- KRCD CPP Project Site
- KRCD CPP Project Laydown (New)
- KRCD CPP Project Laydown (Originally Proposed)
- KRCD CPP Site 1 Mile Buffer
- Linears 1/4 Mile Buffer
- Substation
- Proposed 230KV Transmission Line (New)
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- HDD Bore / Laydown Area
- HDD Bore Span
- Natural Gas Connection Point
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- Freeway
- Street
- Railroad
- Parcel
- Waterway
- FEMA 100 Year Flood Zone
- County Boundary
- City Boundary

NOTE: Potable Water and Sewer Connections are on the project site.

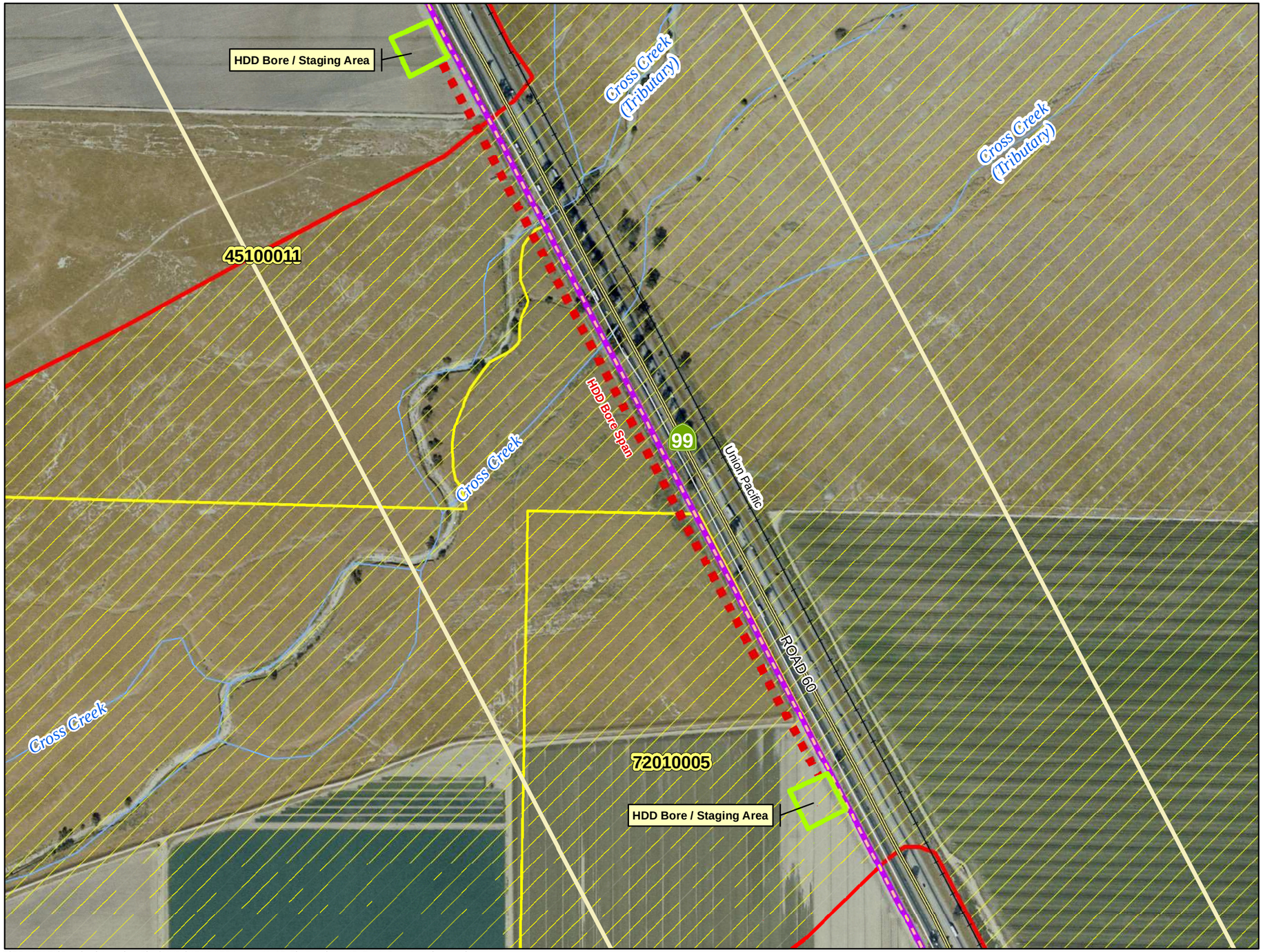
N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Bio-SupplementB_Rev1_Bore_Locations.mxd

Kings River Conservation District Community Power Plant



Z:\PROJECTS\Baseload_Location_Sites\MXDs\KRCDCPP Layout 11x17_Bio-SupplementB_Rev1_Bore_Locations.mxd

KRCD COMMUNITY POWER PLANT

Energy for our Future

Drainage, Erosion, and Sediment Control Plan (DESCP)

Attachment 4-2, Page 4 of 4

- KRCD Community Power Plant
- KRCD CPP Project Site
- KRCD CPP Project Laydown (New)
- KRCD CPP Project Laydown (Originally Proposed)
- KRCD CPP Site 1 Mile Buffer
- Linears 1/4 Mile Buffer
- Substation
- Proposed 230KV Transmission Line (New)
- Waste Water Percolation Ponds
- Proposed Water Supply Pipeline - Option 1
- Proposed Water Supply Pipeline - Option 2
- Manning Recharge Basin
- HDD Bore / Laydown Area
- HDD Bore Span
- Natural Gas Connection Point
- Proposed Natural Gas Pipeline
- SoCal Gas 7000 Line
- Freeway
- Street
- Railroad
- Parcel
- Waterway
- FEMA 100 Year Flood Zone
- County Boundary
- City Boundary

NOTE: Potable Water and Sewer Connections are on the project site.

N

0 250 500 750 1,000 Feet

1:6,000 Scale 1 Inch equals 500 Feet

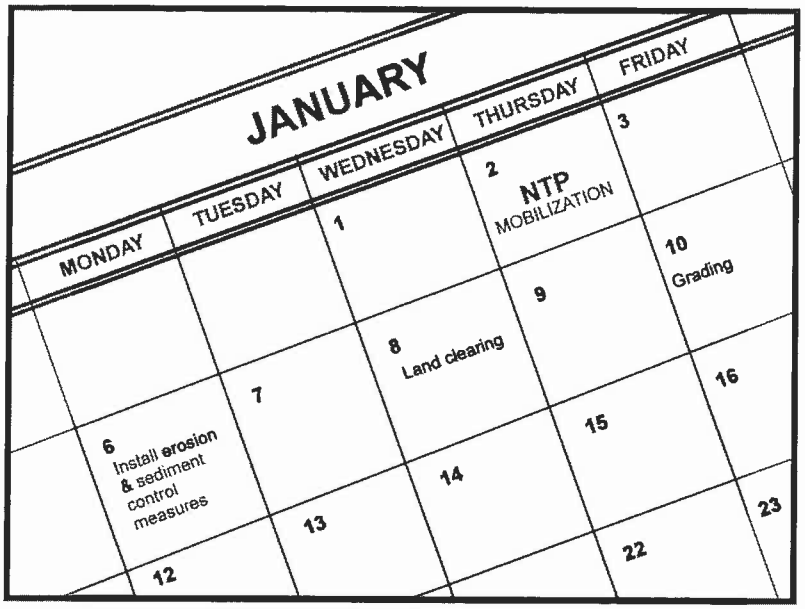
KINGS RIVER CONSERVATION DISTRICT
COMMUNITY POWERPLANT

DRAINAGE, EROSION AND SEDIMENT CONTROL PLAN

APPENDIX A - BEST MANAGEMENT PRACTICES FACT SHEETS

Scheduling

EC-1



Objectives

EC	Erosion Control	☑
SE	Sediment Control	☒
TR	Tracking Control	☒
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

Limitations

- Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.

- Plan the project and develop a schedule showing each phase of construction. Clearly show how the rainy season relates to soil

disturbing and re-stabilization activities. Incorporate the construction schedule into the SWPPP.

- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion control BMPs
  - Sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs
  - Waste management and materials pollution control BMPs
- Include dates for activities that may require non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season.
  - Sequence trenching activities so that most open portions are closed before new trenching begins.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or one day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Inspection and Maintenance

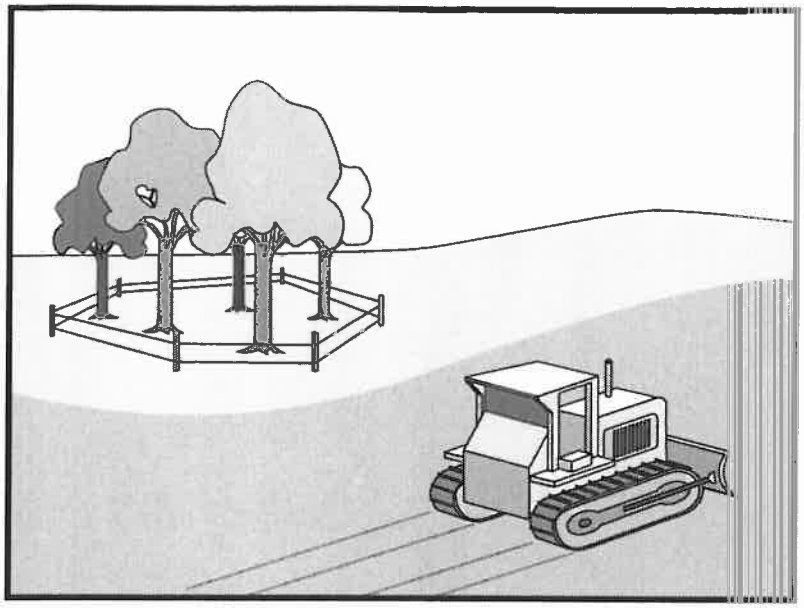
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Preservation Of Existing Vegetation EC-2



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Carefully planned preservation of existing vegetation minimizes the potential of removing or injuring existing trees, vines, shrubs, and grasses that protect soil from erosion.

Suitable Applications

Preservation of existing vegetation is suitable for use on most projects. Large project sites often provide the greatest opportunity for use of this BMP. Suitable applications include the following:

- Areas within the site where no construction activity occurs, or occurs at a later date. This BMP is especially suitable to multi year projects where grading can be phased.
- Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.
- Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc. These areas are usually designated on the plans, or in the specifications, permits, or environmental documents.
- Where vegetation designated for ultimate removal can be temporarily preserved and be utilized for erosion control and sediment control.

EC-2 Preservation Of Existing Vegetation

Limitations

- Requires forward planning by the owner/developer, contractor, and design staff.
- Limited opportunities for use when project plans do not incorporate existing vegetation into the site design.
- For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the planned development.

Implementation

The best way to prevent erosion is to not disturb the land. In order to reduce the impacts of new development and redevelopment, projects may be designed to avoid disturbing land in sensitive areas of the site (e.g., natural watercourses, steep slopes), and to incorporate unique or desirable existing vegetation into the site's landscaping plan. Clearly marking and leaving a buffer area around these unique areas during construction will help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping.

Existing vegetation to be preserved on the site must be protected from mechanical and other injury while the land is being developed. The purpose of protecting existing vegetation is to ensure the survival of desirable vegetation for shade, beautification, and erosion control. Mature vegetation has extensive root systems that help to hold soil in place, thus reducing erosion. In addition, vegetation helps keep soil from drying rapidly and becoming susceptible to erosion. To effectively save existing vegetation, no disturbances of any kind should be allowed within a defined area around the vegetation. For trees, no construction activity should occur within the drip line of the tree.

Timing

- Provide for preservation of existing vegetation prior to the commencement of clearing and grubbing operations or other soil disturbing activities in areas where no construction activity is planned or will occur at a later date.

Design and Layout

- Mark areas to be preserved with temporary fencing. Include sufficient setback to protect roots.
  - Orange colored plastic mesh fencing works well.
  - Use appropriate fence posts and adequate post spacing and depth to completely support the fence in an upright position.
- Locate temporary roadways, stockpiles, and layout areas to avoid stands of trees, shrubs, and grass.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Maintain existing irrigation systems where feasible. Temporary irrigation may be required.
- Instruct employees and subcontractors to honor protective devices. Prohibit heavy equipment, vehicular traffic, or storage of construction materials within the protected area.

Costs

There is little cost associated with preserving existing vegetation if properly planned during the project design, and these costs may be offset by aesthetic benefits that enhance property values. During construction, the cost for preserving existing vegetation will likely be less than the cost of applying erosion and sediment controls to the disturbed area. Replacing vegetation inadvertently destroyed during construction can be extremely expensive, sometimes in excess of $10,000 per tree.

Inspection and Maintenance

During construction, the limits of disturbance should remain clearly marked at all times. Irrigation or maintenance of existing vegetation should be described in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below should be followed:

- Verify that protective measures remain in place. Restore damaged protection measures immediately.
- Serious tree injuries shall be attended to by an arborist.
- Damage to the crown, trunk, or root system of a retained tree shall be repaired immediately.
- Trench as far from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching or tunneling near or under trees to be retained, place tunnels at least 18 in. below the ground surface, and not below the tree center to minimize impact on the roots.
- Do not leave tree roots exposed to air. Cover exposed roots with soil as soon as possible. If soil covering is not practical, protect exposed roots with wet burlap or peat moss until the tunnel or trench is ready for backfill.
- Cleanly remove the ends of damaged roots with a smooth cut.
- Fill trenches and tunnels as soon as possible. Careful filling and tamping will eliminate air spaces in the soil, which can damage roots.
- If bark damage occurs, cut back all loosened bark into the undamaged area, with the cut tapered at the top and bottom and drainage provided at the base of the wood. Limit cutting the undamaged area as much as possible.
- Aerate soil that has been compacted over a trees root zone by punching holes 12 in. deep with an iron bar, and moving the bar back and forth until the soil is loosened. Place holes 18 in. apart throughout the area of compacted soil under the tree crown.
- Fertilization
  - Fertilize stressed or damaged broadleaf trees to aid recovery.
  - Fertilize trees in the late fall or early spring.

- Apply fertilizer to the soil over the feeder roots and in accordance with label instructions, but never closer than 3 ft to the trunk. Increase the fertilized area by one-fourth of the crown area for conifers that have extended root systems.

- Retain protective measures until all other construction activity is complete to avoid damage during site cleanup and stabilization.

References

County of Sacramento Tree Preservation Ordinance, September 1981.

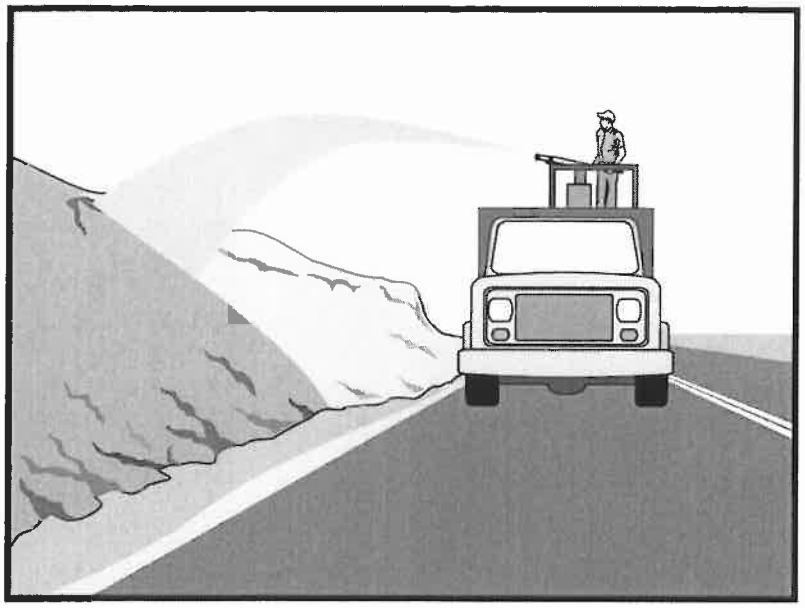
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for The Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Hydraulic Mulch

EC-3



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-4 Hydroseeding

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

Description and Purpose

Hydraulic mulch consists of applying a mixture of shredded wood fiber or a hydraulic matrix, and a stabilizing emulsion or tackifier with hydro-mulching equipment, which temporarily protects exposed soil from erosion by raindrop impact or wind.

Suitable Applications

Hydraulic mulch is suitable for soil disturbed areas requiring temporary protection until permanent stabilization is established, and disturbed areas that will be re-disturbed following an extended period of inactivity.

Limitations

Wood fiber hydraulic mulches are generally short lived and need 24 hours to dry before rainfall occurs to be effective. May require a second application in order to remain effective for an entire rainy season.

Implementation

- Prior to application, roughen embankment and fill areas by rolling with a crimping or punching type roller or by track walking. Track walking shall only be used where other methods are impractical.
- To be effective, hydraulic matrices require 24 hours to dry before rainfall occurs.
- Avoid mulch over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

- Paper based hydraulic mulches alone shall not be used for erosion control.

Hydraulic Mulches

Wood fiber mulch can be applied alone or as a component of hydraulic matrices. Wood fiber applied alone is typically applied at the rate of 2,000 to 4,000 lb/acre. Wood fiber mulch is manufactured from wood or wood waste from lumber mills or from urban sources.

Hydraulic Matrices

Hydraulic matrices include a mixture of wood fiber and acrylic polymer or other tackifier as binder. Apply as a liquid slurry using a hydraulic application machine (i.e., hydro seeder) at the following minimum rates, or as specified by the manufacturer to achieve complete coverage of the target area: 2,000 to 4,000 lb/acre wood fiber mulch, and 5 to 10% (by weight) of tackifier (acrylic copolymer, guar, psyllium, etc.)

Bonded Fiber Matrix

Bonded fiber matrix (BFM) is a hydraulically applied system of fibers and adhesives that upon drying forms an erosion resistant blanket that promotes vegetation, and prevents soil erosion. BFMs are typically applied at rates from 3,000 lb/acre to 4,000 lb/acre based on the manufacturer's recommendation. A biodegradable BFM is composed of materials that are 100% biodegradable. The binder in the BFM should also be biodegradable and should not dissolve or disperse upon re-wetting. Typically, biodegradable BFMs should not be applied immediately before, during or immediately after rainfall if the soil is saturated. Depending on the product, BFMs typically require 12 to 24 hours to dry and become effective.

Costs

Average cost for installation of wood fiber mulch is $900/acre. Average cost for installation of BFM is $5,500/acre.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Maintain an unbroken, temporary mulched ground cover throughout the period of construction when the soils are not being reworked.

References

Controlling Erosion of Construction Sites Agricultural Information #347, U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) (formerly Soil Conservation Service – SCS).

Guides for Erosion and Sediment Control in California, USDA Soils Conservation Service, January 1991.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

Soil Erosion by Water, Agriculture Information Bulletin #513, U.S. Department of Agriculture, Soil Conservation Service.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

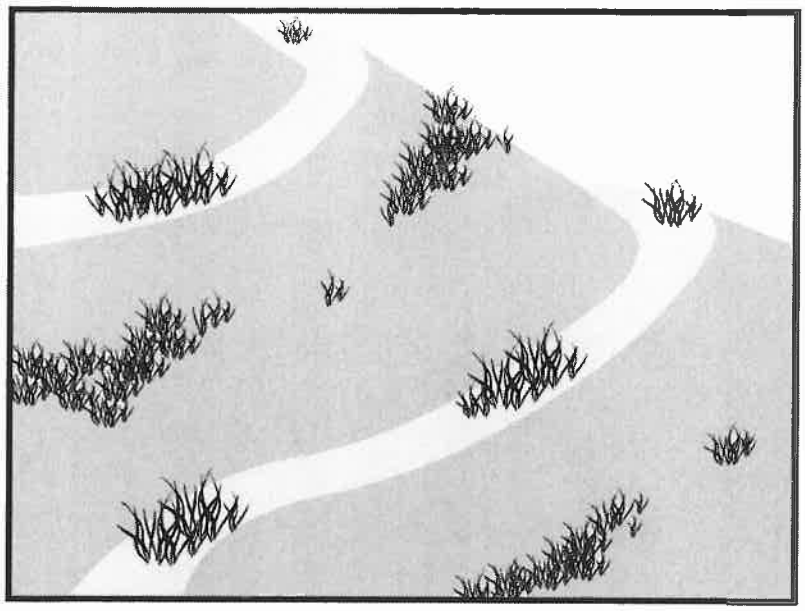
Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Hydroseeding

EC-4



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-5 Soil Binders

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

Description and Purpose

Hydroseeding typically consists of applying a mixture of wood fiber, seed, fertilizer, and stabilizing emulsion with hydro-mulch equipment, to temporarily protect exposed soils from erosion by water and wind.

Suitable Applications

Hydroseeding is suitable for soil disturbed areas requiring temporary protection until permanent stabilization is established, and disturbed areas that will be re-disturbed following an extended period of inactivity.

Limitations

- Hydroseeding may be used alone only when there is sufficient time in the season to ensure adequate vegetation establishment and coverage to provide adequate erosion control. Otherwise, hydroseeding must be used in conjunction with mulching (i.e., straw mulch).
- Steep slopes are difficult to protect with temporary seeding.
- Temporary seeding may not be appropriate in dry periods without supplemental irrigation.
- Temporary vegetation may have to be removed before permanent vegetation is applied.
- Temporary vegetation is not appropriate for short term inactivity.

Implementation

In order to select appropriate hydroseeding mixtures, an evaluation of site conditions shall be performed with respect to:

- Soil conditions
- Site topography
- Season and climate
- Vegetation types
- Maintenance requirements
- Sensitive adjacent areas
- Water availability
- Plans for permanent vegetation

The local office of the U.S.D.A. Natural Resources Conservation Service (NRCS) is an excellent source of information on appropriate seed mixes.

The following steps shall be followed for implementation:

- Avoid use of hydroseeding in areas where the BMP would be incompatible with future earthwork activities and would have to be removed.
- Hydroseeding can be accomplished using a multiple step or one step process. The multiple step process ensures maximum direct contact of the seeds to soil. When the one step process is used to apply the mixture of fiber, seed, etc., the seed rate shall be increased to compensate for all seeds not having direct contact with the soil.
- Prior to application, roughen the area to be seeded with the furrows trending along the contours.
- Apply a straw mulch to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.
- All seeds shall be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container shall be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed shall be pellet inoculated. Inoculant sources shall be species specific and shall be applied at a rate of 2 lb of inoculant per 100 lb seed.
- Commercial fertilizer shall conform to the requirements of the California Food and Agricultural Code. Fertilizer shall be pelleted or granular form.
- Follow up applications shall be made as needed to cover weak spots and to maintain adequate soil protection.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

Costs

Average cost for installation and maintenance may vary from as low as $300 per acre for flat slopes and stable soils, to $1600 per acre for moderate to steep slopes and/or erosive soils.

Hydroseeding		Installed Cost per Acre
High Density	Ornamentals	$400 - $1600
	Turf Species	$350
	Bunch Grasses	$300 - $1300
Fast Growing	Annual	$350 - $650
	Perennial	$300 - $800
Non-Competing	Native	$300 - $1600
	Non-Native	$400 - $500
Sterile	Cereal Grain	$500

Source: Caltrans Guidance for Soil Stabilization for Temporary Slopes, Nov. 1999

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Where seeds fail to germinate, or they germinate and die, the area must be re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates.
- Irrigation systems, if applicable, should be inspected daily while in use to identify system malfunctions and line breaks. When line breaks are detected, the system must be shut down immediately and breaks repaired before the system is put back into operation.
- Irrigation systems shall be inspected for complete coverage and adjusted as needed to maintain complete coverage.

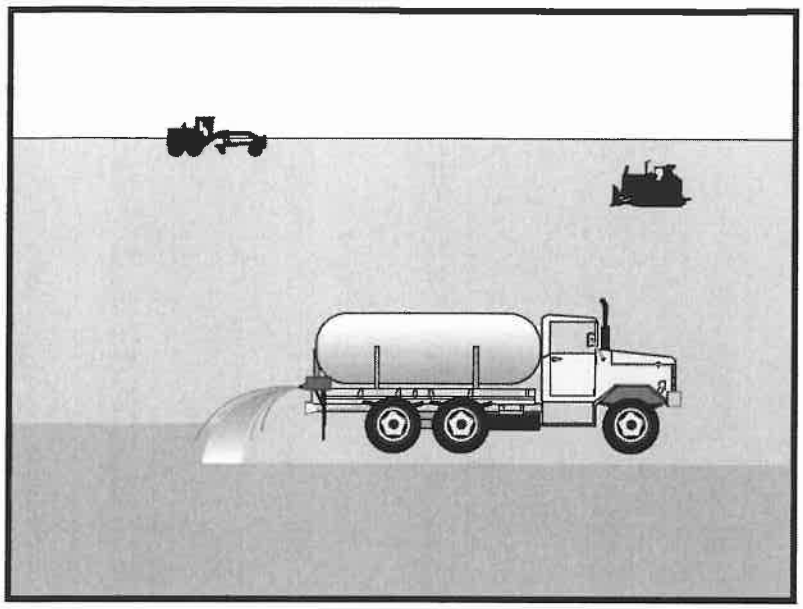
References

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

Soil Binders

EC-5



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	☒
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

EC-3 Hydraulic Mulch

EC-4 Hydroseeding

EC-6 Straw Mulch

EC-7 Geotextiles and Mats

EC-8 Wood Mulching

Description and Purpose

Soil binders consist of applying and maintaining a soil stabilizer to exposed soil surfaces. Soil binders are materials applied to the soil surface to temporarily prevent water induced erosion of exposed soils on construction sites. Soil binders also prevent wind erosion.

Suitable Applications

Soil binders are typically applied to disturbed areas requiring short term temporary protection. Because soil binders can often be incorporated into the work, they are a good alternative to mulches in areas where grading activities will soon resume. Soil binders are also suitable for use on stockpiles.

Limitations

- Soil binders are temporary in nature and may need reapplication.
- Soil binders require a minimum curing time until fully effective, as prescribed by the manufacturer. Curing time may be 24 hours or longer. Soil binders may need reapplication after a storm event.
- Soil binders will generally experience spot failures during heavy rainfall events. If runoff penetrates the soil at the top of a slope treated with a soil binder, it is likely that the runoff will undercut the stabilized soil layer and discharge at a point further down slope.

- Soil binders do not hold up to pedestrian or vehicular traffic across treated areas.
- Soil binders may not penetrate soil surfaces made up primarily of silt and clay, particularly when compacted.
- Some soil binders may not perform well with low relative humidity. Under rainy conditions, some agents may become slippery or leach out of the soil.
- Soil binders may not cure if low temperatures occur within 24 hours of application.
- The water quality impacts of soil binders are relatively unknown and some may have water quality impacts due to their chemical makeup.
- A sampling and analysis plan must be incorporated into the SWPPP as soil binders could be a source of non-visible pollutants.

Implementation

General Considerations

- Regional soil types will dictate appropriate soil binders to be used.
- A soil binder must be environmentally benign (non-toxic to plant and animal life), easy to apply, easy to maintain, economical, and should not stain paved or painted surfaces. Soil binders should not pollute stormwater.
- Some soil binders may not be compatible with existing vegetation.
- Performance of soil binders depends on temperature, humidity, and traffic across treated areas.
- Avoid over spray onto roads, sidewalks, drainage channels, existing vegetation, etc.

Selecting a Soil Binder

Properties of common soil binders used for erosion control are provided on Table 1 at the end of this BMP. Use Table 1 to select an appropriate soil binder. Refer to WE-1, Wind Erosion Control, for dust control soil binders.

Factors to consider when selecting a soil binder include the following:

- Suitability to situation - Consider where the soil binder will be applied, if it needs a high resistance to leaching or abrasion, and whether it needs to be compatible with any existing vegetation. Determine the length of time soil stabilization will be needed, and if the soil binder will be placed in an area where it will degrade rapidly. In general, slope steepness is not a discriminating factor for the listed soil binders.
- Soil types and surface materials - Fines and moisture content are key properties of surface materials. Consider a soil binder's ability to penetrate, likelihood of leaching, and ability to form a surface crust on the surface materials.
- Frequency of application - The frequency of application can be affected by subgrade conditions, surface type, climate, and maintenance schedule. Frequent applications could

lead to high costs. Application frequency may be minimized if the soil binder has good penetration, low evaporation, and good longevity. Consider also that frequent application will require frequent equipment clean up.

Plant-Material Based (Short Lived) Binders

Guar: Guar is a non-toxic, biodegradable, natural galactomannan based hydrocolloid treated with dispersant agents for easy field mixing. It should be mixed with water at the rate of 11 to 15 lb per 1,000 gallons. Recommended minimum application rates are as follows:

Application Rates for Guar Soil Stabilizer

Slope (H:V):	Flat	4:1	3:1	2:1	1:1
lb/acre:	40	45	50	60	70

Psyllium: Psyllium is composed of the finely ground muciloid coating of plantago seeds that is applied as a dry powder or in a wet slurry to the surface of the soil. It dries to form a firm but rewettable membrane that binds soil particles together but permits germination and growth of seed. Psyllium requires 12 to 18 hours drying time. Application rates should be from 80 to 200 lb/acre, with enough water in solution to allow for a uniform slurry flow.

Starch: Starch is non-ionic, cold water soluble (pre-gelatinized) granular cornstarch. The material is mixed with water and applied at the rate of 150 lb/acre. Approximate drying time is 9 to 12 hours.

Plant-Material Based (Long Lived) Binders

Pitch and Rosin Emulsion: Generally, a non-ionic pitch and rosin emulsion has a minimum solids content of 48%. The rosin should be a minimum of 26% of the total solids content. The soil stabilizer should be non-corrosive, water dilutable emulsion that upon application cures to a water insoluble binding and cementing agent. For soil erosion control applications, the emulsion is diluted and should be applied as follows:

- For clayey soil: 5 parts water to 1 part emulsion
- For sandy soil: 10 parts water to 1 part emulsion

Application can be by water truck or hydraulic seeder with the emulsion and product mixture applied at the rate specified by the manufacturer.

Polymeric Emulsion Blend Binders

Acrylic Copolymers and Polymers: Polymeric soil stabilizers should consist of a liquid or solid polymer or copolymer with an acrylic base that contains a minimum of 55% solids. The polymeric compound should be handled and mixed in a manner that will not cause foaming or should contain an anti-foaming agent. The polymeric emulsion should not exceed its shelf life or expiration date; manufacturers should provide the expiration date. Polymeric soil stabilizer should be readily miscible in water, non-injurious to seed or animal life, non-flammable, should provide surface soil stabilization for various soil types without totally inhibiting water infiltration, and should not re-emulsify when cured. The applied compound should air cure within a maximum of 36 to 48 hours. Liquid copolymer should be diluted at a rate of 10 parts water to 1 part polymer and the mixture applied to soil at a rate of 1,175 gallons/acre.

Liquid Polymers of Methacrylates and Acrylates: This material consists of a tackifier/sealer that is a liquid polymer of methacrylates and acrylates. It is an aqueous 100% acrylic emulsion blend of 40% solids by volume that is free from styrene, acetate, vinyl, ethoxylated surfactants or silicates. For soil stabilization applications, it is diluted with water in accordance with manufacturer's recommendations, and applied with a hydraulic seeder at the rate of 20 gallons/acre. Drying time is 12 to 18 hours after application.

Copolymers of Sodium Acrylates and Acrylamides: These materials are non-toxic, dry powders that are copolymers of sodium acrylate and acrylamide. They are mixed with water and applied to the soil surface for erosion control at rates that are determined by slope gradient:

Slope Gradient (H:V)	lb/acre
Flat to 5:1	3.0 – 5.0
5:1 to 3:1	5.0 – 10.0
2:2 to 1:1	10.0 – 20.0

Poly-Acrylamide and Copolymer of Acrylamide: Linear copolymer polyacrylamide is packaged as a dry flowable solid. When used as a stand alone stabilizer, it is diluted at a rate of 11lb/1,000 gal of water and applied at the rate of 5.0 lb/acre.

Hydro-Colloid Polymers: Hydro-Colloid Polymers are various combinations of dry flowable poly-acrylamides, copolymers and hydro-colloid polymers that are mixed with water and applied to the soil surface at rates of 55 to 60 lb/acre. Drying times are 0 to 4 hours.

Cementitious-Based Binders

Gypsum: This is a formulated gypsum based product that readily mixes with water and mulch to form a thin protective crust on the soil surface. It is composed of high purity gypsum that is ground, calcined and processed into calcium sulfate hemihydrate with a minimum purity of 86%. It is mixed in a hydraulic seeder and applied at rates 4,000 to 12,000 lb/acre. Drying time is 4 to 8 hours.

Applying Soil Binders

After selecting an appropriate soil binder, the untreated soil surface must be prepared before applying the soil binder. The untreated soil surface must contain sufficient moisture to assist the agent in achieving uniform distribution. In general, the following steps should be followed:

- Follow manufacturer's written recommendations for application rates, pre-wetting of application area, and cleaning of equipment after use.
- Prior to application, roughen embankment and fill areas.
- Consider the drying time for the selected soil binder and apply with sufficient time before anticipated rainfall. Soil binders should not be applied during or immediately before rainfall.
- Avoid over spray onto roads, sidewalks, drainage channels, sound walls, existing vegetation, etc.

- Soil binders should not be applied to frozen soil, areas with standing water, under freezing or rainy conditions, or when the temperature is below 40°F during the curing period.
- More than one treatment is often necessary, although the second treatment may be diluted or have a lower application rate.
- Generally, soil binders require a minimum curing time of 24 hours before they are fully effective. Refer to manufacturer's instructions for specific cure time.
- For liquid agents:
  - Crown or slope ground to avoid ponding.
  - Uniformly pre-wet ground at 0.03 to 0.3 gal/yd^2 or according to manufacturer's recommendations.
  - Apply solution under pressure. Overlap solution 6 to 12 in.
  - Allow treated area to cure for the time recommended by the manufacturer; typically at least 24 hours.
  - Apply second treatment before first treatment becomes ineffective, using 50% application rate.
  - In low humidities, reactivate chemicals by re-wetting with water at 0.1 to 0.2 gal/yd^2.

Costs

Costs vary according to the soil stabilizer selected for implementation. The following are approximate costs:

Soil Binder	Cost per Acre
Plant-Material Based (Short Lived) Binders	$400
Plant-Material Based (Long Lived) Binders	$1,200
Polymeric Emulsion Blend Binders	$400 (1)
Cementitious-Based Binders	$800

(1) $1,200 for Acrylic polymers and copolymers

Source: Caltrans Guidance for Soil Stabilization for Temporary Slopes, Nov. 1999

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Areas where erosion is evident shall be repaired and BMPs re-applied as soon as possible. Care should be exercised to minimize the damage to protected areas while making repairs, as any area damaged will require re-application of BMPs.
- Reapply the selected soil binder as needed to maintain effectiveness.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Sedimentation and Erosion Control, An Inventory of Current Practices Draft, US EPA, April 1990.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Guidance Document: Soil Stabilization for Temporary Slopes, State of California Department of Transportation (Caltrans), November 1999.

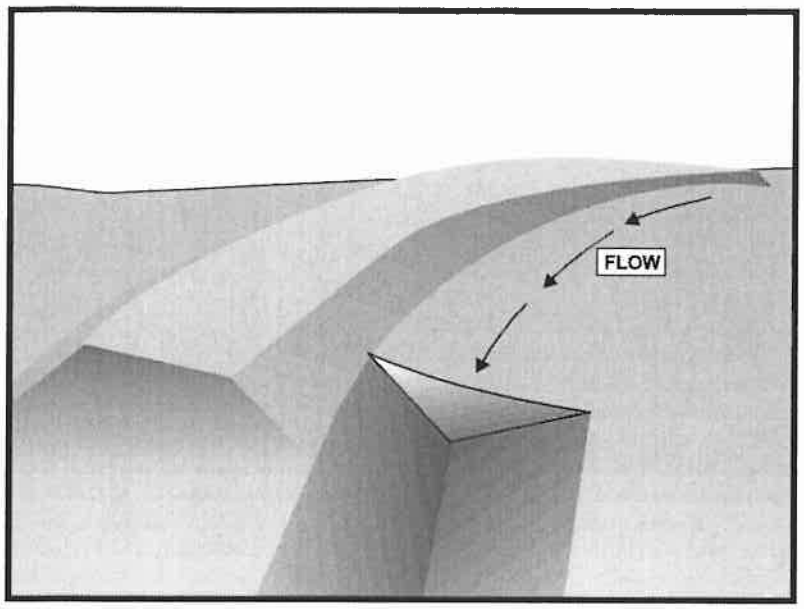
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Table 1 Properties of Soil Binders for Erosion Control

Evaluation Criteria	Binder Type			
	Plant Material Based (Short Lived)	Plant Material Based (Long Lived)	Polymeric Emulsion Blends	Cementitious-Based Binders
Relative Cost	Low	Low	Low	Low
Resistance to Leaching	High	High	Low to Moderate	Moderate
Resistance to Abrasion	Moderate	Low	Moderate to High	Moderate to High
Longevity	Short to Medium	Medium	Medium to Long	Medium
Minimum Curing Time before Rain	9 to 18 hours	19 to 24 hours	0 to 24 hours	4 to 8 hours
Compatibility with Existing Vegetation	Good	Poor	Poor	Poor
Mode of Degradation	Biodegradable	Biodegradable	Photodegradable/ Chemically Degradable	Photodegradable/ Chemically Degradable
Labor Intensive	No	No	No	No
Specialized Application Equipment	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher
Liquid/Powder	Powder	Liquid	Liquid/Powder	Powder
Surface Crusting	Yes, but dissolves on rewetting	Yes	Yes, but dissolves on rewetting	Yes
Clean Up	Water	Water	Water	Water
Erosion Control Application Rate	Varies (1)	Varies (1)	Varies (1)	4,000 to 12,000 lbs/acre

(1) See Implementation for specific rates.

Earth Dikes and Drainage Swales EC-9



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

An earth dike is a temporary berm or ridge of compacted soil used to divert runoff or channel water to a desired location. A drainage swale is a shaped and sloped depression in the soil surface used to convey runoff to a desired location. Earth dikes and drainage swales are used to divert off site runoff around the construction site, divert runoff from stabilized areas and disturbed areas, and direct runoff into sediment basins or traps.

Suitable Applications

Earth dikes and drainage swales are suitable for use, individually or together, where runoff needs to be diverted from one area and conveyed to another.

- Earth dikes and drainage swales may be used:
  - To convey surface runoff down sloping land
  - To intercept and divert runoff to avoid sheet flow over sloped surfaces
  - To divert and direct runoff towards a stabilized watercourse, drainage pipe or channel
  - To intercept runoff from paved surfaces
  - Below steep grades where runoff begins to concentrate
  - Along roadways and facility improvements subject to flood drainage

- At the top of slopes to divert runon from adjacent or undisturbed slopes
- At bottom and mid slope locations to intercept sheet flow and convey concentrated flows
- Divert sediment laden runoff into sediment basins or traps

Limitations

Dikes should not be used for drainage areas greater than 10 acres or along slopes greater than 10 percent. For larger areas more permanent drainage structures should be built. All drainage structures should be built in compliance with local municipal requirements.

- Earth dikes may create more disturbed area on site and become barriers to construction equipment.
- Earth dikes must be stabilized immediately, which adds cost and maintenance concerns.
- Diverted stormwater may cause downstream flood damage.
- Dikes should not be constructed of soils that may be easily eroded.
- Regrading the site to remove the dike may add additional cost.
- Temporary drains and swales or any other diversion of runoff should not adversely impact upstream or downstream properties.
- Temporary drains and swales must conform to local floodplain management requirements.
- Earth dikes/drainage swales are not suitable as sediment trapping devices.
- It may be necessary to use other soil stabilization and sediment controls such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales, and ditches.

Implementation

The temporary earth dike is a berm or ridge of compacted soil, located in such a manner as to divert stormwater to a sediment trapping device or a stabilized outlet, thereby reducing the potential for erosion and offsite sedimentation. Earth dikes can also be used to divert runoff from off site and from undisturbed areas away from disturbed areas and to divert sheet flows away from unprotected slopes.

An earth dike does not itself control erosion or remove sediment from runoff. A dike prevents erosion by directing runoff to an erosion control device such as a sediment trap or directing runoff away from an erodible area. Temporary diversion dikes should not adversely impact adjacent properties and must conform to local floodplain management regulations, and should not be used in areas with slopes steeper than 10%.

Slopes that are formed during cut and fill operations should be protected from erosion by runoff. A combination of a temporary drainage swale and an earth dike at the top of a slope can divert runoff to a location where it can be brought to the bottom of the slope (see EC-11, Slope Drains). A combination dike and swale is easily constructed by a single pass of a bulldozer or grader and

compacted by a second pass of the tracks or wheels over the ridge. Diversion structures should be installed when the site is initially graded and remain in place until post construction BMPs are installed and the slopes are stabilized.

Diversion practices concentrate surface runoff, increasing its velocity and erosive force. Thus, the flow out of the drain or swale must be directed onto a stabilized area or into a grade stabilization structure. If significant erosion will occur, a swale should be stabilized using vegetation, chemical treatment, rock rip-rap, matting, or other physical means of stabilization. Any drain or swale that conveys sediment laden runoff must be diverted into a sediment basin or trap before it is discharged from the site.

General

- Care must be applied to correctly size and locate earth dikes, drainage swales. Excessively steep, unlined dikes, and swales are subject to erosion and gully formation.
- Conveyances should be stabilized.
- Use a lined ditch for high flow velocities.
- Select flow velocity based on careful evaluation of the risks due to erosion of the measure, soil types, overtopping, flow backups, washout, and drainage flow patterns for each project site.
- Compact any fills to prevent unequal settlement.
- Do not divert runoff onto other property without securing written authorization from the property owner.
- When possible, install and utilize permanent dikes, swales, and ditches early in the construction process.
- Provide stabilized outlets.

Earth Dikes

Temporary earth dikes are a practical, inexpensive BMP used to divert stormwater runoff. Temporary diversion dikes should be installed in the following manner:

- All dikes should be compacted by earth moving equipment.
- All dikes should have positive drainage to an outlet.
- All dikes should have 2:1 or flatter side slopes, 18 in. minimum height, and a minimum top width of 24 in. Wide top widths and flat slopes are usually needed at crossings for construction traffic.
- The outlet from the earth dike must function with a minimum of erosion. Runoff should be conveyed to a sediment trapping device such as a Sediment Trap (SE-3) or Sediment Basin (SE-2) when either the dike channel or the drainage area above the dike are not adequately stabilized.

- Temporary stabilization may be achieved using seed and mulching for slopes less than 5% and either rip-rap or sod for slopes in excess of 5%. In either case, stabilization of the earth dike should be completed immediately after construction or prior to the first rain.

- If riprap is used to stabilize the channel formed along the toe of the dike, the following typical specifications apply:

Channel Grade	Riprap Stabilization
0.5-1.0%	4 in. Rock
1.1-2.0%	6 in. Rock
2.1-4.0%	8 in. Rock
4.1-5.0%	8 in. -12 in. Riprap

- The stone riprap, recycled concrete, etc. used for stabilization should be pressed into the soil with construction equipment.

- Filter cloth may be used to cover dikes in use for long periods.

- Construction activity on the earth dike should be kept to a minimum.

Drainage Swales

Drainage swales are only effective if they are properly installed. Swales are more effective than dikes because they tend to be more stable. The combination of a swale with a dike on the downhill side is the most cost effective diversion.

Standard engineering design criteria for small open channel and closed conveyance systems should be used (see the local drainage design manual). Unless local drainage design criteria state otherwise, drainage swales should be designed as follows:

- No more than 5 acres may drain to a temporary drainage swale.

- Place drainage swales above or below, not on, a cut or fill slope.

- Swale bottom width should be at least 2 ft

- Depth of the swale should be at least 18 in.

- Side slopes should be 2:1 or flatter.

- Drainage or swales should be laid at a grade of at least 1 percent, but not more than 15 percent.

- The swale must not be overtopped by the peak discharge from a 10-year storm, irrespective of the design criteria stated above.

- Remove all trees, stumps, obstructions, and other objectionable material from the swale when it is built.

- Compact any fill material along the path of the swale.

- Stabilize all swales immediately. Seed and mulch swales at a slope of less than 5 percent, and use rip-rap or sod for swales with a slope between 5 and 15 percent. For temporary swales, geotextiles and mats (EC-7) may provide immediate stabilization.
- Irrigation may be required to establish sufficient vegetation to prevent erosion.
- Do not operate construction vehicles across a swale unless a stabilized crossing is provided.
- Permanent drainage facilities must be designed by a professional engineer (see the local drainage design criteria for proper design).
- At a minimum, the drainage swale should conform to predevelopment drainage patterns and capacities.
- Construct the drainage swale with a positive grade to a stabilized outlet.
- Provide erosion protection or energy dissipation measures if the flow out of the drainage swale can reach an erosive velocity.

Costs

- Cost ranges from $15 to $55 per ft for both earthwork and stabilization and depends on availability of material, site location, and access.
- Small dikes: $2.50 - $6.50/linear ft; Large dikes: $2.50/yd^3.
- The cost of a drainage swale increases with drainage area and slope. Typical swales for controlling internal erosion are inexpensive, as they are quickly formed during routine earthwork.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspect ditches and berms for washouts. Replace lost riprap, damaged linings or soil stabilizers as needed.
- Inspect channel linings, embankments, and beds of ditches and berms for erosion and accumulation of debris and sediment. Remove debris and sediment and repair linings and embankments as needed.
- Temporary conveyances should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction

References

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursetynsky, P.E., McGraw Hill Book Company, 1986.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Association of Home Builders (NAHB). Stormwater Runoff & Nonpoint Source Pollution Control Guide for Builders and Developers. National Association of Home Builders, Washington, D.C., 1995

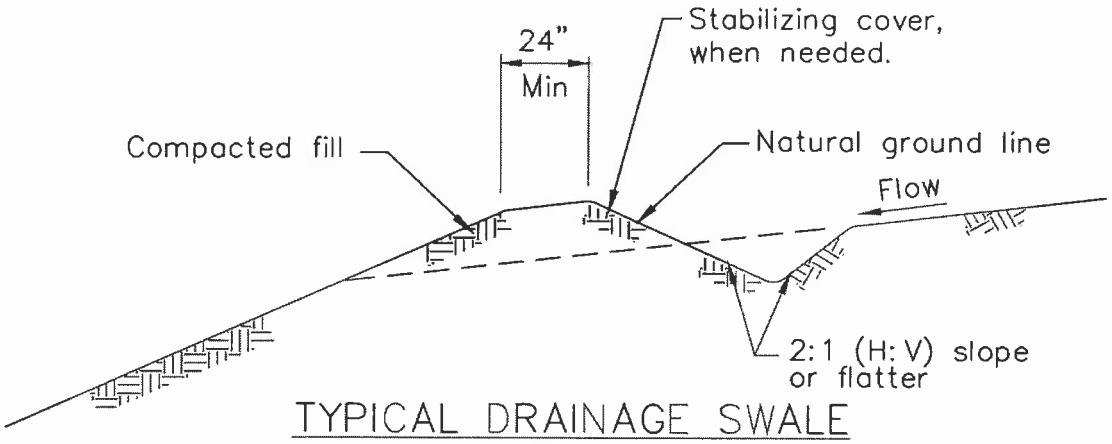
National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

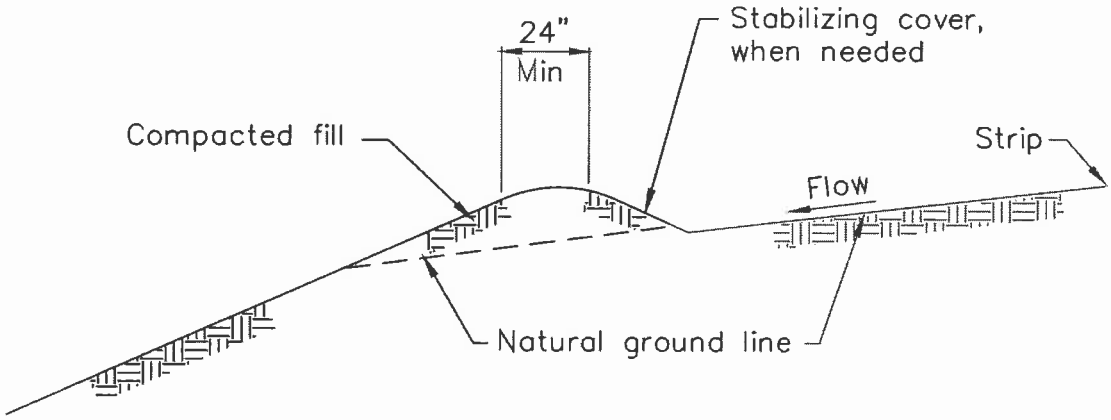
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



TYPICAL DRAINAGE SWALE
NOT TO SCALE

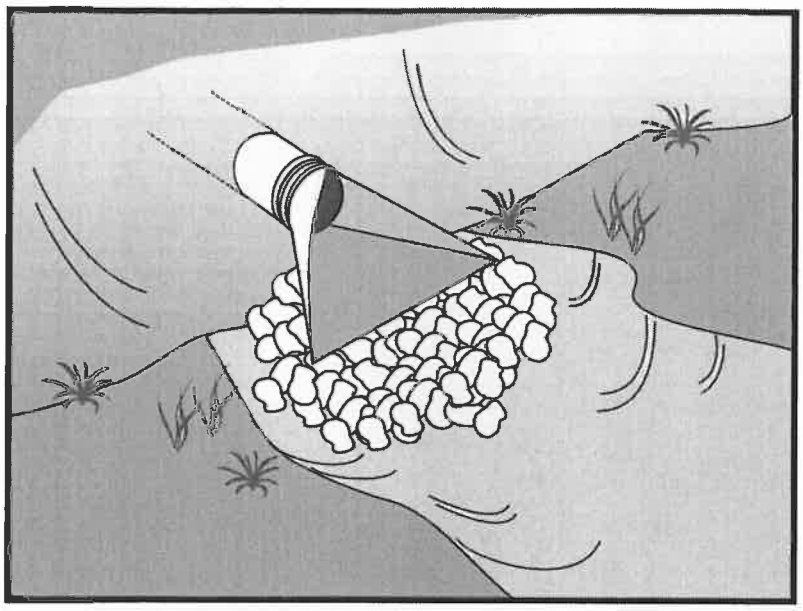
NOTES:

1. Stabilize inlet, outlets and slopes.
2. Properly compact the subgrade.



TYPICAL EARTH DIKE
NOT TO SCALE

Velocity Dissipation Devices EC-10



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Outlet protection is a physical device composed of rock, grouted riprap, or concrete rubble, which is placed at the outlet of a pipe or channel to prevent scour of the soil caused by concentrated, high velocity flows.

Suitable Applications

Whenever discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This includes temporary diversion structures to divert runon during construction.

- These devices may be used at the following locations:
  - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits, or channels.
  - Outlets located at the bottom of mild to steep slopes.
  - Discharge outlets that carry continuous flows of water.
  - Outlets subject to short, intense flows of water, such as flash floods.
  - Points where lined conveyances discharge to unlined conveyances

Limitations

- Large storms or high flows can wash away the rock outlet protection and leave the area susceptible to erosion.

- Sediment captured by the rock outlet protection may be difficult to remove without removing the rock.
- Outlet protection may negatively impact the channel habitat.
- Grouted riprap may break up in areas of freeze and thaw.
- If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.

Implementation

General

Outlet protection is needed where discharge velocities and energies at the outlets of culverts, conduits or channels are sufficient to erode the immediate downstream reach. This practice protects the outlet from developing small eroded pools (plange pools), and protects against gully erosion resulting from scouring at a culvert mouth.

Design and Layout

As with most channel design projects, depth of flow, roughness, gradient, side slopes, discharge rate, and velocity should be considered in the outlet design. Compliance to local and state regulations should also be considered while working in environmentally sensitive streambeds. General recommendations for rock size and length of outlet protection mat are shown in the rock outlet protection figure in this BMP and should be considered minimums. The apron length and rock size gradation are determined using a combination of the discharge pipe diameter and estimate discharge rate: Select the longest apron length and largest rock size suggested by the pipe size and discharge rate. Where flows are conveyed in open channels such as ditches and swales, use the estimated discharge rate for selecting the apron length and rock size. Flows should be same as the culvert or channel design flow but never the less than the peak 5 year flow for temporary structures planned for one rainy season, or the 10 year peak flow for temporary structures planned for two or three rainy seasons.

- There are many types of energy dissipaters, with rock being the one that is represented in the attached figure.
- Best results are obtained when sound, durable, and angular rock is used.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction. Grouted or wired tied rock riprap can minimize maintenance requirements.
- Rock outlet protection is usually less expensive and easier to install than concrete aprons or energy dissipaters. It also serves to trap sediment and reduce flow velocities.
- Carefully place riprap to avoid damaging the filter fabric.
  - Stone 4 in. to 6 in. may be carefully dumped onto filter fabric from a height not to exceed 12 in.
  - Stone 8 in. to 12 in. must be hand placed onto filter fabric, or the filter fabric may be covered with 4 in. of gravel and the 8 in. to 12 in. rock may be dumped from a height not to exceed 16 in.

- Stone greater than 12 in. shall only be dumped onto filter fabric protected with a layer of gravel with a thickness equal to one half the D_{50} rock size, and the dump height limited to twice the depth of the gravel protection layer thickness.

- For proper operation of apron: Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.

- Outlets on slopes steeper than 10 percent should have additional protection.

Costs

Costs are low if material is readily available. If material is imported, costs will be higher. Average installed cost is $150 per device.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

- Inspect BMPs subjected to non-stormwater discharges daily while non-stormwater discharges occur.

- Inspect apron for displacement of the riprap and damage to the underlying fabric. Repair fabric and replace riprap that has washed away. If riprap continues to wash away, consider using larger material.

- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.

- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized or at the completion of construction.

References

County of Sacramento Improvement Standards, Sacramento County, May 1989.

Erosion and Sediment Control Handbook, S.J. Goldman, K. Jackson, T.A. Bursztynsky, P.E., McGraw Hill Book Company, 1986.

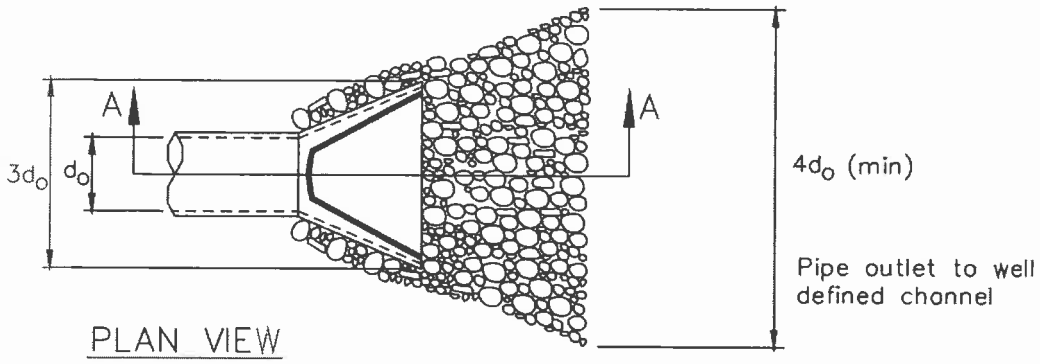
Handbook of Steel Drainage & Highway Construction, American Iron and Steel Institute, 1983.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

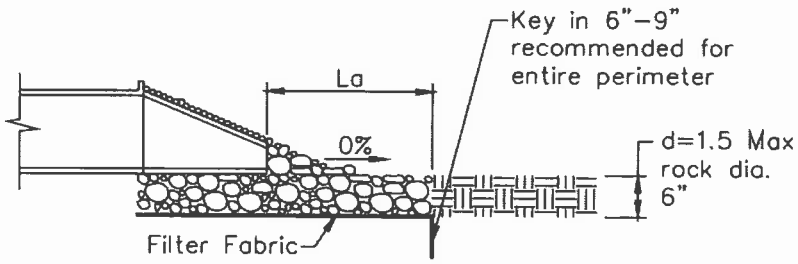
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, state of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



PLAN VIEW



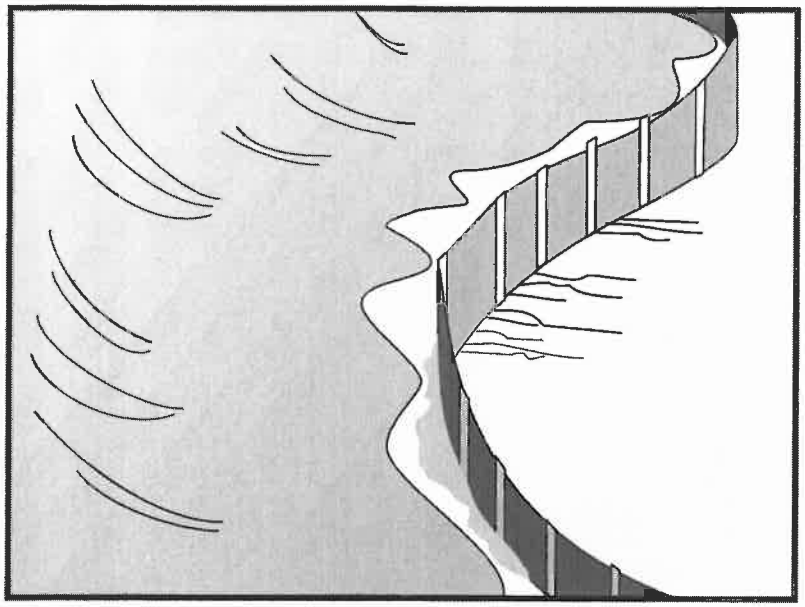
SECTION A–A

Pipe Diameter inches	Discharge ft^3/s	Apron Length, La ft	Rip Rap D_{50} Diameter Min inches
12	5	10	4
	10	13	6
18	10	10	6
	20	16	8
	30	23	12
	40	26	16
24	30	16	8
	40	26	8
	50	26	12
	60	30	16

For larger or higher flows consult a Registered Civil Engineer
Source: USDA - SCS

Silt Fence

SE-1



Objectives

EC	Erosion Control	☑
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-9 Straw Bale Barrier

Description and Purpose

A silt fence is made of a filter fabric that has been entrenched, attached to supporting poles, and sometimes backed by a plastic or wire mesh for support. The silt fence detains sediment-laden water, promoting sedimentation behind the fence.

Suitable Applications

Silt fences are suitable for perimeter control, placed below areas where sheet flows discharge from the site. They should also be used as interior controls below disturbed areas where runoff may occur in the form of sheet and rill erosion. Silt fences are generally ineffective in locations where the flow is concentrated and are only applicable for sheet or overland flows. Silt fences are most effective when used in combination with erosion controls. Suitable applications include:

- Along the perimeter of a project.
- Below the toe or down slope of exposed and erodible slopes.
- Along streams and channels.
- Around temporary spoil areas and stockpiles.
- Below other small cleared areas.

Limitations

- Do not use in streams, channels, drain inlets, or anywhere flow is concentrated.

- Do not use in locations where ponded water may cause flooding.
- Do not place fence on a slope, or across any contour line. If not installed at the same elevation throughout, silt fences will create erosion.
- Filter fences will create a temporary sedimentation pond on the upstream side of the fence and may cause temporary flooding. Fences not constructed on a level contour will be overtopped by concentrated flow resulting in failure of the filter fence.
- Improperly installed fences are subject to failure from undercutting, overlapping, or collapsing.
  - Not effective unless trenched and keyed in.
  - Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
  - Do not allow water depth to exceed 1.5 ft at any point.

Implementation

General

A silt fence is a temporary sediment barrier consisting of filter fabric stretched across and attached to supporting posts, entrenched, and, depending upon the strength of fabric used, supported with plastic or wire mesh fence. Silt fences trap sediment by intercepting and detaining small amounts of sediment-laden runoff from disturbed areas in order to promote sedimentation behind the fence.

Silt fences are preferable to straw bale barriers in many cases. Laboratory work at the Virginia Highway and Transportation Research Council has shown that silt fences can trap a much higher percentage of suspended sediments than can straw bales. While the failure rate of silt fences is lower than that of straw bale barriers, there are many instances where silt fences have been improperly installed. The following layout and installation guidance can improve performance and should be followed:

- Use principally in areas where sheet flow occurs.
- Don't use in streams, channels, or anywhere flow is concentrated. Don't use silt fences to divert flow.
- Don't use below slopes subject to creep, slumping, or landslides.
- Select filter fabric that retains 85% of soil by weight, based on sieve analysis, but that is not finer than an equivalent opening size of 70.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- The maximum length of slope draining to any point along the silt fence should be 200 ft or less.
- The maximum slope perpendicular to the fence line should be 1:1.

- Provide sufficient room for runoff to pond behind the fence and to allow sediment removal equipment to pass between the silt fence and toes of slopes or other obstructions. About 1200 ft^2 of ponding area should be provided for every acre draining to the fence.
- Turn the ends of the filter fence uphill to prevent stormwater from flowing around the fence.
- Leave an undisturbed or stabilized area immediately down slope from the fence where feasible.
- Silt fences should remain in place until the disturbed area is permanently stabilized.

Design and Layout

Selection of a filter fabric is based on soil conditions at the construction site (which affect the equivalent opening size (EOS) fabric specification) and characteristics of the support fence (which affect the choice of tensile strength). The designer should specify a filter fabric that retains the soil found on the construction site yet that it has openings large enough to permit drainage and prevent clogging. The following criteria is recommended for selection of the equivalent opening size:

1. If 50 percent or less of the soil, by weight, will pass the U.S. Standard Sieve No. 200, select the EOS to retain 85 % of the soil. The EOS should not be finer than EOS 70.
2. For all other soil types, the EOS should be no larger than the openings in the U.S. Standard Sieve No. 70 except where direct discharge to a stream, lake, or wetland will occur, then the EOS should be no larger than Standard Sieve No. 100.

To reduce the chance of clogging, it is preferable to specify a fabric with openings as large as allowed by the criteria. No fabric should be specified with an EOS smaller than U.S. Standard Sieve No. 100. If 85% or more of a soil, by weight, passes through the openings in a No. 200 sieve, filter fabric should not be used. Most of the particles in such a soil would not be retained if the EOS was too large and they would clog the fabric quickly if the EOS were small enough to capture the soil.

The fence should be supported by a plastic or wire mesh if the fabric selected does not have sufficient strength and bursting strength characteristics for the planned application (as recommended by the fabric manufacturer). Filter fabric material should contain ultraviolet inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0 °F to 120 °F.

- Layout in accordance with attached figures.
- For slopes steeper than 2:1 (H:V) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to sensitive receiving waters or Environmentally Sensitive Areas (ESAs), silt fence should be used in conjunction with erosion control BMPs.

Materials

- Silt fence fabric should be woven polypropylene with a minimum width of 36 in. and a minimum tensile strength of 100 lb force. The fabric should conform to the requirements in ASTM designation D4632 and should have an integral reinforcement layer. The reinforcement layer should be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric should be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491.

- Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

- Staples used to fasten the fence fabric to the stakes should be not less than 1.75 in. long and should be fabricated from 15 gauge or heavier wire. The wire used to fasten the tops of the stakes together when joining two sections of fence should be 9 gauge or heavier wire. Galvanizing of the fastening wire will not be required.

- There are new products that may use prefabricated plastic holders for the silt fence and use bar reinforcement instead of wood stakes. If bar reinforcement is used in lieu of wood stakes, use number four or greater bar. Provide end protection for any exposed bar reinforcement.

Installation Guidelines

Silt fences are to be constructed on a level contour. Sufficient area should exist behind the fence for ponding to occur without flooding or overtopping the fence.

- A trench should be excavated approximately 6 in. wide and 6 in. deep along the line the proposed silt fence.

- Bottom of the silt fence should be keyed-in a minimum of 12 in.

- Posts should be spaced a maximum of 6 ft apart and driven securely into the ground a minimum of 18 in. or 12 in. below the bottom of the trench.

- When standard strength filter fabric is used, a plastic or wire mesh support fence should be fastened securely to the upslope side of posts using heavy–duty wire staples at least 1 in. long. The mesh should extend into the trench. When extra-strength filter fabric and closer post spacing are used, the mesh support fence may be eliminated. Filter fabric should be purchased in a long roll, then cut to the length of the barrier. When joints are necessary, filter cloth should be spliced together only at a support post, with a minimum 6 in. overlap and both ends securely fastened to the post.

- The trench should be backfilled with compacted native material.

- Construct silt fences with a setback of at least 3 ft from the toe of a slope. Where a silt fence is determined to be not practicable due to specific site conditions, the silt fence may be constructed at the toe of the slope, but should be constructed as far from the toe of the slope as practicable. Silt fences close to the toe of the slope will be less effective and difficult to maintain.

- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case should the reach exceed 500 ft.

Costs

- Average annual cost for installation and maintenance (assumes 6 month useful life): $7 per lineal foot ($850 per drainage acre). Range of cost is $3.50 - $9.10 per lineal foot.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric. The lifespan of silt fence fabric is generally 5 to 8 months.
- Silt fences that are damaged and become unsuitable for the intended purpose should be removed from the site of work, disposed of, and replaced with new silt fence barriers.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Silt fences should be left in place until the upstream area is permanently stabilized. Until then, the silt fence must be inspected and maintained.
- Holes, depressions, or other ground disturbance caused by the removal of the silt fences should be backfilled and repaired.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Sedimentation and Erosion Control Practices, and Inventory of Current Practices (Draft), UESPA, 1990.

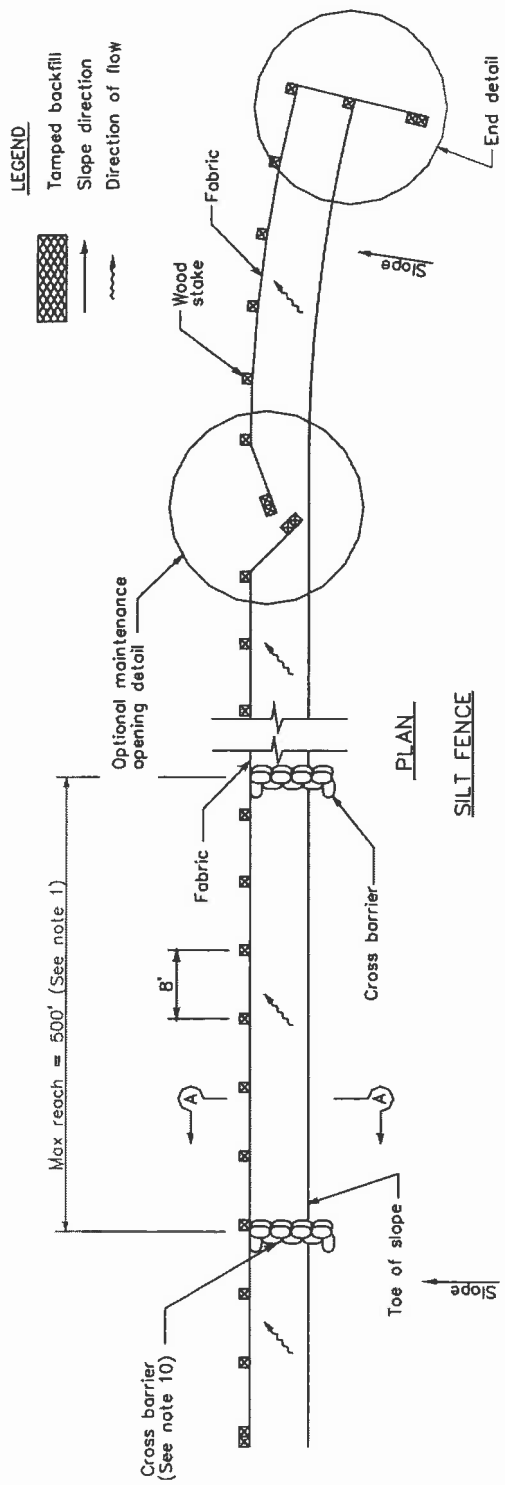
Southeastern Wisconsin Regional Planning Commission (SWRPC). Costs of Urban Nonpoint Source Water Pollution Control Measures. Technical Report No. 31. Southeastern Wisconsin Regional Planning Commission, Waukesha, WI. 1991

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

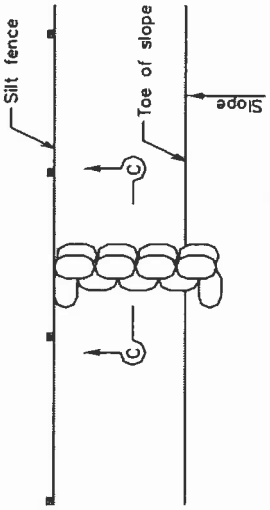
U.S. Environmental Protection Agency (USEPA). Stormwater Management for Industrial Activities: Developing Pollution Prevention Plans and Best Management Practices. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1992.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

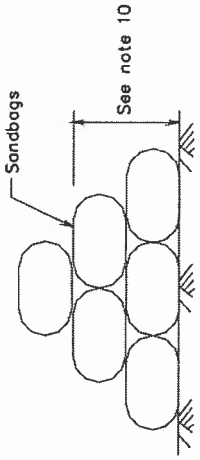


PLAN

SILT FENCE



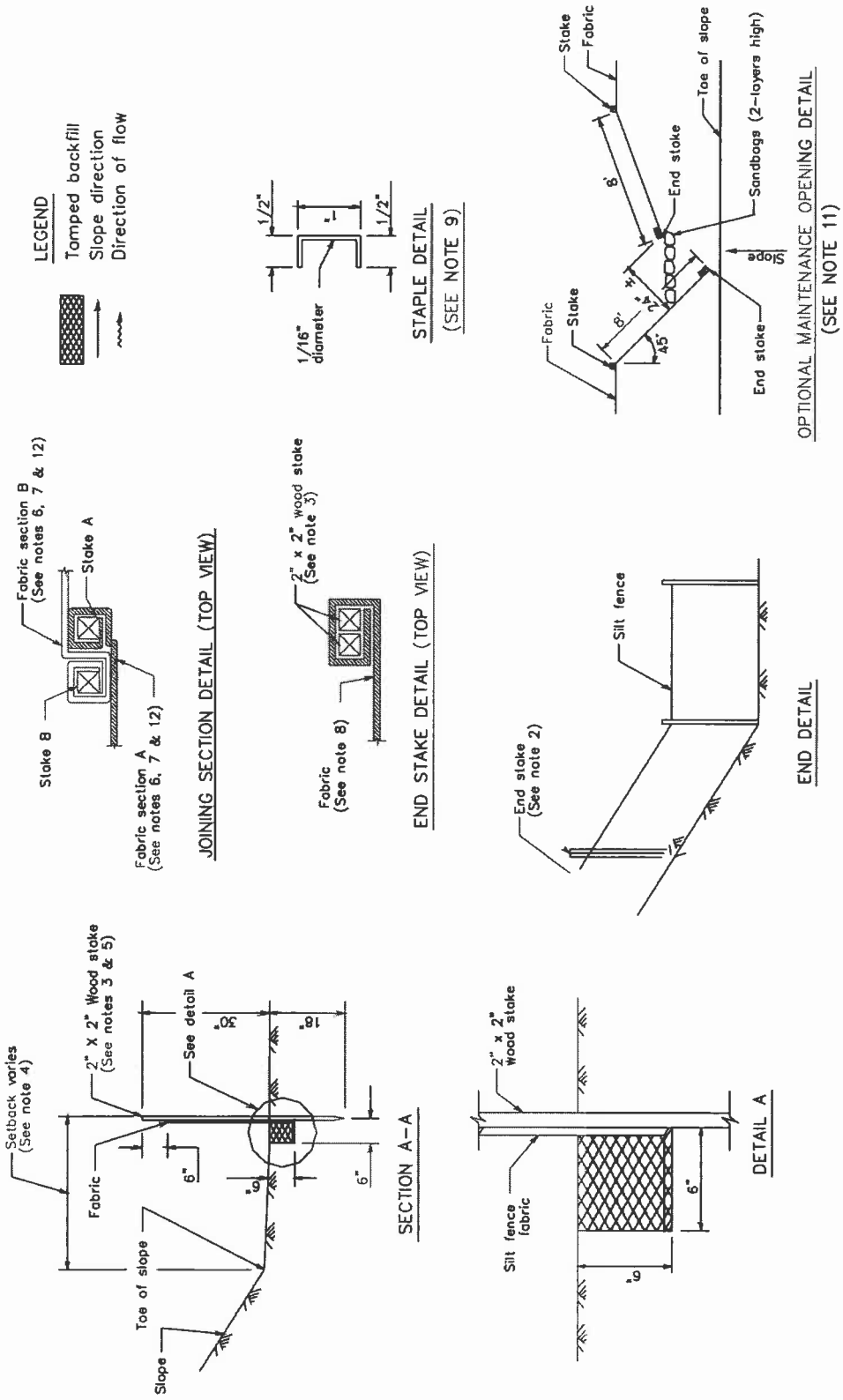
CROSS BARRIER DETAIL



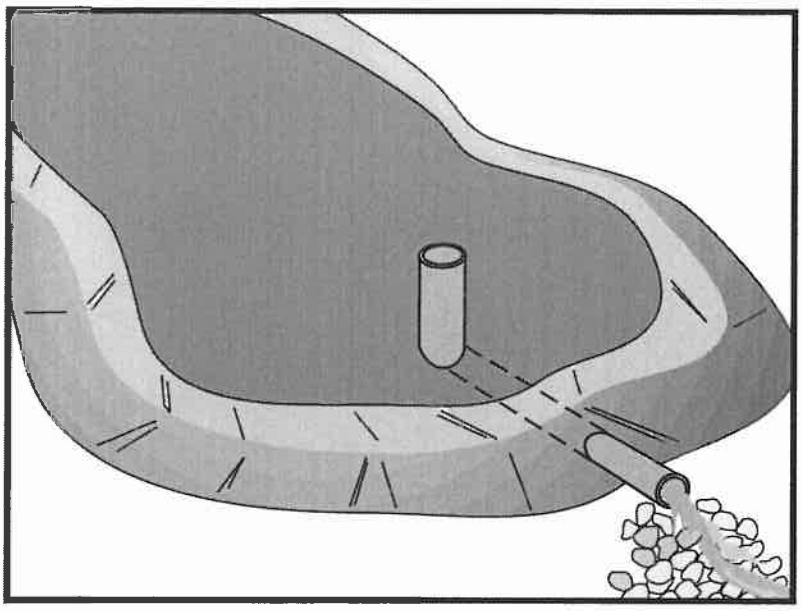
SECTION C–C

NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 500'.
2. The last 8'–0" of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 8'–0" maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow–through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.


LEGEND
Tamped backfill
Slope direction
Direction of flow
Setback varies (See note 4)
2" X 2" Wood stake (See notes 3 & 5)
See detail A
30"
18"
Fabric
6"
6"
6"
Toe of slope
Slope
SECTION A-A
Fabric section B (See notes 6, 7 & 12)
Stake A
Stake B
Fabric section A (See notes 6, 7 & 12)
JOINING SECTION DETAIL (TOP VIEW)
2" x 2" wood stake (See note 3)
Fabric (See note 8)
END STAKE DETAIL (TOP VIEW)
1/2"
1"
1/2"
1/16" diameter
STAPLE DETAIL
(SEE NOTE 9)
2" x 2" Wood stake
Silt fence fabric
6"
6"
DETAIL A
End stake (See note 2)
Silt fence
END DETAIL
Stake
Fabric
Toe of slope
8'
End stake
Sandbags (2-layers high)
Slope
4'
2'
8'
45°
Fabric
Stake
End stake
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)

Sediment Basin SE-2



Objectives

EC	Erosion Control	
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-3 Sediment Trap (for smaller areas)

Description and Purpose

A sediment basin is a temporary basin formed by excavation or by constructing an embankment so that sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out before the runoff is discharged.

Suitable Applications

Sediment basins may be suitable for use on larger projects with sufficient space for constructing the basin. Sediment basins should be considered for use:

- Where sediment-laden water may enter the drainage system or watercourses
- On construction projects with disturbed areas during the rainy season
- At the outlet of disturbed watersheds between 5 acres and 75 acres
- At the outlet of large disturbed watersheds, as necessary
- Where post construction detention basins are required
- In association with dikes, temporary channels, and pipes used to convey runoff from disturbed areas

Limitations

Sediment basins must be installed only within the property limits and where failure of the structure will not result in loss of life, damage to homes or buildings, or interruption of use or service of

public roads or utilities. In addition, sediment basins are attractive to children and can be very dangerous. Local ordinances regarding health and safety must be adhered to. If fencing of the basin is required, the type of fence and its location should be shown in the SWPPP and in the construction specifications.

- Generally, sediment basins are limited to drainage areas of 5 acres or more, but not appropriate for drainage areas greater than 75 acres.
- Sediment basins may become an "attractive nuisance" and care must be taken to adhere to all safety practices. If safety is a concern, basin may require protective fencing.
- Sediment basins designed according to this handbook are only practically effective in removing sediment down to about the medium silt size fraction. Sediment-laden runoff with smaller size fractions (fine silt and clay) may not be adequately treated unless chemical treatment is used in addition to the sediment basin.
- Sites with very fine sediments (fine silt and clay) may require longer detention times for effective sediment removal.
- Basins with a height of 25 ft or more or an impounding capacity of 50 ac-ft or more must obtain approval from Division of Safety of Dams.
- Standing water may cause mosquitoes or other pests to breed.
- Basins require large surface areas to permit settling of sediment. Size may be limited by the available area.

Implementation

General

A sediment basin is a controlled stormwater release structure formed by excavation or by construction of an embankment of compacted soil across a drainage way, or other suitable location. It is intended to trap sediment before it leaves the construction site. The basin is a temporary measure with a design life of 12 to 28 months in most cases and is to be maintained until the site area is permanently protected against erosion or a permanent detention basin is constructed.

Sediment basins are suitable for nearly all types of construction projects. Whenever possible, construct the sediment basins before clearing and grading work begins. Basins should be located at the stormwater outlet from the site but not in any natural or undisturbed stream. A typical application would include temporary dikes, pipes, and/or channels to divert runoff to the basin inlet.

Many development projects in California will be required by local ordinances to provide a stormwater detention basin for post-construction flood control, desilting, or stormwater pollution control. A temporary sediment basin may be constructed by rough grading the post-construction control basins early in the project.

Sediment basins trap 70-80 % of the sediment that flows into them if designed according to this handbook. Therefore, they should be used in conjunction with erosion control practices such as

temporary seeding, mulching, diversion dikes, etc., to reduce the amount of sediment flowing into the basin.

Planning

To improve the effectiveness of the basin, it should be located to intercept runoff from the largest possible amount of disturbed area. The best locations are generally low areas. Drainage into the basin can be improved by the use of earth dikes and drainage swales (see BMP EC-9). The basin must not be located in a stream but it should be located to trap sediment-laden runoff before it enters the stream. The basin should not be located where its failure would result in the loss of life or interruption of the use or service of public utilities or roads.

- Construct before clearing and grading work begins when feasible.
- Do not locate in a stream.
- Basin sites should be located where failure of the structure will not cause loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities.
- Large basins are subject to state and local dam safety requirements.
- Limit the contributing area to the sediment basin to only the runoff from the disturbed soil areas. Use temporary concentrated flow conveyance controls to divert runoff from undisturbed areas away from the sediment basin.
- The basin should be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where post-construction (permanent) detention basins will be constructed, and (3) where the basins can be maintained on a year-round basis to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area, and to maintain the basin to provide the required capacity.

Design

Sediment basins must be designed in accordance with Section A of the State of California NPDES General Permit for Stormwater Discharges Associated with Construction Activities (General Permit) where sediment basins are the only control measure proposed for the site. If there is insufficient area to construct a sediment basin in accordance with the General Permit requirements, then the alternate design standards specified herein may be used.

Sediment basins designed per the General Permit shall be designed as follows:

Option 1:

Pursuant to local ordinance for sediment basin design and maintenance, provided that the design efficiency is as protective or more protective of water quality than Option 3.

OR

Option 2:

Sediment basin(s), as measured from the bottom of the basin to the principal outlet, shall have at least a capacity equivalent to 3,600 cubic feet (133 yd^3) of storage per acre draining into the sediment basin. The length of the basin shall be more than twice the width of the basin. The

length is determined by measuring the distance between the inlet and the outlet; and the depth must not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency.

OR

Option 3:
Sediment basin(s) shall be designed using the standard equation:

$$As=1.2Q/Vs \qquad \text{(Eq. 1)}$$

Where:

As = Minimum surface area for trapping soil particles of a certain size

Vs = Settling velocity of the design particle size chosen

Q = C I A

Where

Q = Discharge rate measured in cubic feet per second

C = Runoff coefficient

I = Precipitation intensity for the 10-year, 6-hour rain event

A = Area draining into the sediment basin in acres

The design particle size shall be the smallest soil grain size determined by wet sieve analysis, or the fine silt sized (0.01 mm [or 0.0004 in.]) particle, and the *Vs* used shall be 100 percent of the calculated settling velocity.

The length is determined by measuring the distance between the inlet and the outlet; the length shall be more than twice the dimension as the width; the depth shall not be less than 3 ft nor greater than 5 ft for safety reasons and for maximum efficiency (2 ft of sediment storage, 2 ft of capacity). The basin(s) shall be located on the site where it can be maintained on a year-round basis and shall be maintained on a schedule to retain the 2 ft of capacity.

OR

Option 4:
The use of an equivalent surface area design or equation, provided that the design efficiency is as protective or more protective of water quality than Option 3.

Other design considerations are:

- The volume of the settling zone should be sized to capture runoff from a 2-year storm or other appropriate design storms specified by the local agency. A detention time of 24 to 40 hours should allow 70 to 80 % of sediment to settle.
- The basin volume consists of two zones:
  - A sediment storage zone at least 1 ft deep.
  - A settling zone at least 2 ft deep.
- The length to settling depth ratio (L/SD) should be less than 200.
- Sediment basins are best used in conjunction with erosion controls. Sediment basins that will be used as the only means of treatment, without upstream erosion and sediment controls, must be designed according to the four options required by the General Permit (see Options 1-4 above). Sediment basins that are used in conjunction with upstream erosion and sediment controls should be designed to have a capacity equivalent to 67 yd^3 of sediment storage per acre of contributory area.
- The length of the basin should be more than twice the width of the basin; the length should be determined by measuring the distance between the inlet and the outlet.
- The depth must be no less than 3 ft.
- Basins with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and basins capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.
- Basins should be designed to drain within 72 hours following storm events. If a basin fails to drain within 72 hours, it must be pumped dry.
- Sediment basins, regardless of size and storage volume, should include features to accommodate overflow or bypass flows that exceed the design storm event.
  - Include an emergency spillway to accommodate flows not carried by the principal spillway. The spillway should consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap.
  - The spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, should be a minimum of 20 ft in length.
- Rock or vegetation should be used to protect the basin inlet and slopes against erosion.
- A forebay, constructed upstream of the basin may be provided to remove debris and larger particles.

- The outflow from the sediment basin should be provided with velocity dissipation devices (see BMP EC-10) to prevent erosion and scouring of the embankment and channel.
- Basin inlets should be located to maximize travel distance to the basin outlet.
- The principal outlet should consist of a corrugated metal, high density polyethylene (HDPE), or reinforced concrete riser pipe with dewatering holes and an anti-vortex device and trash rack attached to the top of the riser, to prevent floating debris from flowing out of the basin or obstructing the system. This principal structure should be designed to accommodate the inflow design storm.
- A rock pile or rock-filled gabions can serve as alternatives to the debris screen; although the designer should be aware of the potential for extra maintenance involved should the pore spaces in the rock pile clog.
- The outlet structure should be placed on a firm, smooth foundation with the base securely anchored with concrete or other means to prevent floatation.
- Attach riser pipe (watertight connection) to a horizontal pipe (barrel). Provide anti-seep collars on the barrel.
- Cleanout level should be clearly marked on the riser pipe.
- Proper hydraulic design of the outlet is critical to achieving the desired performance of the basin. The outlet should be designed to drain the basin within 24 to 72 hours (also referred to as "drawdown time"). The 24-hour limit is specified to provide adequate settling time; the 72-hour limit is specified to mitigate vector control concerns.
- The two most common outlet problems that occur are: (1) the capacity of the outlet is too great resulting in only partial filling of the basin and drawdown time less than designed for; and (2) the outlet clogs because it is not adequately protected against trash and debris. To avoid these problems, the following outlet types are recommended for use: (1) a single orifice outlet with or without the protection of a riser pipe, and (2) perforated riser. Design guidance for single orifice and perforated riser outlets follow:
  - *Flow Control Using a Single Orifice At The Bottom Of The Basin (Figure 1)*: The outlet control orifice should be sized using the following equation:

$$a = \frac{2A(H-Ho)^{0.5}}{3600CT(2g)^{0.5}} = \frac{(7x10^{-5})A(H-Ho)^{0.5}}{CT} \qquad \text{(Eq. 2)}$$

where:

a = area of orifice (ft^2)

A = surface area of the basin at mid elevation (ft^2)

C = orifice coefficient

T = drawdown time of full basin (hrs)

g = gravity (32.2 ft/s²)

H = elevation when the basin is full (ft)

Ho = final elevation when basin is empty (ft)

With a drawdown time of 40 hours, the equation becomes:

$$a = \frac{(1.75x10^{-6})A(H - Ho)^{0.5}}{C} \qquad \text{(Eq. 3)}$$

- *Flow Control Using Multiple Orifices (see Figure2):*

$$a_t = \frac{2A(h_{\max})}{3600CT(2g[h_{\max} - h_{centroid\ of\ orifices}])^{0.5}} \qquad \text{(Eq. 4)}$$

With terms as described above except:

a_t = total area of orifices

h_{max} = maximum height from lowest orifice to the maximum water surface (ft)

$h_{centroid\ of\ orifices}$ = height from the lowest orifice to the centroid of the orifice configuration (ft)

Allocate the orifices evenly on two rows; separate the holes by 3x hole diameter vertically, and by 120 degrees horizontally (refer to Figure 2).

Because basins are not maintained for infiltration, water loss by infiltration should be disregarded when designing the hydraulic capacity of the outlet structure.

Care must be taken in the selection of "C"; 0.60 is most often recommended and used. However, based on actual tests, GKY (1989), "Outlet Hydraulics of Extended Detention Facilities for Northern Virginia Planning District Commission", recommends the following:

C = 0.66 for thin materials; where the thickness is equal to or less than the orifice diameter, or

C = 0.80 when the material is thicker than the orifice diameter

Installation

- Securely anchor and install an anti-seep collar on the outlet pipe/riser and provide an emergency spillway for passing major floods (see local flood control agency).
- Areas under embankments must be cleared and stripped of vegetation.
- Chain link fencing should be provided around each sediment basin to prevent unauthorized entry to the basin or if safety is a concern.

Costs

Average annual costs for installation and maintenance (2 year useful life) are:

- Basin less than 50,000 ft^3: Range, \$0.24 - \$1.58/ft^3. Average, \$0.73 per ft^3. \$400 - \$2,400, \$1,200 average per drainage acre.
- Basin size greater than 50,000 ft^3: Range, \$0.12 – \$0.48/ft^3. Average, \$0.36 per ft^3. \$200 - \$800, \$600 average per drainage acre.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Examine basin banks for seepage and structural soundness.
- Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Check inlet and outlet area for erosion and stabilize if required.
- Check fencing for damage and repair as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage volume. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at appropriate locations.
- Remove standing water from basin within 72 hours after accumulation.
- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs shall be implemented at all times during dewatering activities.
- To minimize vector production:
  - Remove accumulation of live and dead floating vegetation in basins during every inspection.
  - Remove excessive emergent and perimeter vegetation as needed or as advised by local or state vector control agencies.

References

A Current Assessment of Urban Best Management Practices: Techniques for Reducing Nonpoint Source Pollution in the Coastal Zones, Metropolitan Washington Council of Governments, March 1992.

Draft-Sedimentation and Erosion Control, an Inventory of Current Practices, USEPA. April 1990.

Guidelines for the Design and Construction of Small Embankment Dams, Division of Safety of Dams, California Department of Water Resources, March 1986.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

McLean, J., 2000. Mosquitoes in Constructed Wetlands: A Management Bugaboo? In T.R. Schueler and H.K. Holland [eds.], The Practice of Watershed Protection. pp. 29-33. Center for Watershed Protection, Ellicott City, MD, 2000.

Metzger, M.E., D. F. Messer, C. L. Beitia, C. M. Myers, and V. L. Kramer. The dark site of stormwater runoff management: disease vectors associated with structural BMPs, 2002.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

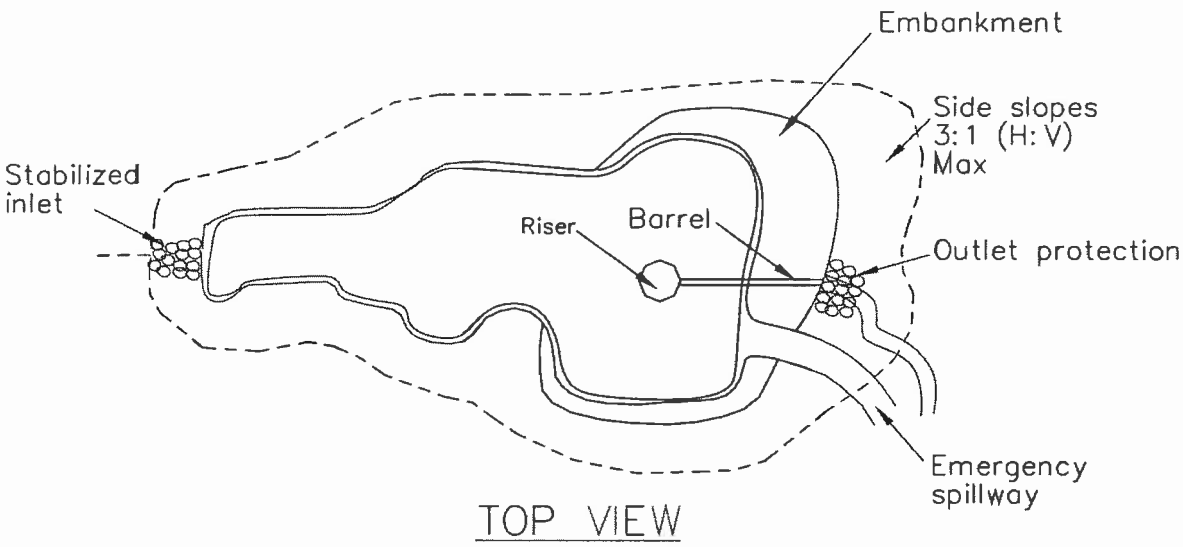
Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Water, Work Group-Working Paper, USEPA, April 1992.

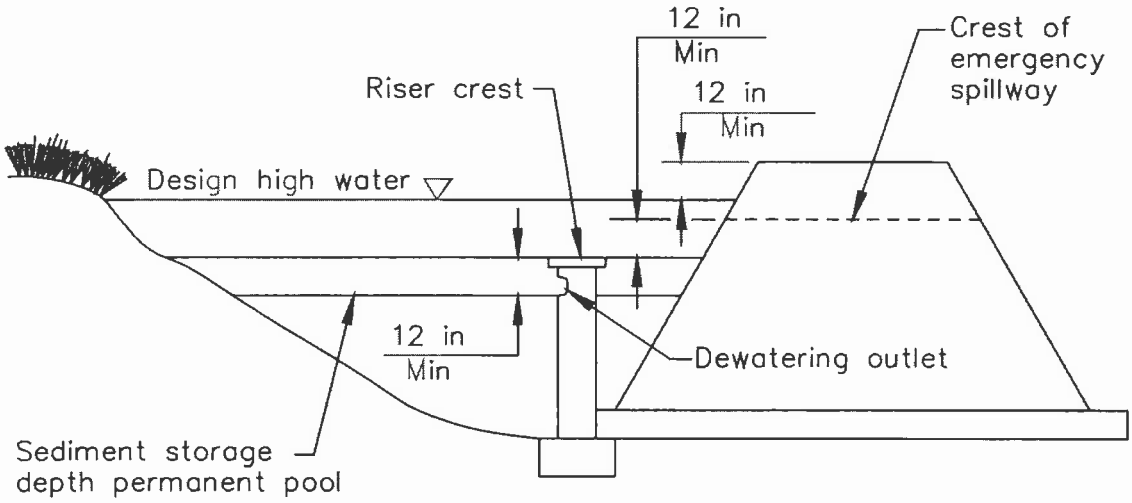
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

U.S. Environmental Protection Agency (USEPA). Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters. EPA 840-B-9-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1993

Water Quality Management Plan for the Lake Tahoe Region, Volume II Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.





NOTE:
This outlet provides no drainage for permanent pool.

FIGURE 1: TYPICAL TEMPORARY SEDIMENT BASIN
SINGLE ORIFICE DESIGN
NOT TO SCALE

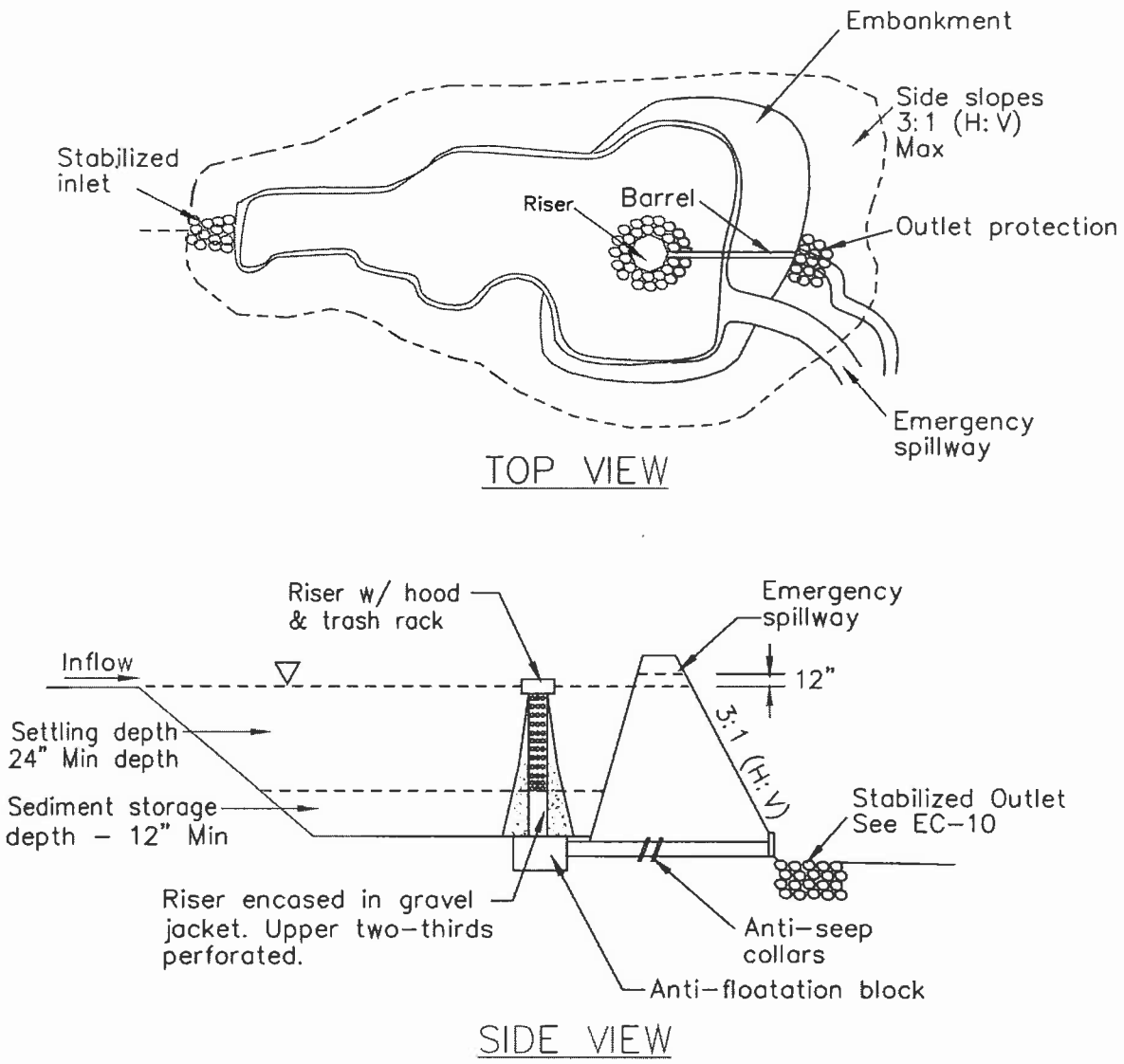


FIGURE 2: TYPICAL TEMPORARY SEDIMENT BASIN

MULTIPLE ORIFICE DESIGN

NOT TO SCALE

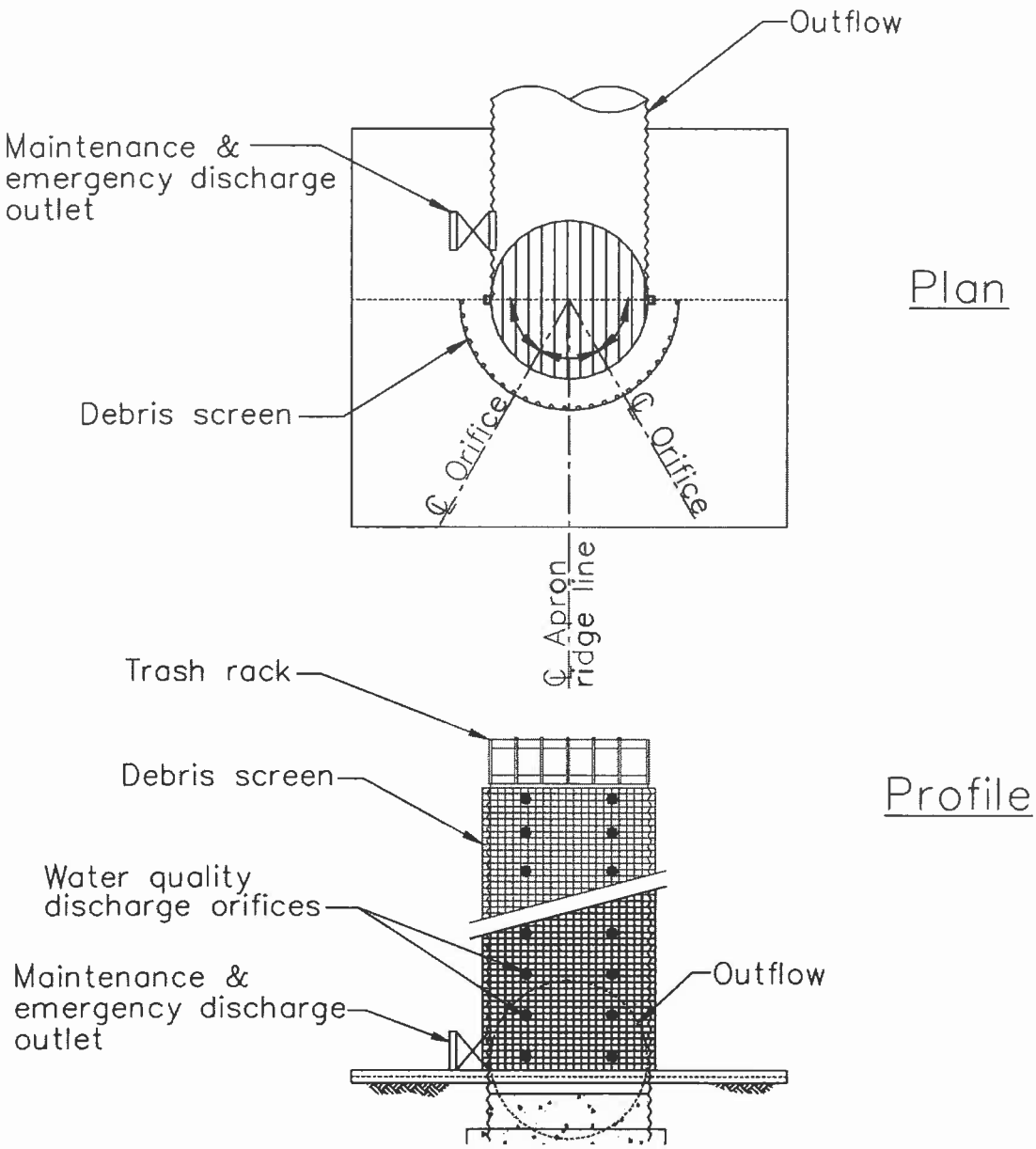
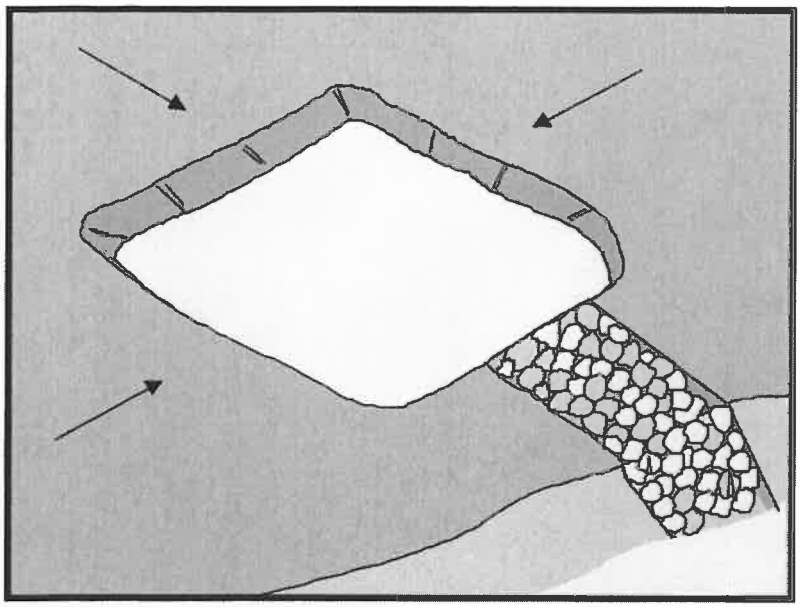


FIGURE 3: MULTIPLE ORIFICE OUTLET RISER

NOT TO SCALE

Sediment Trap SE-3



Objectives

EC	Erosion Control	
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-2 Sediment Basin (for larger areas)

Description and Purpose

A sediment trap is a containment area where sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out or before the runoff is discharged. Sediment traps are formed by excavating or constructing an earthen embankment across a waterway or low drainage area.

Suitable Applications

Sediment traps should be considered for use:

- At the perimeter of the site at locations where sediment-laden runoff is discharged offsite.
- At multiple locations within the project site where sediment control is needed.
- Around or upslope from storm drain inlet protection measures.
- Sediment traps may be used on construction projects where the drainage area is less than 5 acres. Traps would be placed where sediment-laden stormwater may enter a storm drain or watercourse. SE-2, Sediment Basins, must be used for drainage areas greater than 5 acres.
- As a supplemental control, sediment traps provide additional protection for a water body or for reducing sediment before it enters a drainage system.

Limitations

- Requires large surface areas to permit infiltration and settling of sediment.
- Not appropriate for drainage areas greater than 5 acres.
- Only removes large and medium sized particles and requires upstream erosion control.
- Attractive and dangerous to children, requiring protective fencing.
- Conducive to vector production.
- Should not be located in live streams.

Implementation

Design

A sediment trap is a small temporary ponding area, usually with a gravel outlet, formed by excavation or by construction of an earthen embankment. Its purpose is to collect and store sediment from sites cleared or graded during construction. It is intended for use on small drainage areas with no unusual drainage features and projected for a quick build-out time. It should help in removing coarse sediment from runoff. The trap is a temporary measure with a design life of approximately six months to one year and is to be maintained until the site area is permanently protected against erosion by vegetation and/or structures.

Sediment traps should be used only for small drainage areas. If the contributing drainage area is greater than 5 acres, refer to SE-2, Sediment Basins, or subdivide the catchment area into smaller drainage basins.

Sediment usually must be removed from the trap after each rainfall event. The SWPPP should detail how this sediment is to be disposed of, such as in fill areas onsite, or removal to an approved offsite dump. Sediment traps used as perimeter controls should be installed before any land disturbance takes place in the drainage area.

Sediment traps are usually small enough that a failure of the structure would not result in a loss of life, damage to home or buildings, or interruption in the use of public roads or utilities. However, sediment traps are attractive to children and can be dangerous. The following recommendations should be implemented to reduce risks:

- Install continuous fencing around the sediment trap or pond. Consult local ordinances regarding requirements for maintaining health and safety.
- Restrict basin side slopes to 3:1 or flatter.

Sediment trap size depends on the type of soil, size of the drainage area, and desired sediment removal efficiency (see SE-2, Sediment Basin). As a rule of thumb, the larger the basin volume the greater the sediment removal efficiency. Sizing criteria are typically established under the local grading ordinance or equivalent. The runoff volume from a 2-year storm is a common design criteria for a sediment trap. The sizing criteria below assume that this runoff volume is 0.042 acre-ft/acre (0.5 in. of runoff). While the climatic, topographic, and soil type extremes make it difficult to establish a statewide standard, the following criteria should trap moderate to high amounts of sediment in most areas of California:

- Locate sediment traps as near as practical to areas producing the sediment.
- Trap should be situated according to the following criteria: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where failure would not cause loss of life or property damage, and (3) to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area.
- Trap should be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 67 yd^3/acre and 33 yd^3/acre of contributing drainage area, respectively, based on 0.5 in. of runoff volume over a 24-hour period. In many cases, the size of an individual trap is limited by available space. Multiple traps or additional volume may be required to accommodate specific rainfall, soil, and site conditions.
- Traps with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and traps capable of impounding more than 35,000 ft^3, should be designed by a Registered Civil Engineer. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet and bypass structures.
- The outlet pipe or open spillway must be designed to convey anticipated peak flows.
- Use rock or vegetation to protect the trap outlets against erosion.
- Fencing should be provided to prevent unauthorized entry.

Installation

Sediment traps can be constructed by excavating a depression in the ground or creating an impoundment with a small embankment. Sediment traps should be installed outside the area being graded and should be built prior to the start of the grading activities or removal of vegetation. To minimize the area disturbed by them, sediment traps should be installed in natural depressions or in small swales or drainage ways. The following steps must be followed during installation:

- The area under the embankment must be cleared, grubbed, and stripped of any vegetation and root mat. The pool area should be cleared.
- The fill material for the embankment must be free of roots or other woody vegetation as well as oversized stones, rocks, organic material, or other objectionable material. The embankment may be compacted by traversing with equipment while it is being constructed.
- All cut-and-fill slopes should be 3:1 or flatter.
- When a riser is used, all pipe joints must be watertight.
- When a riser is used, at least the top two-thirds of the riser should be perforated with 0.5 in. diameter holes spaced 8 in. vertically and 10 to 12 in. horizontally. See SE-2, Sediment Basin.
- When an earth or stone outlet is used, the outlet crest elevation should be at least 1 ft below the top of the embankment.

- When crushed stone outlet is used, the crushed stone used in the outlet should meet AASHTO M43, size No. 2 or 24, or its equivalent such as MSHA No. 2. Gravel meeting the above gradation may be used if crushed stone is not available.

Costs

Average annual cost per installation and maintenance (18 month useful life) is $0.73 per ft^3 ($1,300 per drainage acre). Maintenance costs are approximately 20% of installation costs.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Inspect outlet area for erosion and stabilize if required.
- Inspect trap banks for seepage and structural soundness, repair as needed.
- Inspect outlet structure and spillway for any damage or obstructions. Repair damage and remove obstructions as needed.
- Inspect fencing for damage and repair as needed.
- Inspect the sediment trap for area of standing water during every visit. Corrective measures should be taken if the BMP does not dewater completely in 72 hours or less to prevent vector production.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the trap capacity. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed of at an appropriate location.
- Remove vegetation from the sediment trap when first detected to prevent pools of standing water and subsequent vector production.
- BMPs that require dewatering shall be continuously attended while dewatering takes place. Dewatering BMPs shall be implemented at all times during dewatering activities.

References

Brown, W., and T. Schueler. The Economics of Stormwater BMPs in the Mid-Atlantic Region. Prepared for Chesapeake Research Consortium, Edgewater, MD, by the Center for Watershed Protection, Ellicott City, MD, 1997.

Draft – Sedimentation and Erosion Control, an Inventory of Current Practices, USEPA, April 1990.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Metzger, M.E., D.F. Messer, C.L. Beitia, C.M. Myers, and V.L. Kramer, The Dark Side of Stormwater Runoff Management: Disease Vectors Associated with Structural BMPs, 2002.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, United States Environmental Protection Agency, 2002.

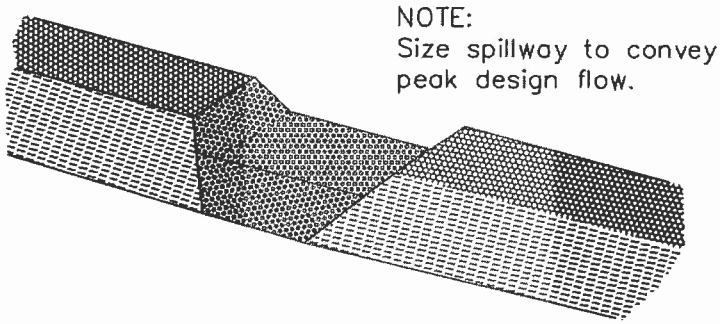
Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group-Working Paper, USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

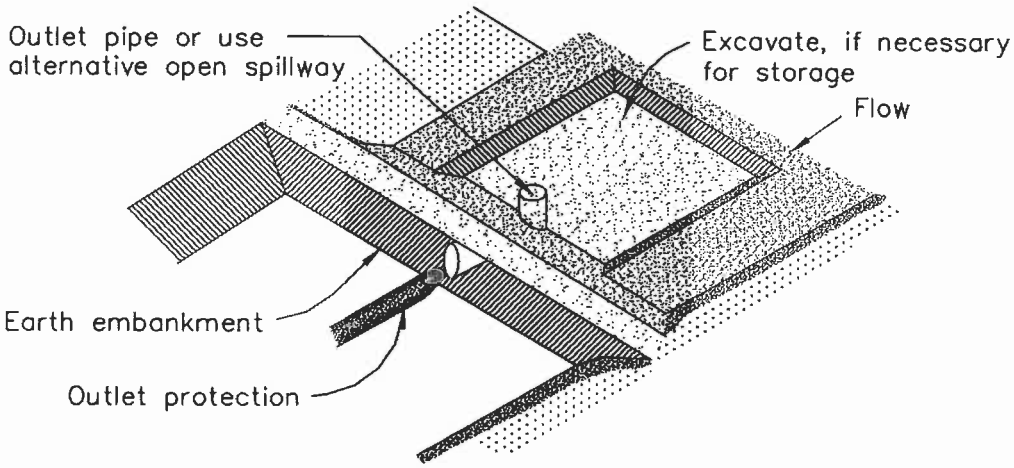
Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

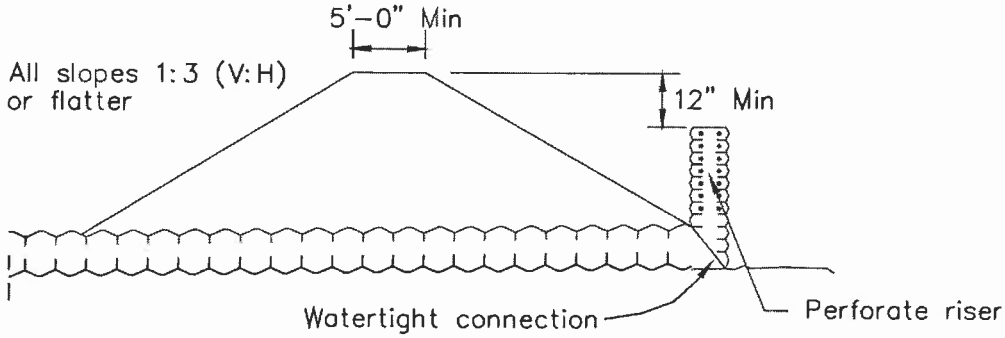
U.S. Environmental Protection Agency (USEPA). Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters. EPA 840-B-9-002. U.S. Environmental Protection Agency, Office of Water, Washington, DC, 1993.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



TYPICAL OPEN SPILLWAY

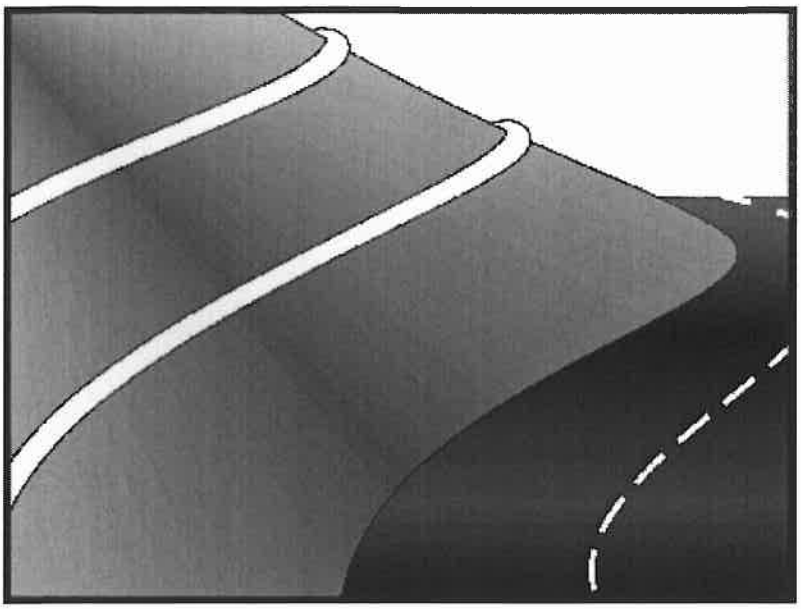




EMBANKMENT SECTION THRU RISER

TYPICAL SEDIMENT TRAP
NOT TO SCALE

Fiber Rolls SE-5



Objectives

EC	Erosion Control	☒
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-9 Straw Bale Barrier

Description and Purpose

A fiber roll consists of straw, flax, or other similar materials bound into a tight tubular roll. When fiber rolls are placed at the toe and on the face of slopes, they intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide removal of sediment from the runoff. By interrupting the length of a slope, fiber rolls can also reduce erosion.

Suitable Applications

Fiber rolls may be suitable:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow
- At the end of a downward slope where it transitions to a steeper slope
- Along the perimeter of a project
- As check dams in unlined ditches
- Down-slope of exposed soil areas
- Around temporary stockpiles

Limitations

- Fiber rolls are not effective unless trenched

- Fiber rolls at the toe of slopes greater than 5:1 (H:V) should be a minimum of 20 in. diameter or installations achieving the same protection (i.e. stacked smaller diameter fiber rolls, etc.).
- Difficult to move once saturated.
- If not properly staked and trenched in, fiber rolls could be transported by high flows.
- Fiber rolls have a very limited sediment capture zone.
- Fiber rolls should not be used on slopes subject to creep, slumping, or landslide.

Implementation

Fiber Roll Materials

- Fiber rolls should be either prefabricated rolls or rolled tubes of erosion control blanket.

Assembly of Field Rolled Fiber Roll

- Roll length of erosion control blanket into a tube of minimum 8 in. diameter.
- Bind roll at each end and every 4 ft along length of roll with jute-type twine.

Installation

- Locate fiber rolls on level contours spaced as follows:
  - Slope inclination of 4:1 (H:V) or flatter: Fiber rolls should be placed at a maximum interval of 20 ft.
  - Slope inclination between 4:1 and 2:1 (H:V): Fiber Rolls should be placed at a maximum interval of 15 ft. (a closer spacing is more effective).
  - Slope inclination 2:1 (H:V) or greater: Fiber Rolls should be placed at a maximum interval of 10 ft. (a closer spacing is more effective).
- Turn the ends of the fiber roll up slope to prevent runoff from going around the roll.
- Stake fiber rolls into a 2 to 4 in. deep trench with a width equal to the diameter of the fiber roll.
  - Drive stakes at the end of each fiber roll and spaced 4 ft maximum on center.
  - Use wood stakes with a nominal classification of 0.75 by 0.75 in. and minimum length of 24 in.
- If more than one fiber roll is placed in a row, the rolls should be overlapped, not abutted.

Removal

- Fiber rolls are typically left in place.

- If fiber rolls are removed, collect and dispose of sediment accumulation, and fill and compact holes, trenches, depressions or any other ground disturbance to blend with adjacent ground.

Costs

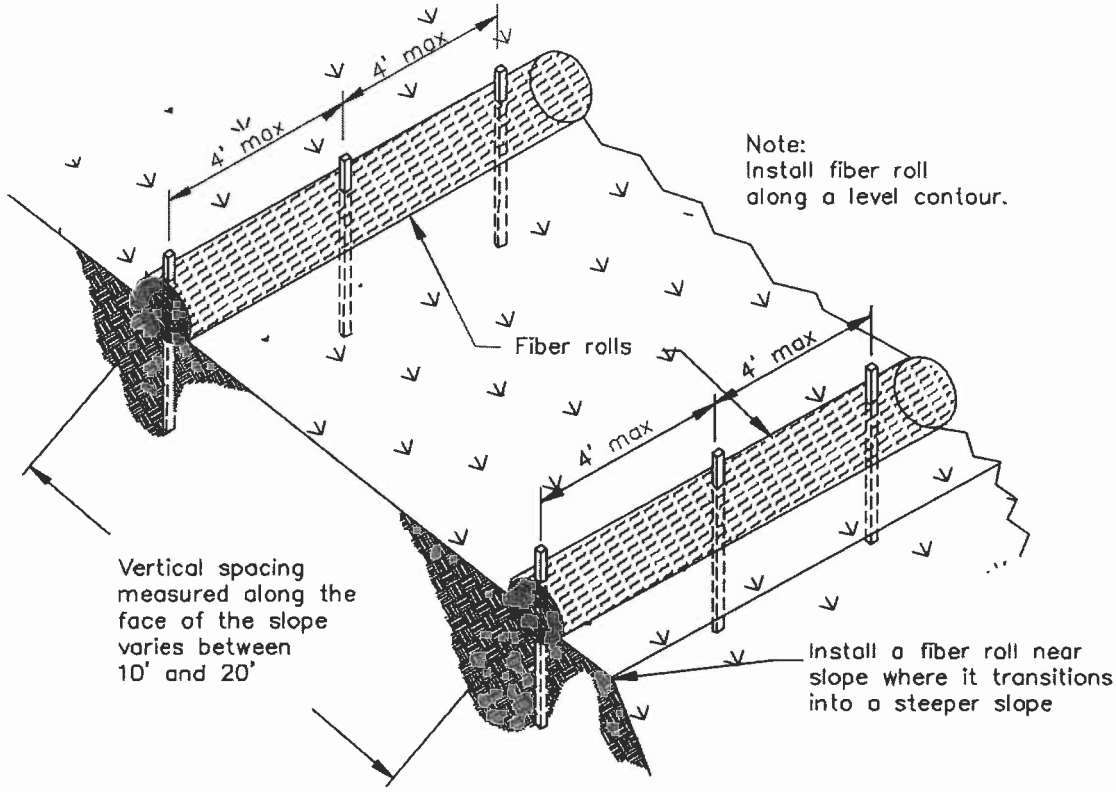
Material costs for fiber rolls range from $20 - $30 per 25 ft roll.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- If the fiber roll is used as a sediment capture device, or as an erosion control device to maintain sheet flows, sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when sediment accumulation reaches one-half the designated sediment storage depth, usually one-half the distance between the top of the fiber roll and the adjacent ground surface. Sediment removed during maintenance may be incorporated into earthwork on the site of disposed at an appropriate location.
- If fiber rolls are used for erosion control, such as in a mini check dam, sediment removal should not be required as long as the system continues to control the grade. Sediment control BMPs will likely be required in conjunction with this type of application.

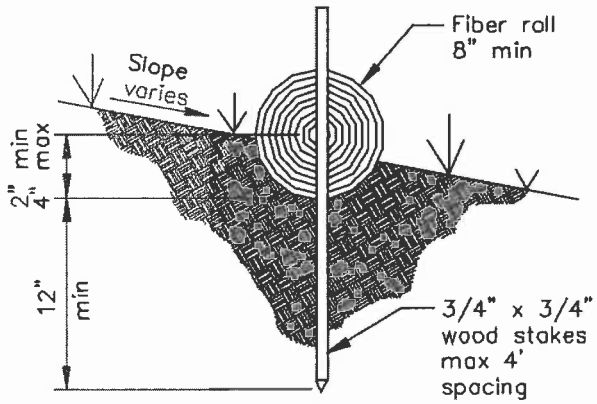
References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.



TYPICAL FIBER ROLL INSTALLATION

N.T.S.



ENTRENCHMENT DETAIL

N.T.S.

Street Sweeping and Vacuuming SE-7

Objectives

EC	Erosion Control	
SE	Sediment Control	☒
TR	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Street sweeping and vacuuming includes use of self-propelled and walk-behind equipment to remove sediment from streets and roadways, and to clean paved surfaces in preparation for final paving. Sweeping and vacuuming prevents sediment from the project site from entering storm drains or receiving waters.

Suitable Applications

Sweeping and vacuuming are suitable anywhere sediment is tracked from the project site onto public or private paved streets and roads, typically at points of egress. Sweeping and vacuuming are also applicable during preparation of paved surfaces for final paving.

Limitations

Sweeping and vacuuming may not be effective when sediment is wet or when tracked soil is caked (caked soil may need to be scraped loose).

Implementation

- Controlling the number of points where vehicles can leave the site will allow sweeping and vacuuming efforts to be focused, and perhaps save money.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed on a daily basis.

- Do not use kick brooms or sweeper attachments. These tend to spread the dirt rather than remove it.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project

Costs

Rental rates for self-propelled sweepers vary depending on hopper size and duration of rental. Expect rental rates from $58/hour (3 yd^3 hopper) to $88/hour (9 yd^3 hopper), plus operator costs. Hourly production rates vary with the amount of area to be swept and amount of sediment. Match the hopper size to the area and expect sediment load to minimize time spent dumping.

Inspection and Maintenance

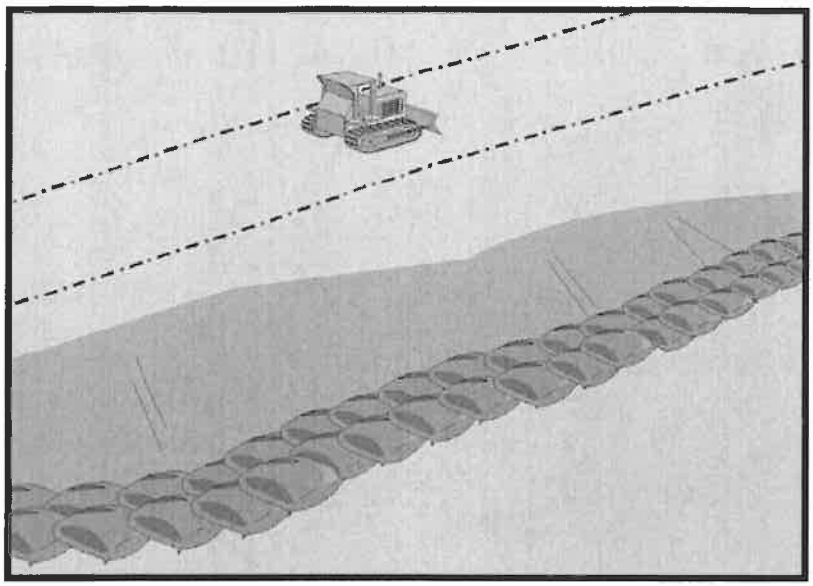
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- When actively in use, points of ingress and egress must be inspected daily.
- When tracked or spilled sediment is observed outside the construction limits, it must be removed at least daily. More frequent removal, even continuous removal, may be required in some jurisdictions.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- Adjust brooms frequently; maximize efficiency of sweeping operations.
- After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Labor Surcharge and Equipment Rental Rates, State of California Department of Transportation (Caltrans), April 1, 2002 – March 31, 2003.

Sandbag Barrier SE-8



Objectives

EC	Erosion Control	☒
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-9 Straw Bale Barrier

Description and Purpose

A sandbag barrier is a series of sand-filled bags placed on a level contour to intercept sheet flows. Sandbag barriers pond sheet flow runoff, allowing sediment to settle out.

Suitable Applications

Sandbag barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow

- At the top of slopes to divert runoff away from disturbed slopes
- As check dams across mildly sloped construction roads

Limitations

- It is necessary to limit the drainage area upstream of the barrier to 5 acres.
- Degraded sandbags may rupture when removed, spilling sand.
- Installation can be labor intensive.
- Barriers may have limited durability for long-term projects.
- When used to detain concentrated flows, maintenance requirements increase.
- Burlap should not be used for sandbags.

Implementation

General

A sandbag barrier consists of a row of sand-filled bags placed on a level contour. When appropriately placed, a sandbag barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. While the sand-filled bags are porous, the fine sand tends to quickly plug with sediment, limiting the rate of flow through the barrier. If a porous barrier is desired, consider SE-1, Silt Fence, SE-5, Fiber Rolls, SE-6, Gravel Bag Berms, or SE-9, Straw Bale Barriers. Sandbag barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets which erode rills, and ultimately gullies, into disturbed, sloped soils. Sandbag barriers are similar to ground bag berms, but less porous.

Design and Layout

- Locate sandbag barriers on a level contour.
  - Slopes between 20:1 and 2:1 (H:V): Sandbags should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the slope toe.
  - Slopes 2:1 (H:V) or steeper: Sandbags should be placed at a maximum interval of 25 ft (a closer spacing is more effective), with the first row placed near the slope toe.
- Turn the ends of the sandbag barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, consider moving the barrier away from the slope toe to facilitate cleaning. To prevent flow behind the barrier, sandbags can be placed perpendicular to the barrier to serve as cross barriers.
- Drainage area should not exceed 5 acres.

- Stack sandbags at least three bags high.
- Butt ends of bags tightly.
- Overlapp butt joints of row beneath with each successive row.
- Use a pyramid approach when stacking bags.
- In non-traffic areas
  - Height = 18 in. maximum
  - Top width = 24 in. minimum for three or more layer construction
  - Side slope = 2:1 or flatter
- In construction traffic areas
  - Height = 12 in. maximum
  - Top width = 24 in. minimum for three or more layer construction.
  - Side slopes = 2:1 or flatter.

Materials

- ***Sandbag Material:*** Sandbag should be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight of 4 ounces/yd^2, Mullen burst strength exceeding 300 lb/in^2 in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355. Use of burlap may not acceptable in some jurisdictions.
- ***Sandbag Size:*** Each sand-filled bag should have a length of 18 in., width of 12 in., thickness of 3 in., and mass of approximately 33 lbs. Bag dimensions are nominal, and may vary based on locally available materials.
- ***Fill Material:*** All sandbag fill material should be non-cohesive, Class 1 or Class 2 permeable material free from clay and deleterious material.

Costs

Sandbag barriers are more costly, but typically have a longer useful life than other barriers. Empty sandbags cost $0.25 - $0.75. Average cost of fill material is $8 per yd^3. Pre-filled sandbags are more expensive at $1.50 - $2.00 per bag.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Sandbags exposed to sunlight will need to be replaced every two to three months due to degradation of the bags.
- Reshape or replace sandbags as needed.

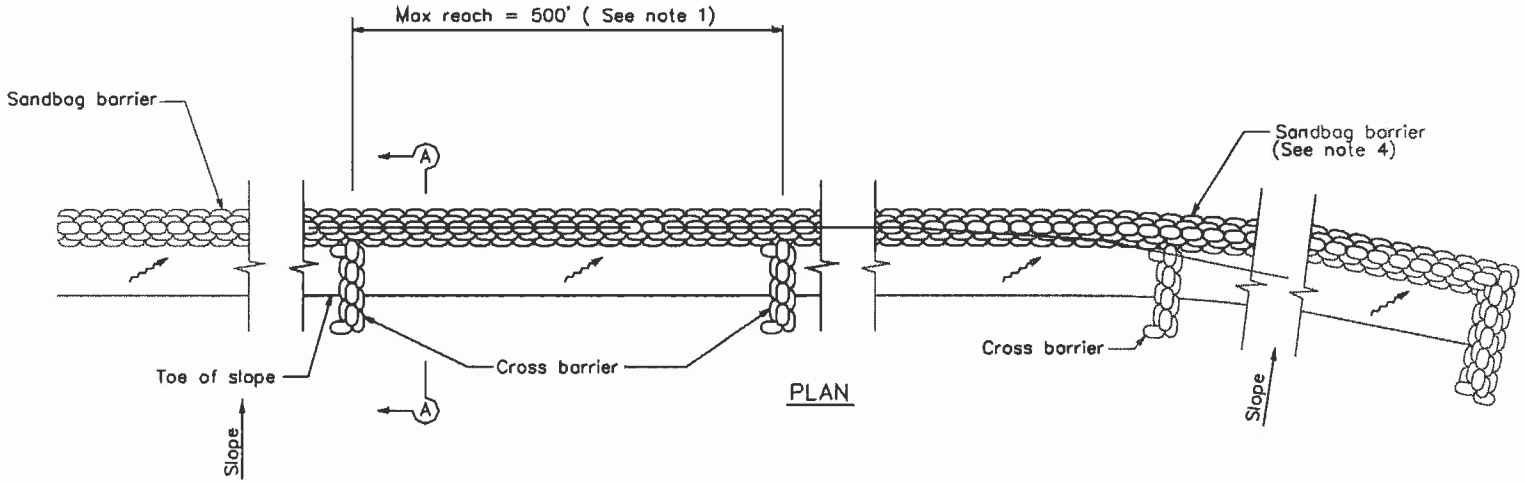
- Repair washouts or other damage as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove sandbags when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Sandbag Barrier

SE-8

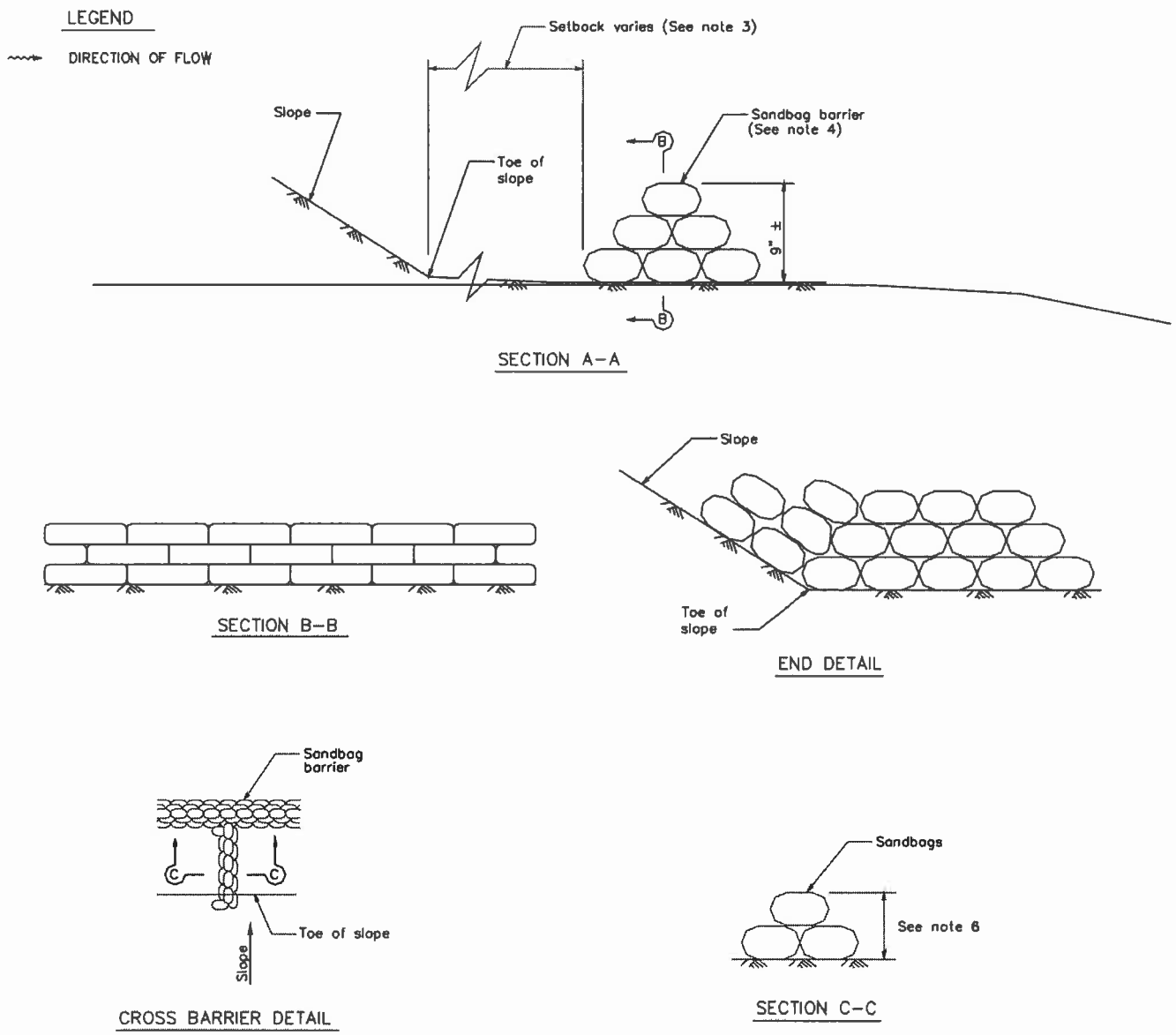


SANDBAG BARRIER

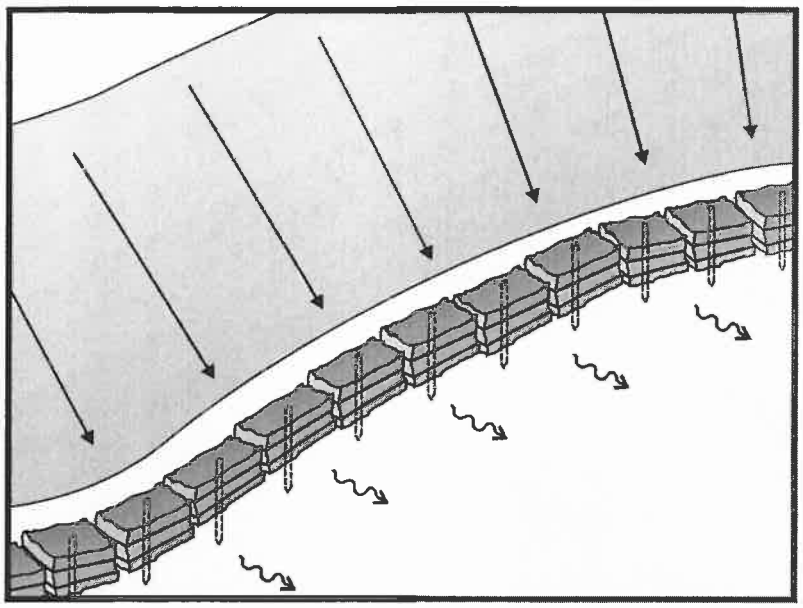
NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. Place sandbags tightly.
3. Dimension may vary to fit field condition.
4. Sandbag barrier shall be a minimum of 3 bags high.
5. The end of the barrier shall be turned up slope.
6. Cross barriers shall be a min of 1/2 and a max of 2/3 the height of the linear barrier.
7. Sandbag rows and layers shall be staggered to eliminate gaps.

SE-8 Sandbag Barrier



Straw Bale Barrier SE-9



Objectives

EC	Erosion Control	☒
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

Description and Purpose

A straw bale barrier is a series of straw bales placed on a level contour to intercept sheet flows. Straw bale barriers pond sheet- flow runoff, allowing sediment to settle out.

Suitable Applications

Straw bale barriers may be suitable:

- As a linear sediment control measure:
  - Below the toe of slopes and erodible slopes
  - As sediment traps at culvert/pipe outlets
  - Below other small cleared areas
  - Along the perimeter of a site
  - Down slope of exposed soil areas
  - Around temporary stockpiles and spoil areas
  - Parallel to a roadway to keep sediment off paved areas
  - Along streams and channels
- As linear erosion control measure:
  - Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow

- At the top of slopes to divert runoff away from disturbed slopes
- As check dams across mildly sloped construction roads

Limitations

Straw bale barriers:

- Are not to be used for extended periods of time because they tend to rot and fall apart
- Are suitable only for sheet flow on slopes of 10 % or flatter
- Are not appropriate for large drainage areas, limit to one acre or less
- May require constant maintenance due to rotting
- Are not recommended for concentrated flow, inlet protection, channel flow, and live streams
- Cannot be made of bale bindings of jute or cotton
- Require labor-intensive installation and maintenance
- Cannot be used on paved surfaces
- Should not to be used for drain inlet protection
- Should not be used on lined ditches
- May introduce undesirable non-native plants to the area

Implementation

General

A straw bale barrier consists of a row of straw bales placed on a level contour. When appropriately placed, a straw bale barrier intercepts and slows sheet flow runoff, causing temporary ponding. The temporary ponding provides quiescent conditions allowing sediment to settle. Straw bale barriers also interrupt the slope length and thereby reduce erosion by reducing the tendency of sheet flows to concentrate into rivulets, which erode rills, and ultimately gullies, into disturbed, sloped soils.

Straw bale barriers have not been as effective as expected due to improper use. These barriers have been placed in streams and drainage ways where runoff volumes and velocities have caused the barriers to wash out. In addition, failure to stake and entrench the straw bale has allowed undercutting and end flow. Use of straw bale barriers in accordance with this BMP should produce acceptable results.

Design and Layout

- Locate straw bale barriers on a level contour.
  - Slopes up to 10:1 (H:V): Straw bales should be placed at a maximum interval of 50 ft (a closer spacing is more effective), with the first row near the toe of slope.
  - Slopes greater than 10:1 (H:V): Not recommended.

- Turn the ends of the straw bale barrier up slope to prevent runoff from going around the barrier.
- Allow sufficient space up slope from the barrier to allow ponding, and to provide room for sediment storage.
- For installation near the toe of the slope, consider moving the barrier away from the slope toe to facilitate cleaning. To prevent flow behind the barrier, sand bags can be placed perpendicular to the barrier to serve as cross barriers.
- Drainage area should not exceed 1 acre, or 0.25 acre per 100 ft of barrier.
- Maximum flow path to the barrier should be limited to 100 ft.
- Straw bale barriers should consist of two parallel rows.
  - Butt ends of bales tightly
  - Stagger butt joints between front and back row
  - Each row of bales must be trenched in and firmly staked
- Straw bale barriers are limited in height to one bale laid on its side.
- Anchor bales with either two wood stakes or four bars driven through the bale and into the soil. Drive the first stake towards the butt joint with the adjacent bale to force the bales together.
- See attached figure for installation details.

Materials

- ***Straw Bale Size:*** Each straw bale should be a minimum of 14 in. wide, 18 in. in height, 36 in. in length and should have a minimum mass of 50 lbs. The straw bale should be composed entirely of vegetative matter, except for the binding material.
- ***Bale Bindings:*** Bales should be bound by steel wire, nylon or polypropylene string placed horizontally. Jute and cotton binding should not be used. Baling wire should be a minimum diameter of 14 gauge. Nylon or polypropylene string should be approximately 12 gauge in diameter with a breaking strength of 80 lbs force.
- ***Stakes:*** Wood stakes should be commercial quality lumber of the size and shape shown on the plans. Each stake should be free from decay, splits or cracks longer than the thickness of the stake, or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable. Steel bar reinforcement should be equal to a #4 designation or greater. End protection should be provided for any exposed bar reinforcement.

Costs

Straw bales cost $5 - $7 each. Adequate labor should be budgeted for installation and maintenance.

Inspection and Maintenance

Maintenance

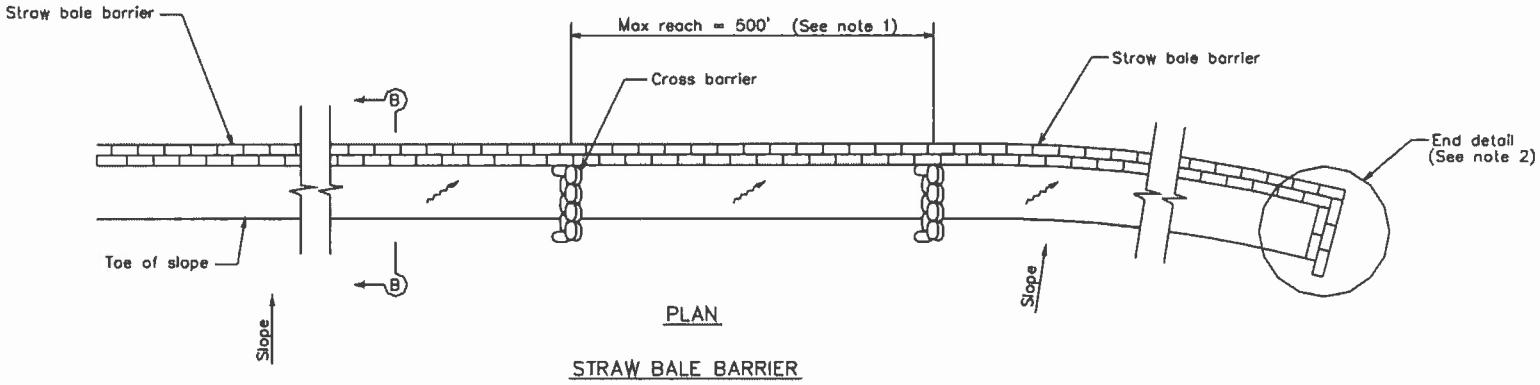
- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.
- Straw bales degrade, especially when exposed to moisture. Rotting bales will need to be replaced on a regular basis.
- Replace or repair damaged bales as needed.
- Repair washouts or other damages as needed.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site or disposed at an appropriate location.
- Remove straw bales when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilize the area. Removed sediment should be incorporated in the project or disposed of.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Straw Bale Barrier

SE-9



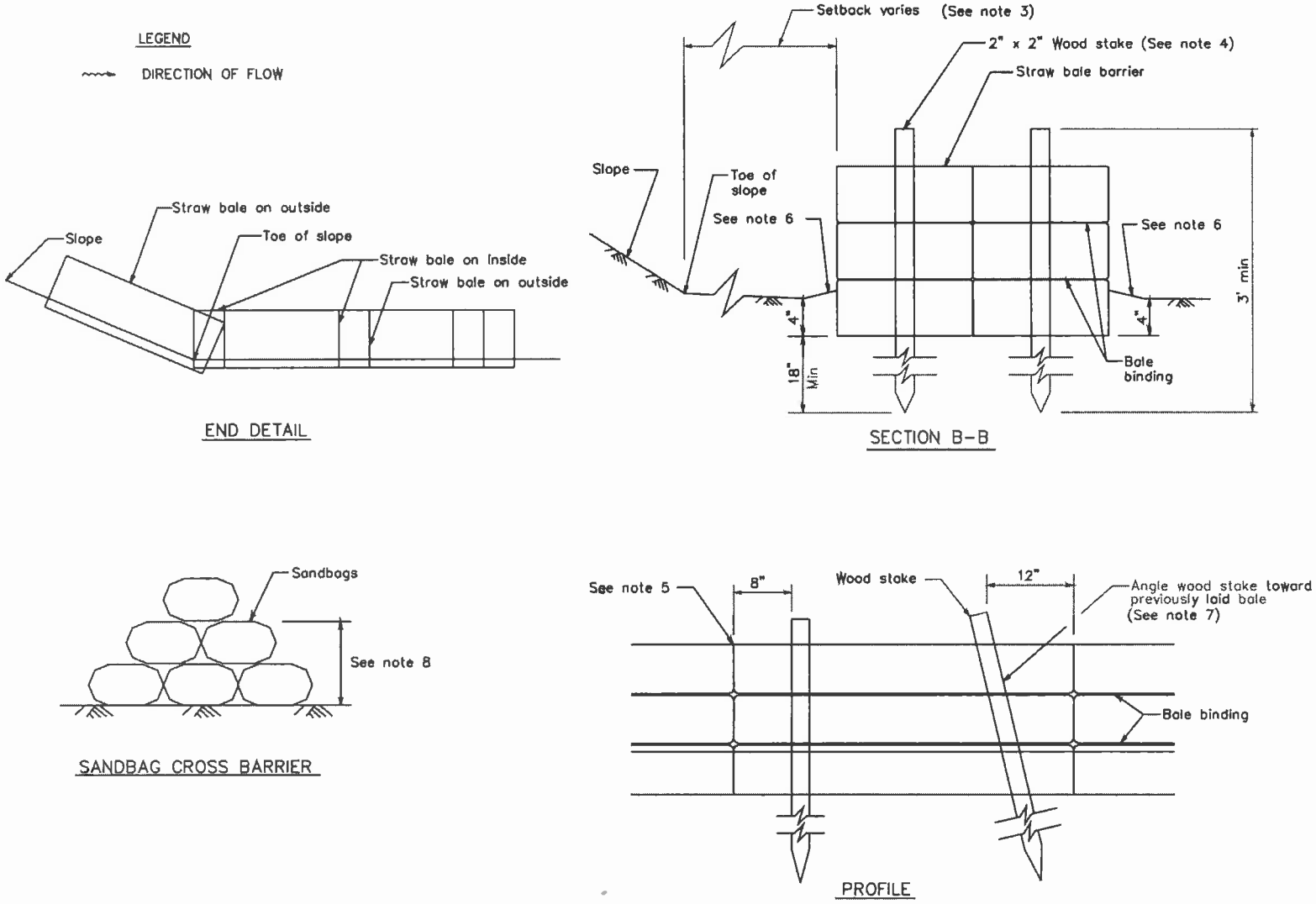
NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 500'.
2. The end of barrier shall be turned up slope.
3. Dimension may vary to fit field condition.
4. Stake dimensions are nominal.
5. Place straw bales tightly together.
6. Tamp embedment spoils against sides of installed bales.
7. Drive angled wood stake before vertical stake to ensure tight abutment to adjacent bale.
8. Sandbag cross barriers should be a min of 1/2 and a max of 2/3 the height of the linear barrier.
9. Sandbag rows and layers should be offset to eliminate gaps.

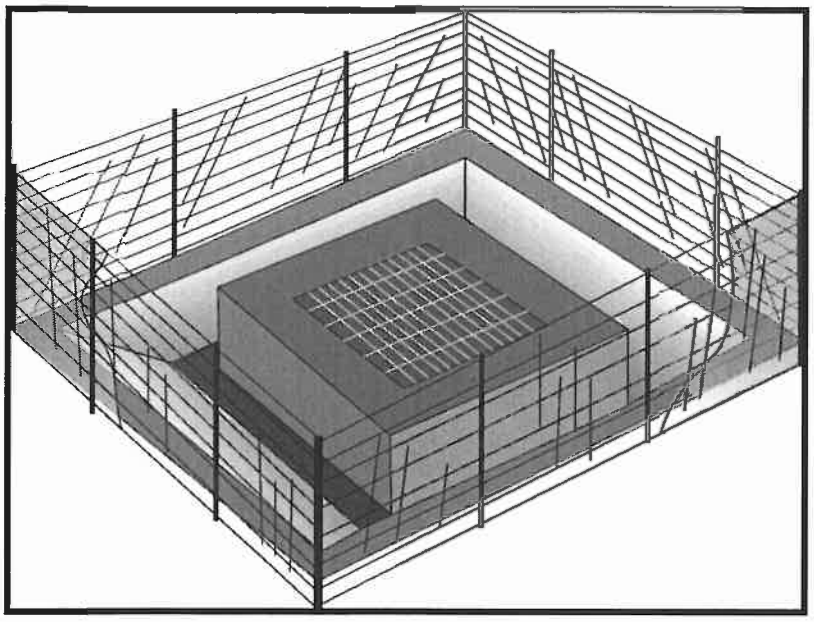
LEGEND

DIRECTION OF FLOW

SE-9 Straw Bale Barrier



Storm Drain Inlet Protection SE-10



Objectives

EC	Erosion Control	
SE	Sediment Control	☑
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	☑
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

SE-1 Silt Fence

SE-5 Fiber Rolls

SE-6 Gravel Bag Berm

SE-8 Sandbag Barrier

SE-9 Straw Bale Barrier

Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction.

Suitable Applications

Every storm drain inlet receiving sediment-laden runoff should be protected.

Limitations

- Drainage area should not exceed 1 acre.
- Straw bales, while potentially effective, have not produced in practice satisfactory results, primarily due to improper installation.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.
- Inlet protection usually requires other methods of temporary protection to prevent sediment-laden stormwater and non-stormwater discharges from entering the storm drain system.
- Sediment removal may be difficult in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are

expected, use other onsite sediment trapping techniques in conjunction with inlet protection.

- Frequent maintenance is required.
- For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2, Sediment Basin, and SE-3, Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.

Implementation

General

Large amounts of sediment may enter the storm drain system when storm drains are installed before the upslope drainage area is stabilized, or where construction is adjacent to an existing storm drain. In cases of extreme sediment loading, the storm drain itself may clog and lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.

Inlet control measures presented in this handbook should not be used for inlets draining more than one acre. Runoff from larger disturbed areas should be first routed through SE-2, Sediment Basin or SE-3, Sediment Trap. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Inlet protection methods not presented in this handbook should be approved by the local stormwater management agency.

Design and Layout

Identify existing and planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed and which method to use.

- Limit upstream drainage area to 1 acre maximum. For larger drainage areas, use SE-2, Sediment Basin, or SE-3, Sediment Trap, upstream of the inlet protection device.
- The key to successful and safe use of storm drain inlet protection devices is to know where runoff will pond or be diverted.
  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the

inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.

- Four types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.
  - Filter Fabric Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cfs.
  - Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
  - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cfs, and where overtopping is required to prevent flooding.
  - Block and Gravel Filter: Appropriate for flows greater than 0.5 cfs.
- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 ft with 2:1 side slopes around the inlet.

Installation

- ***DI Protection Type 1 - Filter Fabric Fence*** - The filter fabric fence (Type 1) protection is shown in the attached figure. Similar to constructing a silt fence; see BMP SE-1, Silt Fence. Do not place filter fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced.
  1. Excavate a trench approximately 6 in. wide and 6 in. deep along the line of the silt fence inlet protection device.
  2. Place 2 in. by 2 in. wooden stakes around the perimeter of the inlet a maximum of 3 ft apart and drive them at least 18 in. into the ground or 12 in. below the bottom of the trench. The stakes must be at least 48 in.
  3. Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1, Silt Fence, for details. The maximum silt fence height around the inlet is 24 in.
  4. Staple the filter fabric (for materials and specifications, see SE-1, Silt Fence) to wooden stakes. Use heavy-duty wire staples at least 1 in. in length.
  5. Backfill the trench with gravel or compacted earth all the way around.
- ***DI Protection Type 2 - Excavated Drop Inlet Sediment Trap*** - The excavated drop inlet sediment trap (Type 2) is shown in the attached figures. Install filter fabric fence in

accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 yd^3/acre of drainage area.

- ***DI Protection Type 3 - Gravel bag*** - The gravel bag barrier (Type 3) is shown in the figures. Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6, Gravel Bag Berm. Gravel bags should be used due to their high permeability.

  1. Use sand bag made of geotextile fabric (not burlap) and fill with 0.75 in. rock or 0.25 in. pea gravel.
  2. Construct on gently sloping street.
  3. Leave room upstream of barrier for water to pond and sediment to settle.
  4. Place several layers of sand bags – overlapping the bags and packing them tightly together.
  5. Leave gap of one bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.

- ***DI Protection Type 4 – Block and Gravel Filter*** - The block and gravel filter (Type 4) is shown in the figures. Block and gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction.

  1. Place hardware cloth or comparable wire mesh with 0.5 in. openings over the drop inlet so that the wire extends a minimum of 1 ft beyond each side of the inlet structure. If more than one strip is necessary, overlap the strips. Place filter fabric over the wire mesh.
  2. Place concrete blocks lengthwise on their sides in a single row around the perimeter of the inlet, so that the open ends face outward, not upward. The ends of adjacent blocks should abut. The height of the barrier can be varied, depending on design needs, by stacking combinations of blocks that are 4 in., 8 in., and 12 in. wide. The row of blocks should be at least 12 in. but no greater than 24 in. high.
  3. Place wire mesh over the outside vertical face (open end) of the concrete blocks to prevent stone from being washed through the blocks. Use hardware cloth or comparable wire mesh with 0.5 in. opening.
  4. Pile washed stone against the wire mesh to the top of the blocks. Use 0.75 to 3 in.

Costs

- Average annual cost for installation and maintenance (one year useful life) is $200 per inlet.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at two-week intervals during the non-rainy season.

- Filter Fabric Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes.

- Gravel Filters. If the gravel becomes clogged with sediment, it must be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.

- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches one-third of the barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site ore disposed at an appropriate location.

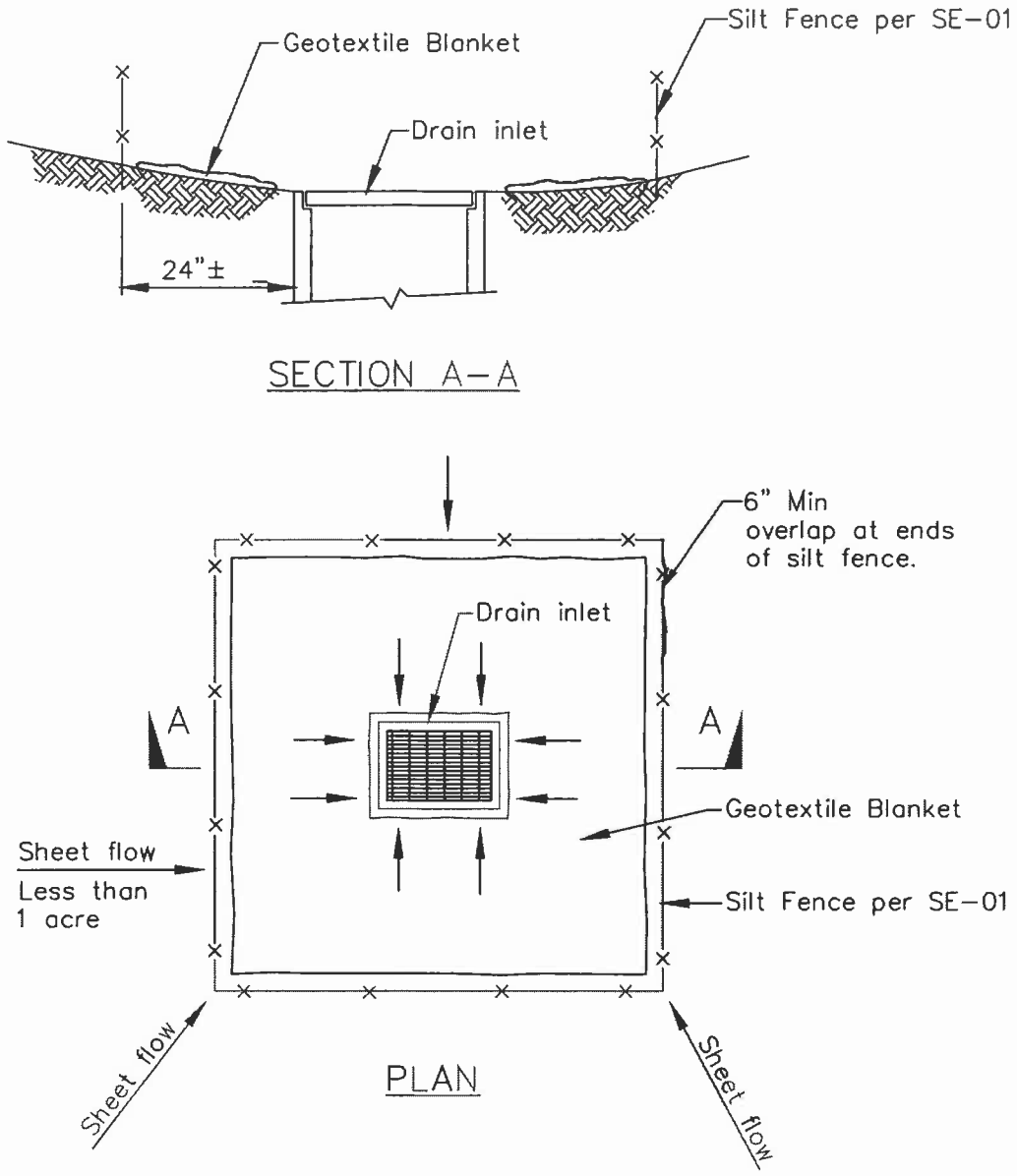
- Remove storm drain inlet protection once the drainage area is stabilized.

  - Clean and regrade area around the inlet and clean the inside of the storm drain inlet as it must be free of sediment and debris at the time of final inspection.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

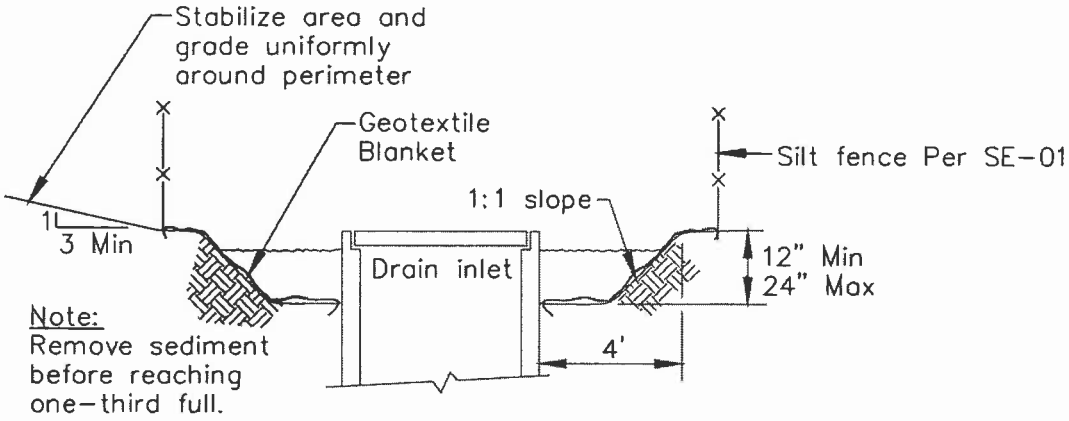
Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.



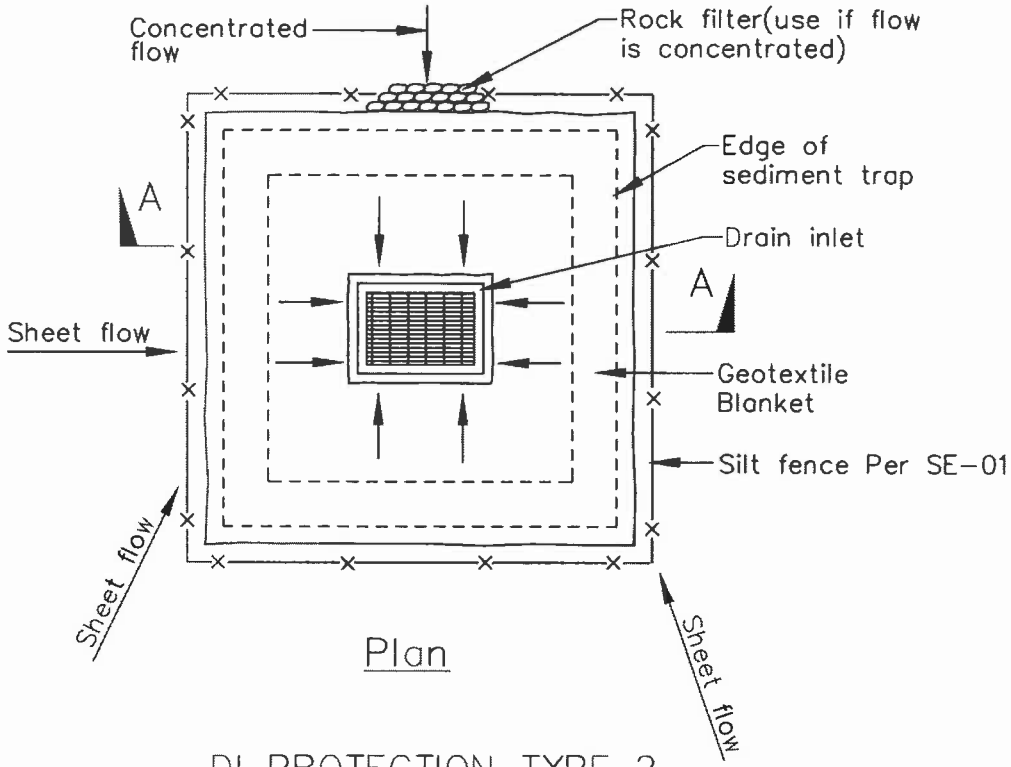
DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.



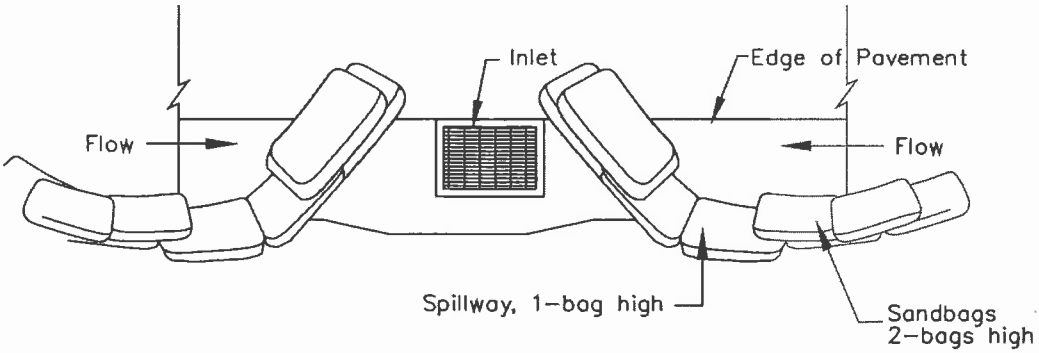
Section A-A



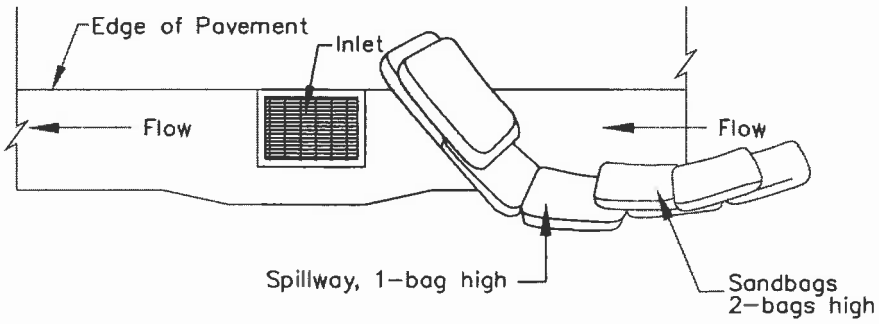
Plan

DI PROTECTION TYPE 2
NOT TO SCALE

Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP

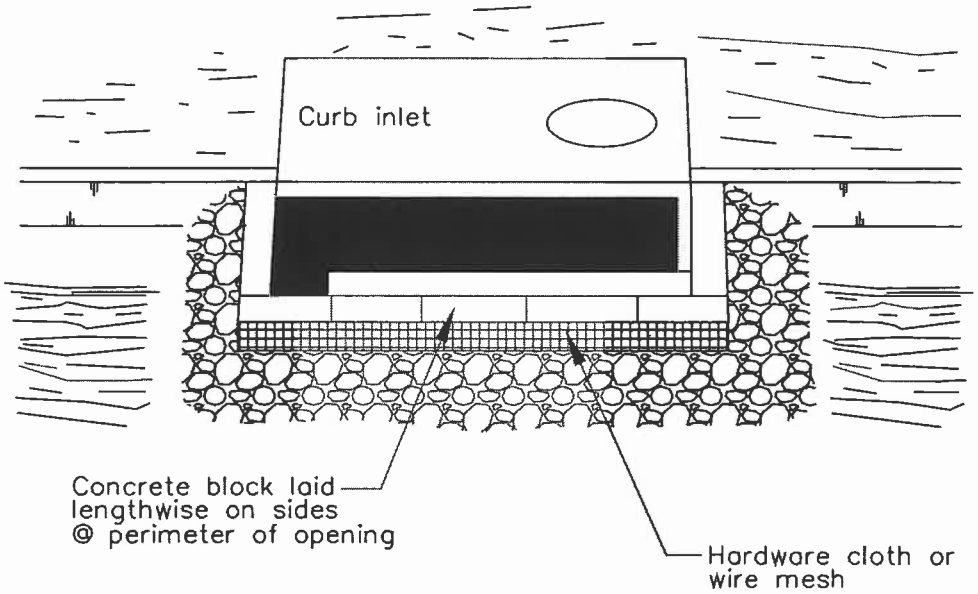


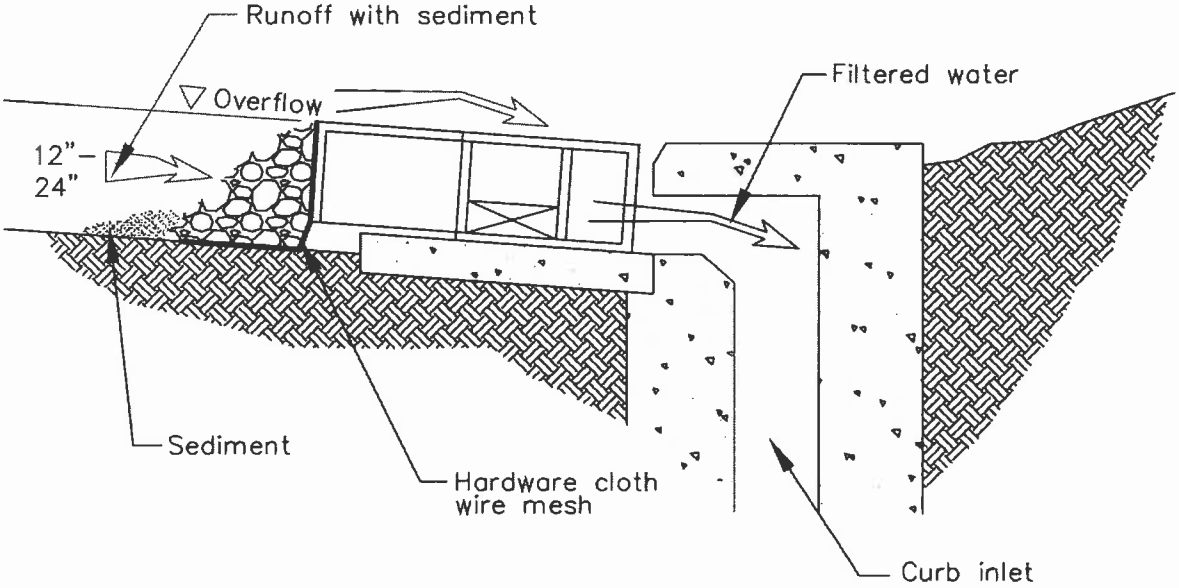
TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.

DI PROTECTION TYPE 3
NOT TO SCALE

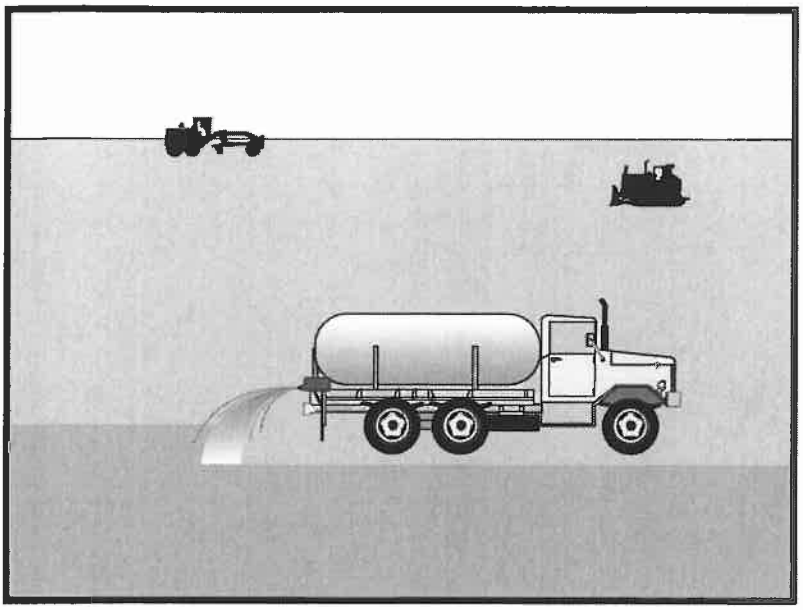




DI PROTECTION – TYPE 4

NOT TO SCALE

Wind Erosion Control WE-1



Objectives

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	
WE	Wind Erosion Control	☑
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Wind erosion or dust control consists of applying water or other dust palliatives as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

Suitable Applications

Wind erosion control BMPs are suitable during the following construction activities:

- Construction vehicle traffic on unpaved roads
- Drilling and blasting activities
- Sediment tracking onto paved roads
- Soils and debris storage piles
- Batch drop from front-end loaders
- Areas with unstabilized soil
- Final grading/site stabilization

Limitations

- Watering prevents dust only for a short period and should be applied daily (or more often) to be effective.
- Over watering may cause erosion.

- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Effectiveness depends on soil, temperature, humidity, and wind velocity.
- Chemically treated sub grades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site. Some chemical dust suppressants may be subject to freezing and may contain solvents and should be handled properly.
- Asphalt, as a mulch tack or chemical mulch, requires a 24-hour curing time to avoid adherence to equipment, worker shoes, etc. Application should be limited because asphalt surfacing may eventually migrate into the drainage system.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.

Implementation

General

California's Mediterranean climate, with short wet seasons and long hot dry seasons, allows the soils to thoroughly dry out. During these dry seasons, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment.

Dust control, as a BMP, is a practice that is already in place for many construction activities. Los Angeles, the North Coast, and Sacramento, among others, have enacted dust control ordinances for construction activities that cause dust to be transported beyond the construction project property line.

Recently, the State Air Resources Control Board has, under the authority of the Clean Air Act, started to address air quality in relation to inhalable particulate matter less than 10 microns (PM-10). Approximately 90 percent of these small particles are considered to be dust. Existing dust control regulations by local agencies, municipal departments, public works department, and public health departments are in place in some regions within California.

Many local agencies require dust control in order to comply with local nuisance laws, opacity laws (visibility impairment) and the requirements of the Clean Air Act. The following are measures that local agencies may have already implemented as requirements for dust control from contractors:

- Construction and Grading Permits: Require provisions for dust control plans.
- Opacity Emission Limits: Enforce compliance with California air pollution control laws.
- Increase Overall Enforcement Activities: Priority given to cases involving citizen complaints.
- Maintain Field Application Records: Require records of dust control measures from contractor;
- Stormwater Pollution Prevention Plan: (SWPPP): Integrate dust control measures into SWPPP.

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table shows dust control practices that can be applied to site conditions that cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures would include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph, and controlling the number and activity of vehicles on a site at any given time.

SITE CONDITION	DUST CONTROLPRACTICES								
	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Silt Fences	Temporary Gravel Construction Entrances/Equipment Wash Down	Haul Truck Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	X	X	X	X	X				X
Disturbed Areas Subject to Traffic			X	X	X		X		X
Material Stock Pile Stabilization			X	X		X			X
Demolition			X				X	X	
Clearing/ Excavation			X	X		X			X
Truck Traffic on Unpaved Roads			X	X	X		X	X	
Mud/Dirt Carry Out					X		X		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (EC-1, Scheduling).
- Quickly stabilize exposed soils using vegetation, mulching, spray-on adhesives, calcium chloride, sprinkling, and stone/gravel layering.
- Identify and stabilize key access points prior to commencement of construction.
- Minimize the impact of dust by anticipating the direction of prevailing winds.
- Direct most construction traffic to stabilized roadways within the project site.
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment should be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.

- If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality Control Board requirements. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, "NON-POTABLE WATER - DO NOT DRINK."
- Materials applied as temporary soil stabilizers and soil binders also generally provide wind erosion control benefits.
- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads.
- Provide covers for haul trucks transporting materials that contribute to dust.
- Provide for wet suppression or chemical stabilization of exposed soils.
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and vehicle wash down areas.
- Stabilize inactive construction sites using vegetation or chemical stabilization methods.
- Limit the amount of areas disturbed by clearing and earth moving operations by scheduling these activities in phases.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on stormwater, plant life, or groundwater.

Costs

Installation costs for water and chemical dust suppression are low, but annual costs may be quite high since these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Check areas protected to ensure coverage.
- Most dust control measures require frequent, often daily, or multiple times per day attention.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

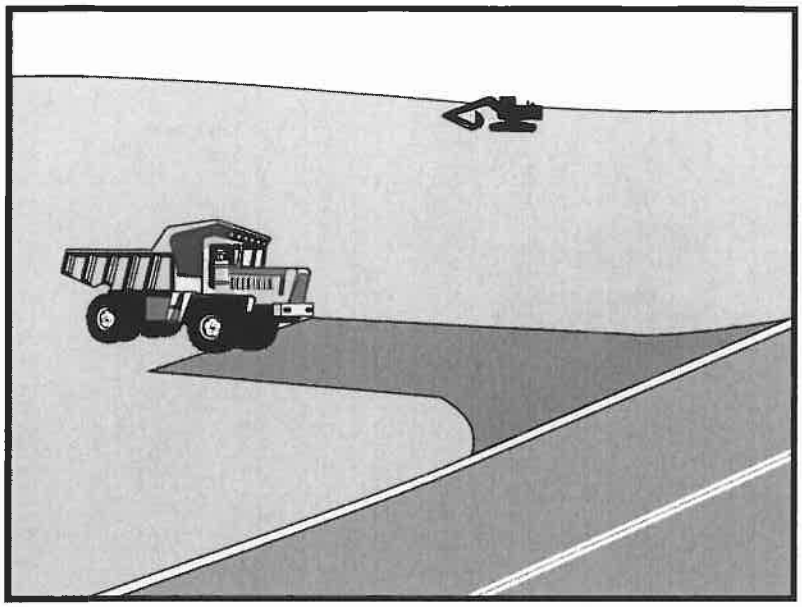
California Air Pollution Control Laws, California Air Resources Board, 1992.

Caltrans, Standard Specifications, Sections 10, "Dust Control"; Section 17, "Watering"; and Section 18, "Dust Palliative".

Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stabilized Construction Entrance/Exit TC-1



Objectives

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads.
- Adjacent to water bodies.
- Where poor soils are encountered.
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit is that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

Design and Layout

- Construct on level ground where possible.
- Select 3 to 6 in. diameter stones.
- Use minimum depth of stones of 12 in. or as recommended by soils engineer.
- Construct length of 50 ft minimum, and 30 ft minimum width.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.
- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use asphalt concrete (AC) grindings for stabilized construction access/roadway.

- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7, Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a two-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction

Costs

Average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance.

References

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

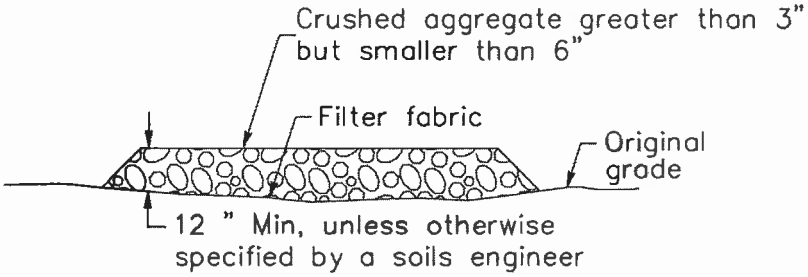
Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

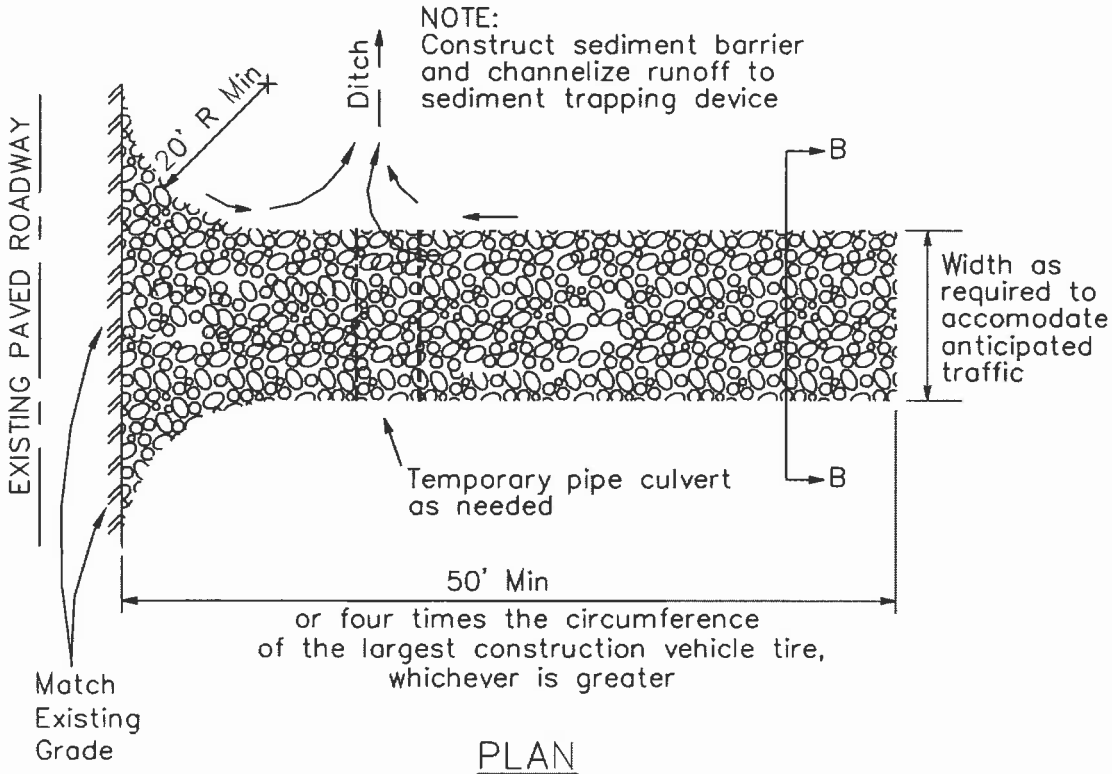
Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

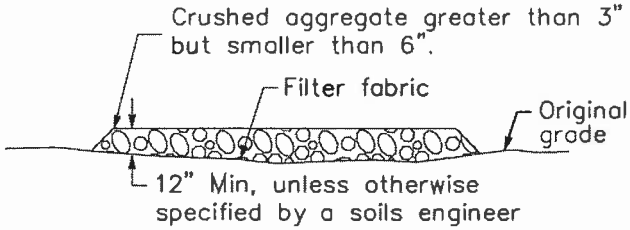
Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.



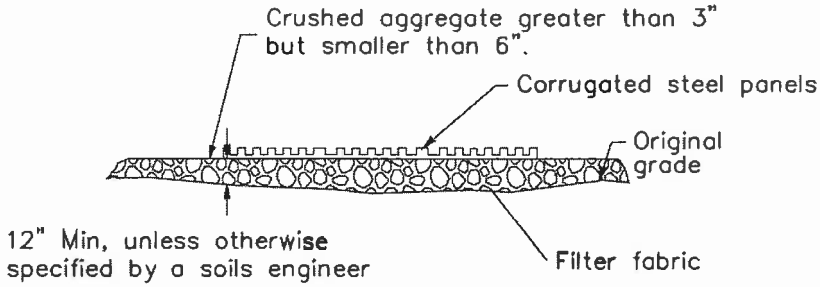
SECTION B–B
NTS



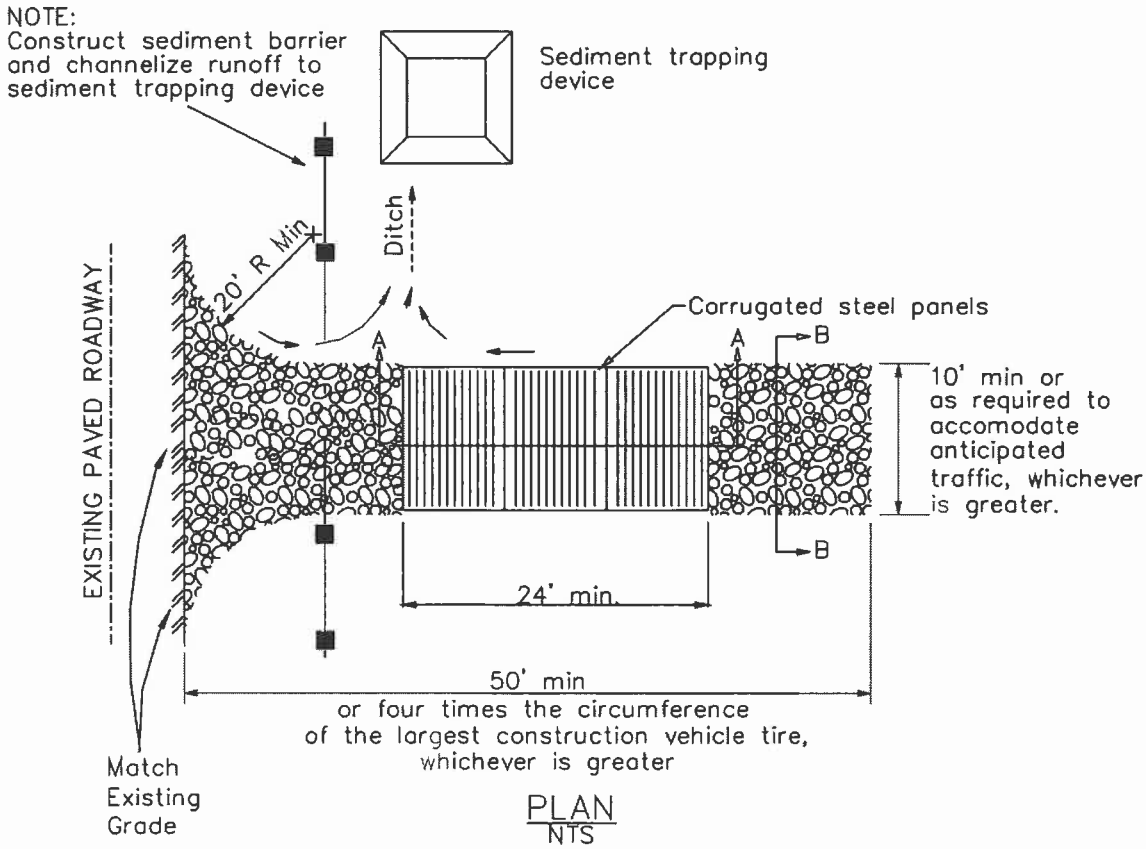
PLAN
NTS



SECTION B–B
NTS

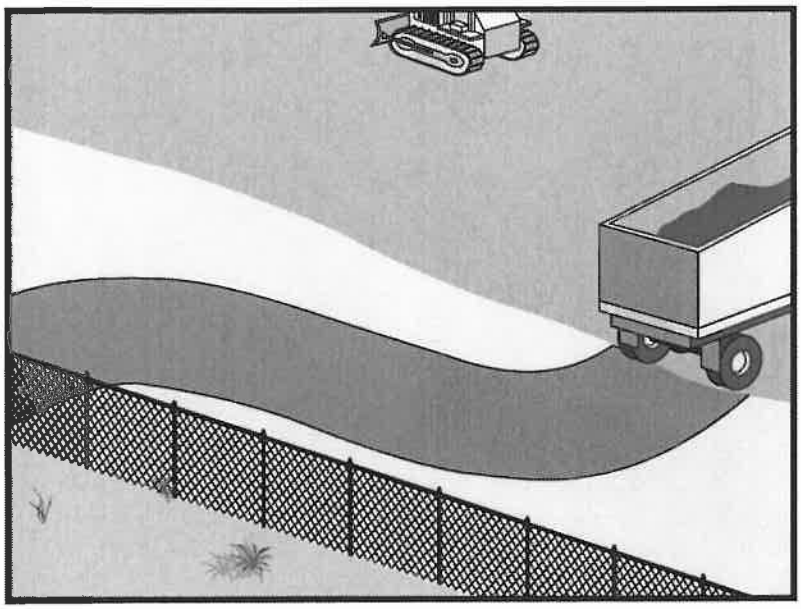


SECTION A–A
NOT TO SCALE



PLAN
NTS

Stabilized Construction Roadway TC-2



Objectives

EC	Erosion Control	☒
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

None

Description and Purpose

Access roads, subdivision roads, parking areas, and other onsite vehicle transportation routes should be stabilized immediately after grading, and frequently maintained to prevent erosion and control dust.

Suitable Applications

This BMP should be applied for the following conditions:

- Temporary Construction Traffic:
  - Phased construction projects and offsite road access
  - Construction during wet weather
- Construction roadways and detour roads:
  - Where mud tracking is a problem during wet weather
  - Where dust is a problem during dry weather
  - Adjacent to water bodies
  - Where poor soils are encountered

Limitations

- The roadway must be removed or paved when construction is complete.

- Certain chemical stabilization methods may cause stormwater or soil pollution and should not be used. See WE-1, Wind Erosion Control.
- Management of construction traffic is subject to air quality control measures. Contact the local air quality management agency.
- Materials will likely need to be removed prior to final project grading and stabilization.
- Use of this BMP may not be applicable to very short duration projects.

Implementation

General

Areas that are graded for construction vehicle transport and parking purposes are especially susceptible to erosion and dust. The exposed soil surface is continually disturbed, leaving no opportunity for vegetative stabilization. Such areas also tend to collect and transport runoff waters along their surfaces. During wet weather, they often become muddy quagmires that generate significant quantities of sediment that may pollute nearby streams or be transported offsite on the wheels of construction vehicles. Dirt roads can become so unstable during wet weather that they are virtually unusable.

Efficient construction road stabilization not only reduces onsite erosion but also can significantly speed onsite work, avoid instances of immobilized machinery and delivery vehicles, and generally improve site efficiency and working conditions during adverse weather

Installation/Application Criteria

Permanent roads and parking areas should be paved as soon as possible after grading. As an alternative where construction will be phased, the early application of gravel or chemical stabilization may solve potential erosion and stability problems. Temporary gravel roadway should be considered during the rainy season and on slopes greater than 5%.

Temporary roads should follow the contour of the natural terrain to the maximum extent possible. Slope should not exceed 15%. Roadways should be carefully graded to drain transversely. Provide drainage swales on each side of the roadway in the case of a crowned section or one side in the case of a super elevated section. Simple gravel berms without a trench can also be used.

Installed inlets should be protected to prevent sediment laden water from entering the storm sewer system (SE-10, Storm Drain Inlet Protection). In addition, the following criteria should be considered.

- Road should follow topographic contours to reduce erosion of the roadway.
- The roadway slope should not exceed 15%.
- Chemical stabilizers or water are usually required on gravel or dirt roads to prevent dust (WE-1, Wind Erosion Control).
- Properly grade roadway to prevent runoff from leaving the construction site.
- Design stabilized access to support heaviest vehicles and equipment that will use it.

- Stabilize roadway using aggregate, asphalt concrete, or concrete based on longevity, required performance, and site conditions. The use of cold mix asphalt or asphalt concrete (AC) grindings for stabilized construction roadway is not allowed.
- Coordinate materials with those used for stabilized construction entrance/exit points.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12 in. depth. A crushed aggregate greater than 3 in. but smaller than 6 in. should be used.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, impact weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Keep all temporary roadway ditches clear.
- When no longer required, remove stabilized construction roadway and re-grade and repair slopes.
- Periodically apply additional aggregate on gravel roads.
- Active dirt construction roads are commonly watered three or more times per day during the dry season.

Costs

Gravel construction roads are moderately expensive, but cost is often balanced by reductions in construction delay. No additional costs for dust control on construction roads should be required above that needed to meet local air quality requirements.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

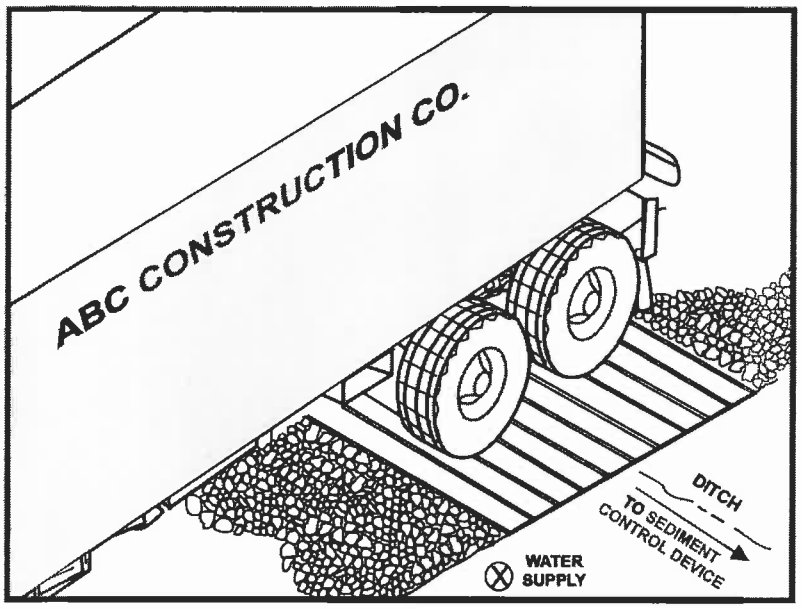
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Entrance/Outlet Tire Wash TC-3



Objectives

EC	Erosion Control	
SE	Sediment Control	☒
TC	Tracking Control	☑
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	
Organics	

Potential Alternatives

TC-1 Stabilized Construction Entrance/Exit

Description and Purpose

A tire wash is an area located at stabilized construction access points to remove sediment from tires and under carriages and to prevent sediment from being transported onto public roadways.

Suitable Applications

Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.

Limitations

- The tire wash requires a supply of wash water.
- A turnout or doublewide exit is required to avoid having entering vehicles drive through the wash area.
- Do not use where wet tire trucks leaving the site leave the road dangerously slick.

Implementation

- Incorporate with a stabilized construction entrance/exit. See TC-1, Stabilized Construction Entrance/Exit.
- Construct on level ground when possible, on a pad of coarse aggregate greater than 3 in. but smaller than 6 in. A geotextile fabric should be placed below the aggregate.
- Wash rack should be designed and constructed/manufactured for anticipated traffic loads.

- Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff.
- Use hoses with automatic shutoff nozzles to prevent hoses from being left on.
- Require that all employees, subcontractors, and others that leave the site with mud caked tires and undercarriages to use the wash facility.
- Implement SC-7, Street Sweeping and Vacuuming, as needed.

Costs

Costs are low for installation of wash rack.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.
- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.
- Inspect routinely for damage and repair as needed.

References

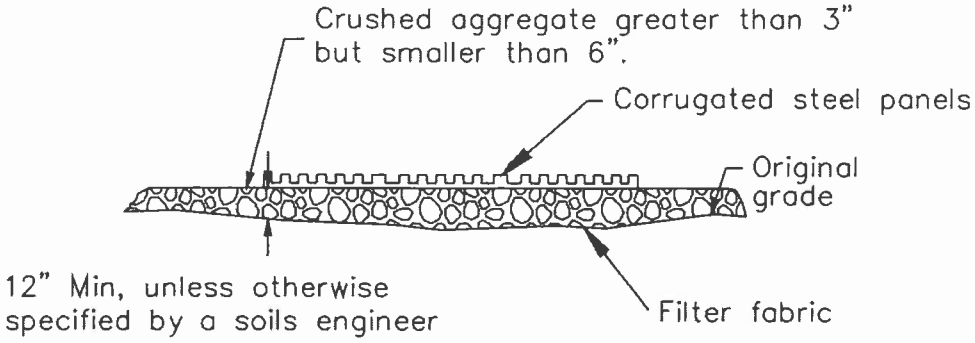
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

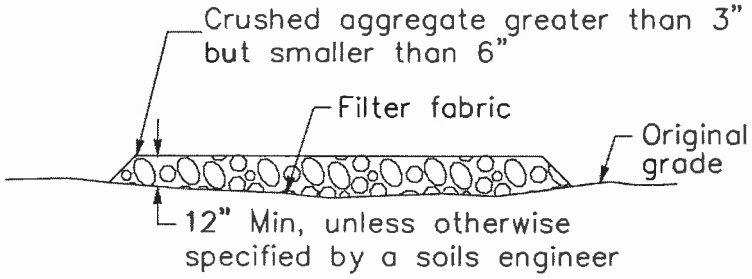
Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

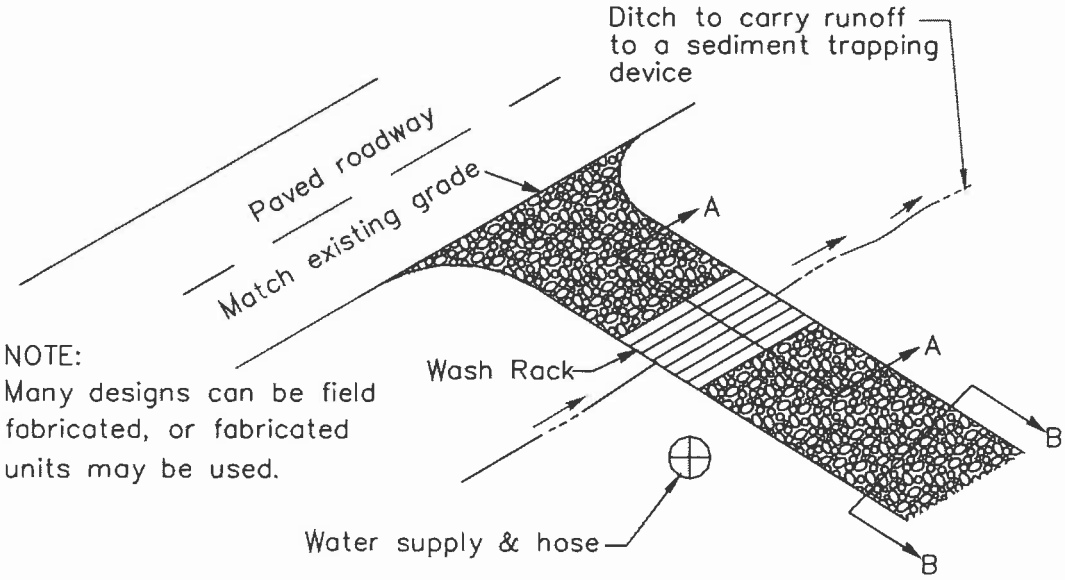
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.



SECTION A–A
NOT TO SCALE



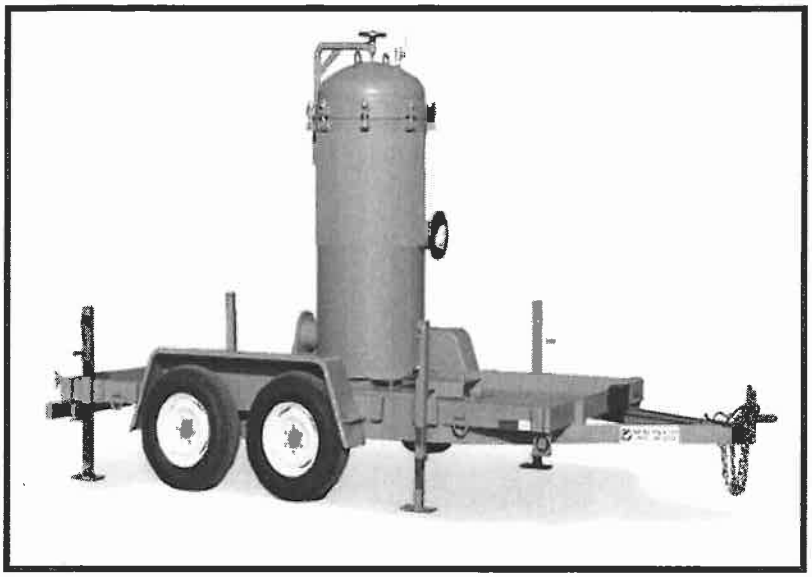
SECTION B–B
NTS



NOTE:
Many designs can be field fabricated, or fabricated units may be used.

TYPICAL TIRE WASH
NOT TO SCALE

Dewatering Operations NS-2



Objectives

EC	Erosion Control	
SE	Sediment Control	☒
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Description and Purpose

Dewatering operations are practices that manage the discharge of pollutants when non-stormwater and accumulated precipitation must be removed from a work location so that construction work may be accomplished.

Suitable Applications

These practices are implemented for discharges of non-stormwater from construction sites. Non-stormwaters include, but are not limited to, groundwater, water from cofferdams, water diversions, and waters used during construction activities that must be removed from a work area.

Practices identified in this section are also appropriate for implementation when managing the removal of accumulated precipitation (stormwater) from depressed areas at a construction site.

Limitations

- Site conditions will dictate design and use of dewatering operations.
- The controls discussed in this best management practice (BMP) address sediment only.
- The controls detailed in this BMP only allow for minimal settling time for sediment particles. Use only when site conditions restrict the use of the other control methods.
- Dewatering operations will require, and must comply with, applicable local permits.

Targeted Constituents

Sediment	☑
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

SE-5: Fiber Roll

SE-6: Gravel Bag Berm

SE-9: Straw Bale Barrier

CASQA

CALIFORNIA STORMWATER QUALITY ASSOCIATION

- Avoid dewatering discharges where possible by using the water for dust control, by infiltration, etc.

Implementation

- Dewatering non-stormwater cannot be discharged without prior notice to and approval from the Regional Water Quality Control Board (RWQCB) and local stormwater management agency. This includes stormwater that is co-mingled with groundwater or other non-stormwater sources. Once the discharge is allowed, appropriate BMPs must be implemented to ensure the discharge complies with all permit requirements and regional and watershed-specific requirements.

- RWQCB may require a separate NPDES permit prior to the dewatering discharge of non-stormwater. These permits will have specific testing, monitoring, and discharge requirements and can take significant time to obtain.

- The flow chart shown in Figure 1 should be utilized to guide dewatering operations.

- The owner will coordinate monitoring and permit compliance.

- Additional permits or permissions from other agencies may be required for dewatering cofferdams or diversions.

- Dewatering discharges must not cause erosion at the discharge point.

A variety of methods can be used to treat water during dewatering operations. Several devices are presented below and provide options to achieve sediment removal. The size of particles present in the sediment and Permit or receiving water limitations on sediment are key considerations for selecting sediment treatment option(s); in some cases, the use of multiple devices may be appropriate.

Sediment Basin (see also SE-2)

Description:

- A sediment basin is a temporary basin with a controlled release structure that is formed by excavation or construction of an embankment to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment basins are generally larger than Sediment Traps (SE-3).

Appropriate Applications:

- Effective for the removal of gravel, sand, silt, some metals that settle out with the sediment, and trash.

Implementation:

- Excavation and construction of related facilities is required.

- Temporary sediment basins must be fenced if safety is a concern.

- Outlet protection is required to prevent erosion at the outfall location.

Maintenance:

- Maintenance is required for safety fencing, vegetation, embankment, inlet and outfall structures, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-half.

Sediment Trap (See also SE-3)

Description:

- A sediment trap is a temporary basin formed by excavation and/or construction of an earthen embankment across a waterway or low drainage area to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment traps are generally smaller than Sediment Basins (SE-2).

Appropriate Applications:

Effective for the removal of large and medium sized particles (sand and gravel) and some metals that settle out with the sediment.

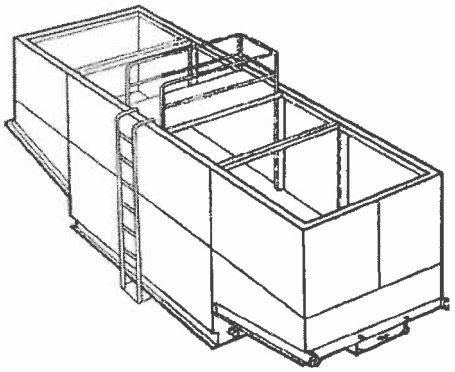
Implementation:

- Excavation and construction of related facilities is required.
- Trap inlets should be located to maximize the travel distance to the trap outlet.
- Use rock or vegetation to protect the trap outlets against erosion.

Maintenance:

- Maintenance is required for vegetation, embankment, inlet and outfall structures, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Weir Tanks



Description:

- A weir tank separates water and waste by using weirs. The configuration of the weirs (over and under weirs) maximizes the residence time in the tank and determines the waste to be removed from the water, such as oil, grease, and sediments.

Appropriate Applications:

- The tank removes trash, some settleable solids (gravel, sand, and silt), some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal must be by licensed waste disposal company.

Dewatering Tanks

Description:

- A dewatering tank removes debris and sediment. Flow enters the tank through the top, passes through a fabric filter, and is discharged through the bottom of the tank. The filter separates the solids from the liquids.

Appropriate Applications:

- The tank removes trash, gravel, sand, and silt, some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

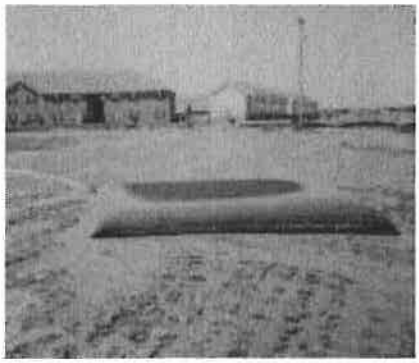
Implementation:

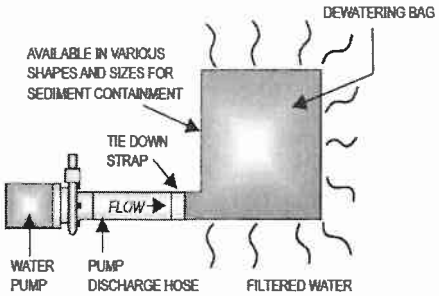
- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors should be consulted to appropriately size tank.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal must be by licensed waste disposal company.

Gravity Bag Filter





Description:

- A gravity bag filter, also referred to as a dewatering bag, is a square or rectangular bag made of non-woven geotextile fabric that collects sand, silt, and fines.

Appropriate Applications:

- Effective for the removal of sediments (gravel, sand, and silt). Some metals are removed with the sediment.

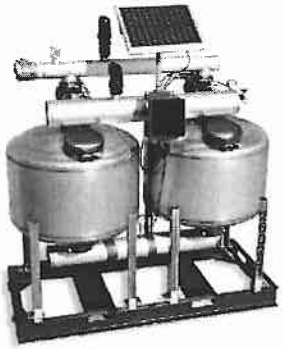
Implementation:

- Water is pumped into one side of the bag and seeps through the bottom and sides of the bag.
- A secondary barrier, such as a rock filter bed or straw/hay bale barrier, is placed beneath and beyond the edges of the bag to capture sediments that escape the bag.

Maintenance:

- Inspection of the flow conditions, bag condition, bag capacity, and the secondary barrier is required.
- Replace the bag when it no longer filters sediment or passes water at a reasonable rate.
- The bag is disposed of offsite.

Sand Media Particulate Filter



Description:

- Water is treated by passing it through canisters filled with sand media. Generally, sand filters provide a final level of treatment. They are often used as a secondary or higher level of treatment after a significant amount of sediment and other pollutants have been removed using other methods.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, and silt and some metals, as well as the reduction of biochemical oxygen demand (BOD) and turbidity.
- Sand filters can be used for stand-alone treatment or in conjunction with bag and cartridge filtration if further treatment is required.
- Sand filters can also be used to provide additional treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filters require regular service to monitor and maintain the level of the sand media. If subjected to high loading rates, filters can plug quickly.
- Venders generally provide data on maximum head loss through the filter. The filter should be monitored daily while in use, and cleaned when head loss reaches target levels.
- If cleaned by backwashing, the backwash water may need to be hauled away for disposal, or returned to the upper end of the treatment train for another pass through the series of dewatering BMPs.

Pressurized Bag Filter

Description:

- A pressurized bag filter is a unit composed of single filter bags made from polyester felt material. The water filters through the unit and is discharged through a header. Vendors provide bag filters in a variety of configurations. Some units include a combination of bag filters and cartridge filters for enhanced contaminant removal.

Appropriate Applications:

- Effective for the removal of sediment (sand and silt) and some metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Oil absorbent bags are available for hydrocarbon removal.

- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

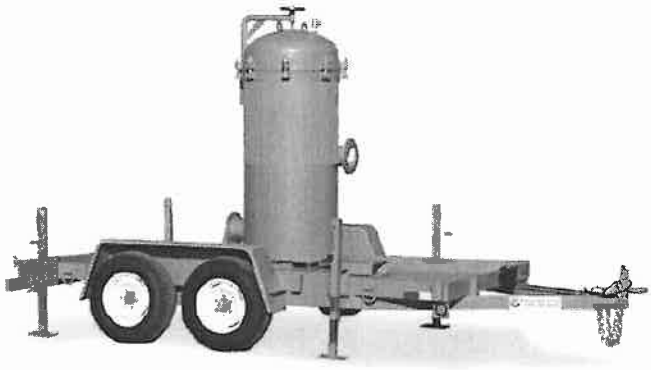
Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filter bags require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Cartridge Filter



Description:

- Cartridge filters provide a high degree of pollutant removal by utilizing a number of individual cartridges as part of a larger filtering unit. They are often used as a secondary or higher (polishing) level of treatment after a significant amount of sediment and other pollutants are removed. Units come with various cartridge configurations (for use in series with bag filters) or with a larger single cartridge filtration unit (with multiple filters within).

Appropriate Applications:

- Effective for the removal of sediment (sand, silt, and some clays) and metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Hydrocarbons can effectively be removed with special resin cartridges.

- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance.

Maintenance:

- The cartridges require replacement when the pressure differential equals or exceeds the manufacturer's recommendation.

Costs

- Sediment controls are low to high cost measures depending on the dewatering system that is selected. Pressurized filters tend to be more expensive than gravity settling, but are often more effective. Simple tanks are generally rented on a long-term basis (one or more months) and can range from $360 per month for a 1,000 gallon tank to $2,660 per month for a 10,000 gallon tank. Mobilization and demobilization costs vary considerably.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Unit-specific maintenance requirements are included with the description of each unit.
- Sediment removed during the maintenance of a dewatering device may be either spread onsite and stabilized, or disposed of at a disposal site as approved by the owner.
- Sediment that is commingled with other pollutants must be disposed of in accordance with all applicable laws and regulations and as approved by the owner.

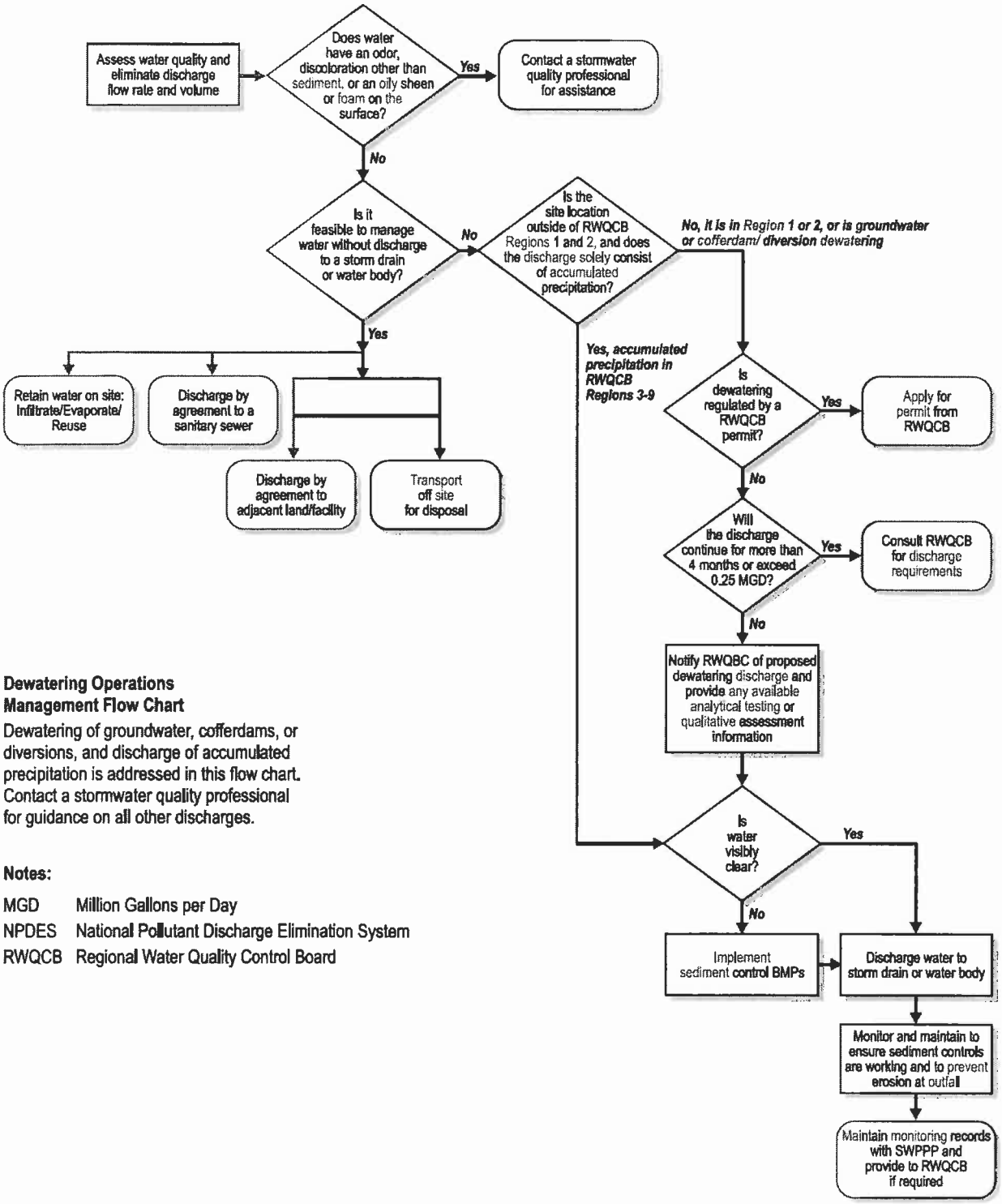
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Labor Surcharge & Equipment Rental Rates, April 1, 2002 through March 31, 2003, California Department of Transportation (Caltrans).



Dewatering Operations Management Flow Chart

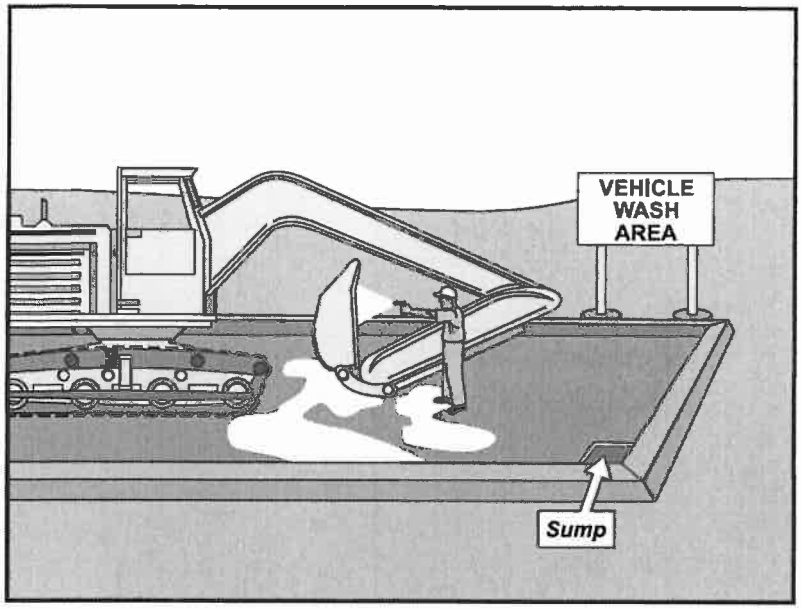
Dewatering of groundwater, cofferdams, or diversions, and discharge of accumulated precipitation is addressed in this flow chart. Contact a stormwater quality professional for guidance on all other discharges.

Notes:

MGD Million Gallons per Day
NPDES National Pollutant Discharge Elimination System
RWQCB Regional Water Quality Control Board

Figure 1
Operations Flow Chart

Vehicle and Equipment Cleaning NS-8



Objectives

EC	Erosion Control	
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to stormwater from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment cleaning is performed.

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TR-1, Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

- Use phosphate-free, biodegradable soaps.
- Educate employees and subcontractors on pollution prevention measures.
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates.
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried, and must be captured and recycled or disposed according to the requirements of WM-10, Liquid Waste Management or WM-6, Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited.
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite.
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - Located away from storm drain inlets, drainage facilities, or watercourses
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent runon and runoff
  - Configured with a sump to allow collection and disposal of wash water
  - No discharge of wash waters to storm drains or watercourses
  - Used only when necessary
- When cleaning vehicles and equipment with water:
  - Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered
  - Use positive shutoff valve to minimize water usage
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger, long-duration projects, and moderate to high on small, short-duration projects.

Inspection and Maintenance

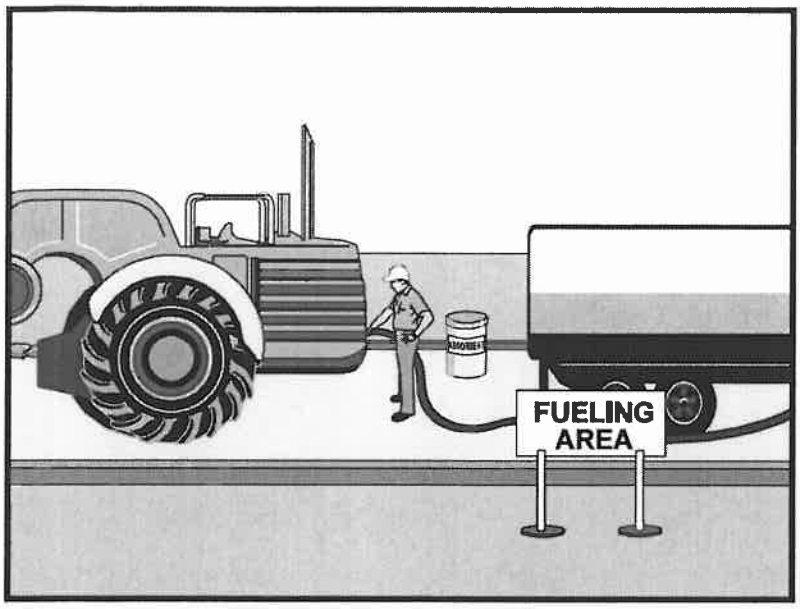
- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

Vehicle and Equipment Fueling NS-9



Objectives

EC	Erosion Control	
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	
Bacteria	
Oil and Grease	☑
Organics	

Potential Alternatives

None

Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks, and reduce or eliminate contamination of stormwater. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

These procedures are suitable on all construction sites where vehicle and equipment fueling takes place.

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TR-1, Stabilized Construction Entrance/ Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage "topping-off" of fuel tanks.

- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks, and should be disposed of properly after use.
- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the SWPPP.
- Dedicated fueling areas should be protected from stormwater runon and runoff, and should be located at least 50 ft away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent runon, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

- All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.
- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

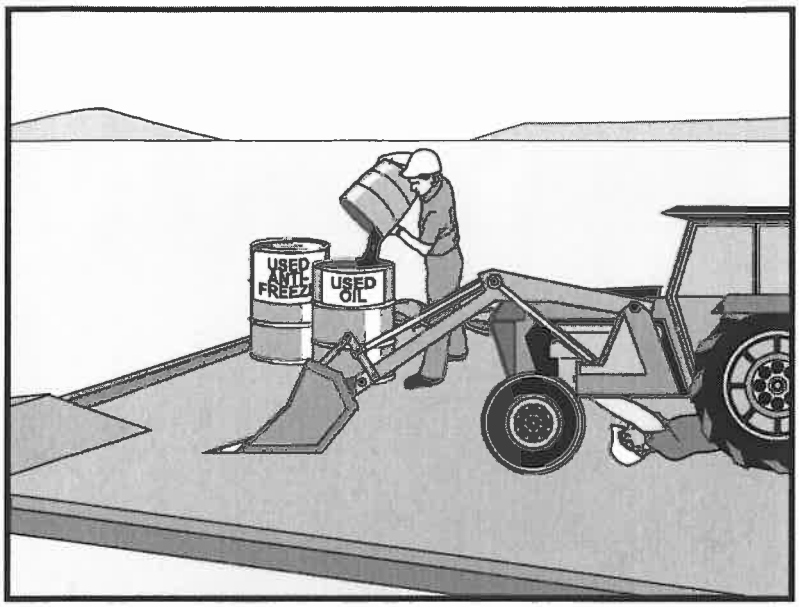
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Vehicle & Equipment Maintenance NS-10



Objectives

EC	Erosion Control	
SE	Sediment Control	
TR	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	☑
WM	Waste Management and Materials Pollution Control	

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	
Nutrients	☑
Trash	☑
Metals	
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the contamination of stormwater resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

These procedures are suitable on all construction projects where an onsite yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TR-1, Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of stormwater pollution. Activities that can contaminate stormwater include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8, Vehicle and Equipment Cleaning, and NS-9, Vehicle and Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from stormwater runon and runoff, and should be located at least 50 ft from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks, and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.
- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an "environmentally friendly" label.
- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.
- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in California Toxic Rule as priority pollutants. These materials are harmful and must not contaminate stormwater. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, one solvent can perform a job as well as two different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharges daily while non-stormwater discharges occur.
- Keep ample supplies of spill cleanup materials onsite.
- Maintain waste fluid containers in leak proof condition.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

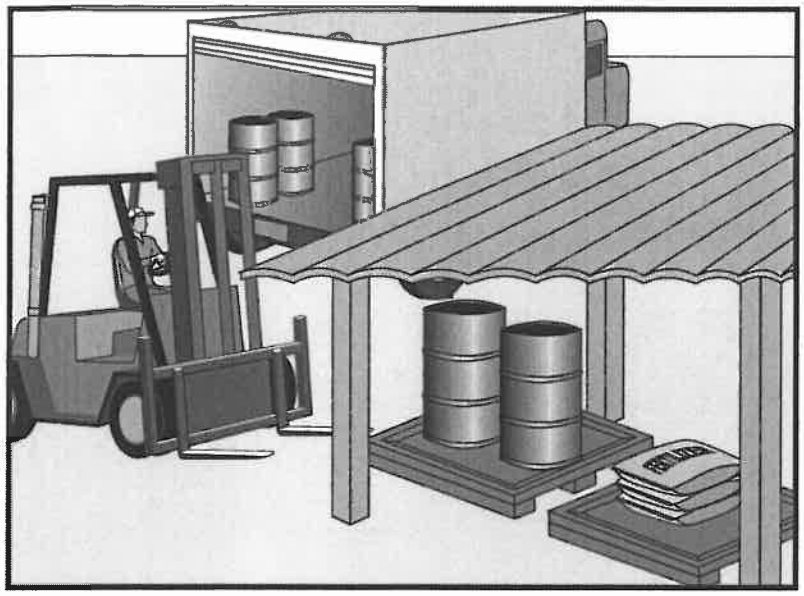
References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Material Delivery and Storage WM-1



Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the stormwater system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in a designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2, Material Use, or WM-4, Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders
- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease
- Asphalt and concrete components

- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds often must meet building and fire code requirements.

Implementation

The following steps should be taken to minimize risk:

- Temporary storage area should be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) should be supplied for all materials stored.
- Construction site areas should be designated for material delivery and storage.
- Material delivery and storage areas should be located near the construction entrances, away from waterways, if possible.
  - Avoid transport near drainage paths or waterways.
  - Surround with earth berms. See EC-9, Earth Dikes and Drainage Swales.
  - Place in an area which will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the fire codes of your area. Contact the local Fire Marshal to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30.
- An up to date inventory of materials delivered and stored onsite should be kept.
- Hazardous materials storage onsite should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- During the rainy season, consider storing materials in a covered area. Store materials in secondary containments such as earthen dike, horse trough, or even a children's wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays.
- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, in secondary containment.

- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.
- Chemicals should be kept in their original labeled containers.
- Employees and subcontractors should be trained on the proper material delivery and storage practices.
- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded.
- If significant residual materials remain on the ground after construction is complete, properly remove materials and any contaminated soil. See WM-7, Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Throughout the rainy season, each temporary containment facility should be covered during non-working days, prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.

- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3, Stockpile Management.
- Materials should be stored indoors within existing structures or sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill clean up material should be kept near storage areas.
- Also see WM-6, Hazardous Waste Management, for storing of hazardous materials.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7, Contaminated Soil Management.
- See WM-4, Spill Prevention and Control, for spills of chemicals and/or hazardous materials.

Cost

- The largest cost of implementation may be in the construction of a materials storage area that is covered and provides secondary containment.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Keep an ample supply of spill cleanup materials near the storage area.
- Keep storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

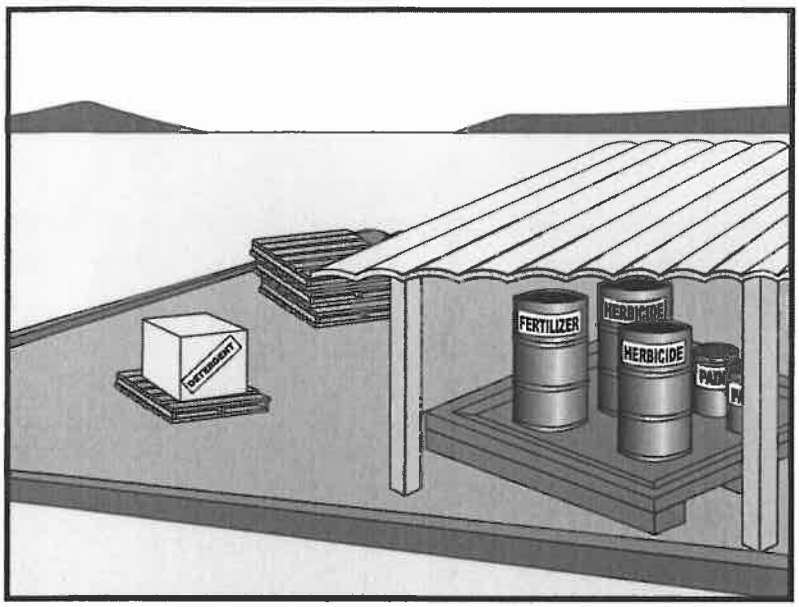
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Material Use

WM-2



Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides
- Fertilizers
- Detergents
- Plaster
- Petroleum products such as fuel, oil, and grease
- Asphalt and other concrete components
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds
- Concrete compounds
- Other materials that may be detrimental if released to the environment

Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite.
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals.
- Train personnel who use pesticides. The California Department of Pesticide Regulation and county agricultural commissioners license pesticide dealers, certify pesticide applicators, and conduct onsite inspections.
- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydro seeding. Apply surface dressings in several smaller applications, as opposed to one large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains.
- Train employees and subcontractors in proper material use.
- Supply Material Safety Data Sheets (MSDS) for all materials.
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris.
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or into a concrete washout pit or temporary sediment trap. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical.

- Require contractors to complete the "Report of Chemical Spray Forms" when spraying herbicides and pesticides.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at two–week intervals in the non-rainy season to verify continued BMP implementation.
- Maintenance of this best management practice is minimal.
- Spot check employees and subcontractors throughout the job to ensure appropriate practices are being employed.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stockpile Management WM-3

Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Stockpile Management procedures and practices are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub base or pre-mixed aggregate, asphalt minder (so called "cold mix" asphalt), and pressure treated wood.

Suitable Applications

Implement in all projects that stockpile soil and other materials.

Limitations

None identified.

Implementation

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

- Locate stockpiles a minimum of 50 ft away from concentrated flows of stormwater, drainage courses, and inlets.
- Protect all stockpiles from stormwater runon using a temporary perimeter sediment barrier such as berms, dikes, fiber rolls, silt fences, sandbag, gravel bags, or straw bale barriers.

- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1, Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7, Contaminated Soil Management.
- Place bagged materials on pallets and under cover.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials should be protected further as follows:

Soil stockpiles

- During the rainy season, soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- During the non-rainy season, soil stockpiles should be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

Stockpiles of Portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub base

- During the rainy season, the stockpiles should be covered or protected with a temporary perimeter sediment barrier at all times.
- During the non-rainy season, the stockpiles should be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

Stockpiles of "cold mix"

- During the rainy season, cold mix stockpiles should be placed on and covered with plastic or comparable material at all times.
- During the non-rainy season, cold mix stockpiles should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Stockpiles/Storage of pressure treated wood with copper, chromium, and arsenic or ammonical, copper, zinc, and arsenate

- During the rainy season, treated wood should be covered with plastic or comparable material at all times.
- During the non-rainy season, treated wood should be covered with plastic or comparable material at all times and cold mix stockpiles should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Protection of Active Stockpiles

Active stockpiles of the identified materials should be protected further as follows:

- All stockpiles should be protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Costs

All of the above are low cost measures.

Inspection and Maintenance

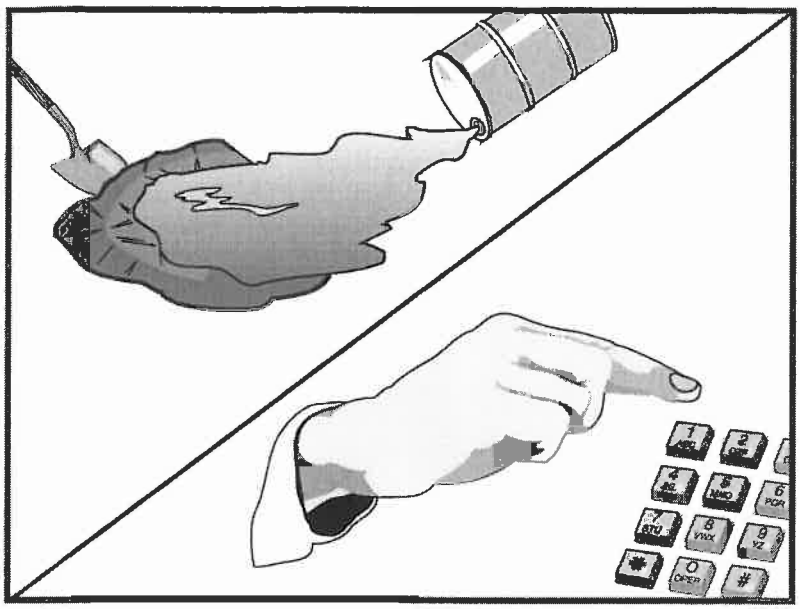
- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation

- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.

References

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Spill Prevention and Control WM-4



Objectives

EC	Erosion Control	
SE	Sediment Control	
TC	Tracking Control	
WE	Wind Erosion Control	
NS	Non-Stormwater Management Control	
WM	Waste Management and Materials Pollution Control	☑

Legend:

☑ **Primary Objective**

☒ **Secondary Objective**

Targeted Constituents

Sediment	☑
Nutrients	☑
Trash	☑
Metals	☑
Bacteria	
Oil and Grease	☑
Organics	☑

Potential Alternatives

None

Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1, Materials Delivery and Storage, and WM-2, Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers
- Deicing/anti-icing chemicals

- Fuels
- Lubricants
- Other petroleum distillates

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite

Implementation

The following steps will help reduce the stormwater impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110,117, and 302, and sanitary and septic wastes should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Spills should be covered and protected from stormwater runon during rainfall to the extent that it doesn't compromise clean up activities.
- Do not bury or wash spills with water.

- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10, Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.
- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill.
  - Recover spilled materials.
  - Clean the contaminated area and properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

- Spills should be cleaned up immediately:
  - Contain spread of the spill.
  - Notify the project foreman immediately.
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  - Notify the Governor's Office of Emergency Services Warning Center, (916) 845-8911.
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802.
  - Notification should first be made by telephone and followed up with a written report.
  - The services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site.
  - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around
- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute stormwater. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the runon of stormwater and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/ leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/ or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of two-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-stormwater discharge daily while non-stormwater discharges occur.

- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

KINGS RIVER CONSERVATION DISTRICT
COMMUNITY POWERPLANT

DRAINAGE, EROSION AND SEDIMENT CONTROL PLAN

APPENDIX B – DRAINAGE AND HYDROLOGIC CALCULATIONS

UTILITY ENGINEERING — **CALCULATION SHEET** — PAGE OF

CLIENT	ZEMC	JOB NO.	C12659	DATE	4/14/08
PROJECT	KINGS RIVER			BY	K. MARTIN
TITLE				DATE	4/15/08
CALCULATION NO	POND VOLUME CALCULATION - 100 YR STORM			CHECKED	J. FRAZEE

ASSUMPTIONS
- PLANT ROADS ARE ASPHALT AND PLANT SITE IS GRAVEL
- POND DESIGNED FOR 100 YEAR STORM EVENT
- BERM ALONG PROPERTY LINES - INTERNAL RUNOFF ONLY

PLANT AREA (GRAVEL, ASPHALT, EQUIPMENT & BUILDINGS) 936,384 SF = 21.496 AC C = 0.90

POND (GRASSES, VEGETATION) 89,087 SF = 2.049 AC C = 0.15

OUTLOT (GRASSES, VEGETATION) 269,260 SF = 6.181 AC C = 0.15

TOTAL AREA = 29.723 AC

$$c = \frac{(0.90)(21.496)+(0.15)(2.049)+(0.15)(6.181)}{29.723} = 0.692$$

COEFFICIENT OF RUNOFF DEVELOPED

HISTORICAL COEFFICIENT OF RUNOFF

AGRICULTURAL / VINEYARDS 0-7% SLOPE C = 0.30

DETENTION POND SIZE

USE 100 YEAR STORM EVENT
P = 3 IN RAINFALL IN 24 HR PERIOD
C = 0.692 DEVELOPED SITE
C = 0.30 HISTORICAL SITE

RAINFALL INFORMATION AS PER NOAA ATLAS 2, VOLUME XI, FIGURE 43 ISOPLUVIALS OF 100 YR 24-HR PRECIPITATION FOR SOUTHERN HALF OF CALIFORNIA IN TENTHS OF AN INCH

DEVELOPED SITE

V = CPA

V = (0.692)(3 IN)(29.723 AC)

V = 61.705 AC-IN = 5.142 AC-FT

HISTORICAL SITE

V = CPA

V = (0.30)(3 IN)(29.723 AC)

V = 26.751 AC-IN = 2.229 AC-FT

POND SIZE = DEVELOPED SITE - HISTORICAL SITE

POND SIZE = 5.142 AC-FT - 2.229 AC-FT = 2.913 AC-FT

UTILITY ENGINEERING — **CALCULATION SHEET** — PAGE OF

CLIENT	ZFMC	JOB NO.	012659	DATE	4/11/08
PROJECT	KINGS RIVER			BY	K. MARTIN
TITLE				DATE	4/15/08
CALCULATION NO	EXISTING RUNOFF COEFFICIENT			CHECKED	J. FRAZEE

- SURFACE RUNOFF TO BE DESIGNED FOR THE FIVE YEAR STORM
- UNDERGROUND STORM SEWERS TO BE DESIGNED FOR THE TEN YEAR STORM
- ROADWAY CULVERTS TO BE DESIGNED FOR THE 10 YR STORM

DESCRIPTION AND RANGE OF RUNOFF PRODUCING CHARACTERISTICS

RELIEF	- FLAT TO MILDLY ROLLING TERRAIN - AVERAGE SLOPES LESS THAN 6%	0.08	TO	0.12
SOIL	- SOILS OF GOOD TO EXCELLENT INFILTRATION CAPACITY - SANDS, LOAMY SANDS AND OTHER LOOSE OPEN SOILS	0.04	TO	0.06
VEGETAL COVER	- GOOD TO FAIR COVER - NOT MORE THAN 50% OF AREA IN CLEAN, CULTIVATED CROPS OR POOR NATURAL VEGETATION - BETWEEN 20 & 65% IN GOOD GRASSLAND, WOODLAND OR EQUIVALENT COVER.	0.06	TO	0.11
SURFACE STORAGE	- LOW - ONLY FAIR AMOUNT OF SURFACE DEPRESSION, STORAGE WELL DEFINED SYSTEM OF SMALL DRAINAGE WAYS - NO PONDS OR MARSHES	0.11	TO	0.15
	TOTAL	0.29	TO	0.44

RUNOFF "C" VALUE FOR EXISTING CONDITIONS

(AS PER IMPROVEMENT STANDARDS FOR FRESNO COUNTY OCTOBER, 1966)

USE C = 0.36 FOR EXISTING RUNOFF

UTILITY ENGINEERING

Job Name: King's River
Job Number: 012659
Date: 4/14/08
By: Kim Martin
Checked: John Frazee

Pond Volumes

Elevation	Area	Interval	Volume CuFt	Total CuFt	Acre-Feet
322	18117.38	1			
323	20335.02	1	19226.20	19226.20	0.44
324	22680.65	1	21507.84	40734.04	0.94
325	25154.20	1	23917.43	64651.46	1.48
326	27753.78	1	26453.99	91105.45	2.09
327	30468.74	1	29111.26	120216.71	2.76
328	33288.13	1	31878.44	152095.15	3.49
329	36211.24	1	34749.69	186844.83	4.29
330	39238.07	1	37724.66	224569.49	5.16
331	42368.60	1	40803.34	265372.82	6.09
332	45602.85	1	43985.73	309358.55	7.10
			Required Volume	215186.40	**4.94**
			Required Elevation		**329.75**
			Elevation w/ Freeboard		**331.75**

The site is located in rural unincorporated Fresno County and not within the Fresno Metropolitan Flood Control District. As per the Fresno County Public Works Department, the required basin volume is calculated as follows:

$V_{REQ'D}$ **= CIA = CA (0.5)**

C = Runoff for the Total Drainage Area
A = Total Drainage Area in Acres
0.5 = Six inches of rainfall over the entire Drainage Area

$V_{REQ'D\ HIST}$ = CA (0.5) = (0.360)*(29.723 Ac)*(0.5) = 5.35 Ac-Ft
$V_{REQ'D\ DEV}$ = CA (0.5) = (0.692)*(29.723 Ac)*(0.5) = 10.29 Ac-Ft

Pond Volume = Developed - Historical = 10.29 Ac-Ft - 5.35 Ac-Ft

Pond Volume = 4.94 Ac-Ft

UTILITY ENGINEERING

Job Name: King's River
Job Number: 012659
Date: 4/14/08
By: Kim Martin
Checked: John Frazee

Pond Volumes

Elevation	Area	Interval	Volume CuFt	Total CuFt	Acre-Feet
322	18117.38	1			
323	20335.02	1	19226.20	19226.20	0.44
324	22680.65	1	21507.84	40734.04	0.94
325	25154.20	1	23917.43	64651.46	1.48
326	27753.78	1	26453.99	91105.45	2.09
327	30468.74	1	29111.26	120216.71	2.76
328	33288.13	1	31878.44	152095.15	3.49
329	36211.24	1	34749.69	186844.83	4.29
			Required Volume	120225.60	**2.76**
			Required Elevation		**327.00**
			Elevation w/ Freeboard		**329.00**

The site is located in rural unincorporated Fresno County and not within the Fresno Metropolitan Flood Control District. As per the Fresno County Public Works Department, the required basin volume is calculated as follows:

$V_{REQ'D}$ = CIA = CA (0.28)

C = Runoff for the Total Drainage Area
A = Total Drainage Area in Acres
0.5 = Six inches of rainfall over the entire Drainage Area

$V_{REQ'D\ HIST}$ = CA (0.28) = (0.360)*(29.723 Ac)*(0.5) = 3.00 Ac-Ft
$V_{REQ'D\ DEV}$ = CA (0.28) = (0.692)*(29.723 Ac)*(0.5) = 5.76 Ac-Ft

Pond Volume = Developed - Historical = 5.76 Ac-Ft - 3.00 Ac-Ft

Pond Volume = 2.76 Ac-Ft

UTILITY ENGINEERING

Job Name: King's River
Job Number: 012659
Date: 4/14/08
By: Kim Martin
Checked: John Frazee

Rational Method - **Developed Conditions - I = 0.50 ft**

			Mannings "n"	L_1	L_2	Runoff Coefficient "c"			Q = CIA		
		Assumptions									
		Vegetated	0.600	0	0	0.15		**A =**	29.72	AC	
		Asphalt	0.011	143	0	0.90		**I =**	6.00		
		Gravel	0.011	157	224	0.90					
		HDPE Pipe	0.012	0	75	0.95					
								A_1 =	358347	SF	Vegetated
								A_2 =	300000	SF	Asphalt
L_T =	0	Total Length n_1 =	0.000					**A_3 =**	636384	SF	Gravel
L_1 =	0	Sheet Flow n_2 =	0.000					**A_4 =**	0	SF	HDPE Pipe
L_2 =	0	Channel Flow									
		T_1 =	**Ln** / **$42s^{(.5)}$**	=		0.00	Min	**c =**	0.69		
s_1 =	0	Slope 1									
s_2 =	0.000	Slope 2 T_2 =	**Ln** / **$60s^{(.5)}$**	=		0.00	Min	**Q =**	123.48		
n_1 =	0.000	Mannings n						Vol =	123.48	Ac-In	
n_2 =	0.000	Mannings n T_T =	**$T_1 + T_2$**	=		0.00	Minutes		**10.29**	**Ac-Ft**	

IDF Data

6 in = 10 Day - 100 Year Storm **I =** 6.00 Inches/Hour

Req'd Pond Volume = Developed Volume - Historical Volume

Req'd Pond Volume = 4.94 Ac-Ft

The 0.50 ft storm information derived from Fresno County "Improvement Standards for Fresno County, October 1966" and Fresno County Public Works Department.

UTILITY ENGINEERING

Job Name: King's River
Job Number: 012659
Date: 4/14/08
By: Kim Martin
Checked: John Frazee

Rational Method - **Developed Conditions - I = 0.28 ft**

	Mannings "n"	L_1	L_2	Runoff Coefficient "c"				
Assumptions						**Q = CIA**		
Vegetated	0.600	0	0	0.15	**A =**	29.72	AC	
Asphalt	0.011	143	0	0.90	**I =**	3.36		
Gravel	0.011	157	224	0.90				
HDPE Pipe	0.012	0	75	0.95				
					A_1 =	358347	SF	Vegetated
					A_2 =	300000	SF	Asphalt
					A_3 =	636384	SF	Gravel
					A_4 =	0	SF	HDPE Pipe

L_T =	0	Total Length	n_1 =	0.000					
L_1 =	0	Sheet Flow	n_2 =	0.000					
L_2 =	0	Channel Flow							
			T_1 =	**Ln** / **$42s^{(.5)}$**	=	0.00	Min	**c =**	0.69
s_1 =	0	Slope 1							
s_2 =	0.000	Slope 2	**T_2 =**	**Ln** / **$60s^{(.5)}$**	=	0.00	Min	**Q =**	69.15
n_1 =	0.000	Mannings n						Vol =	69.15 Ac-In
n_2 =	0.000	Mannings n	**T_T =**	**$T_1 + T_2$**	=	0.00	Minutes		**5.76 Ac-Ft**

IDF Data

3.36 in =	**10 Day - 100 Year Storm**	**I =**	3.36	Inches/Hour	
(0.28)*(12 in) =	**3.36**				

Req'd Pond Volume = **Developed Volume - Historical Volume**

Req'd Pond Volume = **2.77** **Ac-Ft**

The 0.28 ft storm information derived from Fresno County "Improvement Standards for Fresno County, October 1966" and Fresno County Public Works Department. Can use I = 0.28 ft for percolating soils.

UTILITY ENGINEERING

Job Name: King's River
Job Number: 012659
Date: 4/14/08
By: Kim Martin
Checked: John Frazee

Rational Method - **Existing Conditions - I = 0.50 ft**

Assumptions	Mannings "n"	L_1	L_2	Runoff Coefficient "c"		**Q = CIA**		
Agriculture	0.600	0	0	0.36	**A =**	29.72	AC	
Asphalt	0.011	143	0	0.90	**I =**	6.00		
Gravel	0.011	157	224	0.90				
HDPE Pipe	0.012	0	75	0.95				
					A_1 =	1294733.88	SF	Agriculture
					A_2 =	0	SF	Asphalt
					A_3 =	0	SF	Gravel
					A_4 =	0	SF	HDPE Pipe

L_T =	0	Total Length	n_1 =	0.000						
L_1 =	0	Sheet Flow	n_2 =	0.000						
L_2 =	0	Channel Flow								
			T_1 =	**Ln** / **$42s^{(.5)}$**	=	0.00	Min	**c =**	0.36	
s_1 =	0	Slope 1								
s_2 =	0.000	Slope 2	**T_2 =**	**Ln** / **$60s^{(.5)}$**	=	0.00	Min	**Q =**	64.20	
n_1 =	0.000	Mannings n						Vol =	64.20	Ac - In
n_2 =	0.000	Mannings n	**T_T =**	**$T_1 + T_2$**	=	0.00	Minutes		**5.35**	**Ac - Ft**

IDF Data

6 in = 10 Day - 100 Year Storm **I =** 6.00 Inches/Hour

The 0.50 ft storm information derived from Fresno County "Improvement Standards for Fresno County, October 1966" and Fresno County Public Works Department.

UTILITY ENGINEERING

Job Name: King's River
Job Number: 012659
Date: 4/14/08
By: Kim Martin
Checked: John Frazee

Rational Method - **Existing Conditions - I = 0.28 ft**

	Mannings "n"	L_1	L_2	Runoff Coefficient "c"			Q = CIA		
Assumptions									
Agriculture	0.600	0	0	0.36		**A =**	29.72	AC	
Asphalt	0.011	143	0	0.90		**I =**	3.36		
Gravel	0.011	157	224	0.90					
HDPE Pipe	0.012	0	75	0.95					
						A_1 =	1294733.88	SF	Agriculture
						A_2 =	0	SF	Asphalt
L_T = 0 Total Length	n_1 = 0.000					**A_3 =**	0	SF	Gravel
L_1 = 0 Sheet Flow	n_2 = 0.000					**A_4 =**	0	SF	HDPE Pipe
L_2 = 0 Channel Flow									
	T_1 =	**Ln** / **$42s^{(.5)}$**	=	0.00	Min	**c =**	0.36		
s_1 = 0 Slope 1									
s_2 = 0.000 Slope 2	**T_2 =**	**Ln** / **$60s^{(.5)}$**	=	0.00	Min	**Q =**	35.95		
n_1 = 0.000 Mannings n						Vol =	35.95	Ac - In	
n_2 = 0.000 Mannings n	**T_T =**	**$T_1 + T_2$**	=	0.00	Minutes		**3.00**	**Ac - Ft**	

IDF Data

3.36 in = 10 Day - 100 Year Storm **I =** 3.36 Inches/Hour

(0.28)*(12 in) = 3.36

The 0.28 ft storm information derived from Fresno County "Improvement Standards for Fresno County, October 1966" . and Fresno County Public Works Department. Can use I = 0.28 ft for percolating soils.

Chart for obtaining "C" in rational drainage formula Q=CiA, for Rural Areas.
C normally falls between .30 & .55, .55 to .75 is high, above .75 is extreme and below .30 is low. Add partial factors for relief, soil, cover and storage to obtain total C factor:

Example:	Flat terrain	.08 to .12
	Clay soil	.11 to .15
	No cover	.15 to .19
	Normal storage	.06 to .11
	C=	.40 to .57

DESIGNATION OF WATERSHED CHARACTERISTICS	DESCRIPTION AND RANGE OF RUNOFF PRODUCING CHARACTERISTICS			
Relief	.30 to .38 Steep rugged terrain-average slopes above 40%.	.22 to .30 Hilly to mountainous terrain-average slopes between 15 and 40%.	.12 to .22 Rolling to hilly terrain-average slopes from 6 to 15%.	.08 to .12 Flat to mildy rolling terrain-average slopes less than 6%.
Soil	.15 to .19 No effective soil cover-either rock or thin soil mantle of poor to negligible infiltration capacity.	.11 to .15 Slow to take up water-clay or other soil with fair to poor infiltration capacity.	.06 to .11 Normal-permeable soils of good depth with good to fair infiltration capacity.	.04 to .06 Soils of good to excellent infiltration capacity-sands, loamy sands, and other loose open soils.
Vegetal Cover	.15 to .19 No effective plant cover-bare to very sparce cover.	.11 to .15 Fair to sparve cover-clean cultivated crops or poor natural, vegitation-less than 20% of drainage area under good cover.	.06 to .11 Good to fair cover-not more than 50% of area in clean cultivated crops or poor natural vegitation-between 20 & 65% in good grassland, woodland or equivalent cover.	.04 to .06 Good to excellent cover-65 to 85% of area in good grassland, woodland or equivalant cover.
Surface Storage	.15 to .19 Negligible-surface depression few and shallow-drainage ways steep and narrow-no ponds or marshes.	.11 to .15 Low- only fair amount of surface depression storage well defined system of small drainage ways-no ponds or marshes.	.06 to .11 Normal-fair to considerable surface depression storage-having a drainage system similar to that of prairie lands-small amount of lakes, ponds, and marshes	.04 to .06 High-large amount of surface depression storage drainage system not sharply defined-large flood plain storage or a large number of lakes, ponds or

ATTACHMENT WATER-2

Correspondence to the US Army Corps of Engineers

Note:
A copy of the Frac-out plan was included in the original submittal to the Corps. A copy of the Frac-out plan is also included as part of Attachment Bio-1.

HALSTEAD & ASSOCIATES
Environmental / Biological Consultants
296 Burgan Avenue, Clovis, CA 93611
Office (559) 298-2334; Mobile (559) 970-2875
Fax (559) 322-0769; HalsteadEnv@aol.com

September10, 2008

Mr. Ramon Aberasturi
U. S. Army Corps of Engineers, Sacramento District
Regulatory Branch
1325 J Street
Sacramento, CA 95814

RE: Kings River Conservation District's Community Power Plant (Fresno & Tulare Counties)
HDD Boring Under the Kings River and Cross Creek Intermittent Drainages
Frac-out Plan, Location Maps, and Photos for HDD Work Areas - As Requested

Dear Ramon:

Thanks for your phone call of July 21, 2008 regarding our questions about a permit to bore under the Kings River near Kingsburg (Fresno County) and under the 6 intermittent drainages of Cross Creek near Traver (Tulare County) using Horizontal Directional Drilling (HDD) techniques to install a 24-inch natural gas pipeline for the Kings River Conservation District's (KRCD) proposed Community Power Plant project near Parlier. As mentioned in our phone conversation, we do not think a permit is necessary as no impacts will occur to waters/wetlands. We conclude this because no work or impacts will occur in the bed or bank of the waters/wetlands, the HDD work areas (three sites) have been sighted to occur on agricultural land, they are outside, away from, and do not drain into the riparian/wetland habitat, buffer zones of at least 200 feet will occur between the HDD work areas and the outer edge of the riparian/ wetland habitat, lands surrounding the HDD work areas are actively farmed agricultural land or paved county roads, and a variety of preventive avoidance measures will completely avoid all impacts. The buffer zones at the Kings River area will be approximately 500 feet. The buffer zones at the two Cross Creek areas will be approximately 200 feet and 300 feet.

You asked us to provide the following information for your review and evaluation if a permit would be necessary: (1) a frac-out plan for the HDD work, (2) maps of the HDD work locales, and (3) photos of the entrance and exit sites of the HDD. The purpose of sending this information is for you to see the project layout and see that no impacts will occur to waters/wetlands. As requested, a copy of the project's Frac-out Plan is attached, the HDD work areas are shown on maps in the Frac-out Plan, and photos of the entrance and exit sites of the HDD work are attached.

Background

The KRCD is proposing a 565 megawatt natural gas-fired power plant near the City of Parlier (Fresno County, California) and has file an Application For Certification (AFC) with the California Energy Commission for permitting of the plant. Specifically, the plant will set upon a 20 acre parcel just northeast of the intersection of Bethel and Dinuba Avenues. A 20-acre area of a 60-acre alfalfa field adjacent to the plant site will be used as a construction yard for the project. The project involves four basic components including the power plant site, natural gas pipeline, water pipeline, and transmission lines (see attached map). Many miles of water pipeline, transmission lines, and gas pipeline are proposed for the project. The first two structures will occur in Fresno County and the gas pipeline will interconnect with an existing gas pipeline near Visalia in Tulare County and run north to the power plant site in Fresno County.

In May 2007, we conducted reconnaissance surveys to evaluate if wetlands and waters occur on or adjacent to the project site and along the water, gas, and transmission line routes. Our waters/wetlands evaluation report was forwarded to you in January 2008 with a request for guidance on permits. That report lists the multitude of preventive avoidance measures for the project, and they are attached for reference. Since that report, the KRCD has decided to bore completely underneath the Cross Creek area to avoid potential impacts. A Biological Assessment Report was been prepared for the project in November 2007.

HDD techniques will be used to install the 24-inch natural gas pipeline under waters/wetlands at two sites:

- Kings River near Kingsburg (1 HDD site)
  (Section 17, Township 16S, Range 23E, Reedley Quad, Fresno County)

- Cross Creek intermittent drainages south of Traver (2 HDD sites)
  (Section 34, Township 17S, Range 23E, Traver Quad, Tulare County)

The Cross Creek area is annual grassland habitat that has six intermittent drainages, some of which are wetlands and some are waters. The gas pipeline will occur in the Road 60 right-of-way; however, private lands adjacent to the right-of-way have wetland ponds, vernal pool wetlands, the endangered Vernal Pool Tadpole Shrimp, Critical Habitats, and potentially other sensitive species too. Two HDD sites will be used to bore underneath two separate areas of Cross Creek intermittent drainages. The Kings River at the gas pipeline route is a waters and has wetland and riparian habitat along its banks.

Please advise us if a permit is needed to bore under the Kings River and intermittent drainages of Cross Creek using HDD techniques to install a gas pipeline for the KRCD's power plant project.

Sincerely,

Jeffrey A. & Pamela S. Halstead
Owners/Partners/Biologists

cc: Mr. Taylor Matteson (KRCD)
Ms. Amy Cuellar (Navigant Consulting, Inc.)

ATTACHMENT WATER-3

Monthly and Yearly Wastewater Volume
Totals 1999 – 2006

Monthly & Yearly Domestic Waste Water
Effluent Volume Totals at Parlier & Sanger, CA
Waste Water Treatment Plants -
1999 thru 2006

1999	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	66.4	48.7	40.8	*43.4*	*45.5*	48.6	45.3	47.5	41.1	45.5	52.1	54.3	579.2	1,777.7
Sanger WWTP Effluent (Million Gal.)	46.6	43.2	47.6	45.8	50.0	50.6	55.0	61.7	54.1	49.1	45.6	44.1	593.5	1,821.6
												Combined Total 1999	1,172.7	3,599.3

2000	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	49.0	*43.6*	43.7	40.7	43.6	52.5	45.0	45.7	54.2	50.7	42.7	52.8	564.1	1,731.2
Sanger WWTP Effluent (Million Gal.)	46.6	45.8	45.3	43.1	48.3	49.3	45.9	44.4	42.3	43.8	39.1	37.5	531.5	1,631.1
												Combined Total 2000	1,095.5	3,362.2

2001	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	45.7	44.8	47.0	46.0	44.4	45.2	49.6	51.3	54.8	50.1	48.1	48.0	575.0	1,764.6
Sanger WWTP Effluent (Million Gal.)	43.0	39.1	44.4	42.7	47.2	46.3	48.9	48.3	47.0	48.9	47.6	46.0	549.2	1,685.5
												Combined Total 2001	1,124.2	3,450.1

2002	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	41.8	44.7	43.5	42.2	48.7	45.0	45.9	49.3	53.6	49.9	48.8	44.0	557.5	1,710.9
Sanger WWTP Effluent (Million Gal.)	47.1	43.2	47.4	47.4	49.2	50.2	53.9	54.4	51.3	50.8	48.7	50.1	593.6	1,821.7
												Combined Total 2002	1,151.0	3,532.6

2003	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	44.2	44.0	52.2	46.0	47.0	45.0	47.0	44.8	44.9	46.2	44.5	43.0	548.7	1,684.0
Sanger WWTP Effluent (Million Gal.)	49.9	45.7	49.8	49.3	51.8	53.4	55.8	56.2	55.2	55.2	51.9	52.4	626.6	1,923.0
												Combined Total 2003	1,175.3	3,607.0

2004	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	44.8	42.1	44.0	43.9	46.6	*46.4*	47.5	44.7	*49.0*	45.2	45.1	45.5	544.8	1,672.0
Sanger WWTP Effluent (Million Gal.)	51.8	48.4	51.8	50.3	52.5	53.2	56.7	57.6	55.1	55.3	52.4	57.5	642.7	1,972.5
												Combined Total 2004	1,187.5	3,644.5

2005	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	46.0	39.7	41.8	41.1	45.7	44.3	47.4	48.7	45.4	46.4	44.3	43.7	534.5	1,640.3
Sanger WWTP Effluent (Million Gal.)	55.4	48.1	54.2	49.7	51.3	47.0	50.1	51.7	49.5	49.9	46.9	48.5	602.2	1,848.3
												Combined Total 2005	1,136.7	3,488.7

2006	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	45.1	41.4	43.6	44.5	42.9	44.3	45.8	45.8	*49.0*	*47.7*	*46.5*	*47.3*	543.8	1,668.8
Sanger WWTP Effluent (Million Gal.)	53.2	46.7	52.1	51.5	53.9	54.6	57.4	58.3	55.4	55.0	52.2	54.0	644.3	1,977.3
												Combined Total 2006	1,188.0	3,646.1

Notes:
1 - Monthly figures in italics represent months in which no data was available. Data for these months was estimated by averaging the monthly effluent figures from the available data from all other years.
2 - Parlier and Sanger WWTP effluent data for 1997 & 1998 was unavailable.

ATTACHMENT WATER-4

Monthly and Yearly Wastewater Volume
Totals 2011 – 2020

Estimated Monthly & Yearly Domestic Waste Water
Effluent Volume Totals at Parlier & Sanger, CA
Waste Water Treatment Plants - 2011 thru 2020

2011	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	55.8	50.9	52.0	50.7	53.1	54.1	54.5	55.1	57.1	55.6	54.2	55.2	**649.4**	**1,993.1**
Sanger WWTP Effluent (Million Gal.)	61.0	55.8	60.8	58.8	62.6	62.7	65.6	67.0	63.5	63.2	59.5	60.4	**740.3**	**2,272.2**
												Combined Total 2011	**1,389.7**	**4,265.2**

2012	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	57.5	52.4	53.5	52.2	54.7	55.7	56.0	56.7	58.8	57.3	55.8	56.8	**668.9**	**2,052.8**
Sanger WWTP Effluent (Million Gal.)	62.7	57.4	62.6	60.6	64.4	64.5	67.5	69.0	65.3	65.0	61.3	62.2	**762.6**	**2,340.3**
												Combined Total 2012	**1,431.4**	**4,393.2**

2013	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	59.2	54.0	55.1	53.8	56.3	57.4	57.8	58.4	60.6	59.0	57.5	58.5	**688.9**	**2,114.4**
Sanger WWTP Effluent (Million Gal.)	64.7	59.2	64.6	62.5	66.4	66.5	69.6	71.1	67.4	67.1	63.2	64.1	**785.4**	**2,410.6**
												Combined Total 2013	**1,474.4**	**4,525.0**

2014	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	61.0	55.6	56.8	55.4	58.0	59.1	59.5	60.2	62.4	60.8	59.2	60.3	**709.6**	**2,177.9**
Sanger WWTP Effluent (Million Gal.)	66.6	60.9	66.4	64.3	68.4	68.5	71.7	73.2	69.3	69.0	65.0	66.0	**809.0**	**2,482.9**
												Combined Total 2014	**1,518.6**	**4,660.7**

2015	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	62.8	57.3	58.5	57.1	59.8	60.9	61.3	62.0	64.3	62.6	61.0	62.1	**730.9**	**2,243.2**
Sanger WWTP Effluent (Million Gal.)	68.6	62.7	68.4	66.2	70.4	70.5	73.8	75.4	71.4	71.0	66.9	67.9	**833.3**	**2,557.4**
												Combined Total 2015	**1,564.2**	**4,800.6**

2016	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	64.7	59.0	60.2	58.8	61.5	62.7	63.1	63.8	66.2	64.5	62.8	63.9	**752.8**	**2,310.5**
Sanger WWTP Effluent (Million Gal.)	70.7	64.6	70.5	68.2	72.5	72.6	76.0	77.6	73.6	73.2	69.0	70.0	**858.3**	**2,634.1**
												Combined Total 2016	**1,611.1**	**4,944.6**

2017	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	66.6	60.8	62.1	60.5	63.4	64.6	65.0	65.8	68.2	66.4	64.7	65.9	**775.4**	**2,379.8**
Sanger WWTP Effluent (Million Gal.)	72.8	66.6	72.6	70.3	74.8	74.8	78.4	80.0	75.8	75.5	71.1	72.1	**884.0**	**2,713.1**
												Combined Total 2017	**1,659.4**	**5,092.9**

2018	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	**68.7**	62.6	64.0	62.4	65.4	66.6	67.0	67.8	70.3	68.5	66.7	67.9	**798.7**	**2,451.2**
Sanger WWTP Effluent (Million Gal.)	**75.0**	68.6	74.8	72.4	77.0	77.1	80.7	82.4	78.1	77.7	73.2	74.3	**910.5**	**2,794.5**
												Combined Total 2018	**1,709.2**	**5,245.7**

2019	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	70.8	64.5	65.9	64.3	67.3	68.6	69.0	69.8	72.4	70.5	68.7	70.0	**822.6**	**2,524.7**
Sanger WWTP Effluent (Million Gal.)	77.3	70.7	77.1	74.6	79.3	79.4	83.2	84.9	80.4	80.1	75.4	76.5	**937.8**	**2,878.3**
												Combined Total 2019	**1,760.5**	**5,403.1**

2020	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total (MG)	Acre-Ft.
Parlier WWTP Effluent (Million Gal.)	72.8	66.4	67.8	66.2	69.3	70.6	71.0	71.9	74.5	72.6	70.7	72.0	**847.3**	**2,600.5**
Sanger WWTP Effluent (Million Gal.)	79.5	72.8	79.3	76.8	81.7	81.8	85.6	87.4	82.8	82.4	77.7	78.8	**966.0**	**2,964.7**
												Combined Total 2020	**1,813.3**	**5,565.2**

Notes:
1 - Parlier and Sanger yearly projections were determined by using the 2010 estimated wastewater effluent (See AFC Vol. 1, Section 8.5 - Water Resources, Table 8.5-5), then using an annual growth rate of three percent per year to determine WWTP effluent for years 2011 thru 2020 (See AFC Vol.1, Section 8.5 - Water Resources, p. 12-13 & Table 8.5-5)
2 - Monthly effluent figures were determined by taking the 12- month average of the yearly effluent estimate, then multiplying by the Parlier & Sanger WWTP 1999 thru 2006 effluent data monthly percentage of the 12-month average for each calendar month

Technical Area: Transmission System Engineering

Additional Data Request TSE-1:
Please provide drawings of the 230-kV H-frame structure configuration with the proposed dimensions for under-crossing of the existing Balch-McCall and Hass-McCall 230-kV lines.

Initial Response:
Drawings are not available at this time. Drawings will be available during the detailed design phase of the generator tie-line. The tie-line will be designed and constructed such that the clearances meet or exceed the minimum clearances specified in applicable Laws, Ordinances, Regulations and Standards (LORS) including California Public Utilities Commission (CPUC) General Order 95 (GO-95) and Pacific Gas and Electric Company (PG&E) Standards – Electric Design Standard Book.

Technical Area: Transmission System Engineering

Additional Data Request TSE-2:
Please provide drawings which illustrate the line clearance where the generator tie-lines (230-kV) under cross the existing Balch-McCall and Hass-McCall 230-kV lines.

Initial Response:
Please see response to TSE-1.

Technical Area: Transmission System Engineering

Additional Data Request TSE-3:
Please provide drawings which illustrate the line clearance where the generator tie-lines over cross the existing McCall-Reedley 115-kV lines.

Initial Response:
Please see response to TSE-1.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION OF THE STATE OF CALIFORNIA
1516 NINTH STREET, SACRAMENTO, CA 95814
1-800-822-6228 – WWW.ENERGY.CA.GOV

APPLICATION FOR CERTIFICATION for the KINGS RIVER CONSERVATION DISTRICT COMMUNITY POWER PROJECT	**Docket No. 07-AFC-7** **PROOF OF SERVICE** **(REVISED 8/28/08)**

INSTRUCTIONS: All parties shall either (1) send an original signed document plus 12 copies or (2) mail one original signed copy AND e-mail the document to the address for the Docket as shown below, AND (3) all parties shall also send a printed or electronic copy of the document, which includes a proof of service declaration to each of the individuals on the proof of service list shown below:

CALIFORNIA ENERGY COMMISSION
Attn: Docket No. 07-AFC-7
1516 Ninth Street, MS-15
Sacramento, CA 95814-5512
docket@energy.state.ca.us

APPLICANT

***David Orth**
Kings River Conservation District
4886 East Jensen Ave
Frenso, CA 93725-1899
dorth@krcd.org

APPLICANT CONSULTANT

Amy Cuellar, Project Manager
Navigant Consulting
3100 Zinfandel Dr
Rancho Cordova, CA 95670
acuellar@navigantconsulting.com

COUNSEL FOR APPLICANT

Scott Galati
Galati/Blek, LLP
Plaza Towers
555 Capitol Mall, Suite 600
Sacramento, CA 95814
sgalati@gb-llp.com

INTERESTED AGENCIES

California ISO
P.O. Box 639014
Folsom, CA 95763-9014
e-recipient@caiso.com

INTERVENORS

ENERGY COMMISSION

Jackalyne Pfannenstiel
Chairman and Presiding Member
jpfannen@energy.state.ca.us

Karen Douglas
Commissioner and Associate Member
kldougla@energy.state.ca.us

Ken Celli
Hearing Officer
kcelli@energy.state.ca.us

Shaelyn Strattan
Project Manager
sstratten@energy.state.ca.us

Kerry Willis
Staff Counsel
kwillis@energy.state.ca.us

Public Adviser's Office
pao@energy.state.ca.us

DECLARATION OF SERVICE

I, Ann Czerwonka, declare that on October 2, 2008, I deposited copies of the attached Data Response Set #2 and Biological Survey Reports, in the United States mail at Sacramento, California with first-class postage thereon fully prepaid and addressed to those identified on the Proof of Service list above.

OR

Transmission via electronic mail was consistent with the requirements of California Code of Regulations, title 20, sections 1209, 1209.5, and 1210. All electronic copies were sent to all those identified on the Proof of Service list above.

I declare under penalty of perjury that the foregoing is true and correct.

Ann Czerwonka